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CONTENT

1. ȘTEFÎRȚĂ Anastasia, TOMA S., BARBĂ N., BRÂNZĂ Lilia, ROBU Ș., MELENCIUC M., BUCEACEAIA Svetlana - Effect of salicylic acid's derivates on plant growth and productivity	19
2. CĂPRARU Adina-Mirela, UNGUREANU Elena, TRINCĂ Lucia Carmen, POPA I.V. - Study concerning of modification of spruce wood bark by hydroxymethylation reaction	25
3. CĂPRARU Adina-Mirela, UNGUREANU Elena, TRINCĂ Lucia Carmen, POPA I. V. - Contributions concerning the treatment of birch veneer with lignins modified and copper compounds	31
4. OANCEA Servilia, A.V. OANCEA - Chaos control for two dissipative systems	37
5. OANCEA Servilia, A.V. OANCEA - Fractal analysis of corn root change under anionic clays action	43
6. LISNIC S., TOMA S., CORETSCAIA Iulia - Interaction between cation (Ni^{2+}) and anions sulfate and chlorine (SO_4^{2-} and Cl^-) in the expression of peroxidase activity of sugar beet depending on the dose of nickel and temporary water stress	49
7. DUCA Maria, PORT Angela, LEVIȚCHI A., ȘESTACOVA Tatiana, SINEAVSKAIA Marina, AKSIONOVA Elena, DAVIDENKO O. - Clustering analysis of sunflower genotypes cultivated in Moldova on the basis of microsatellite sequences .	55
8. DUCA Maria, MIDONI A., SHESTAKOVA Tatiana, PORT Angela, NECHIFOR Victoria - Cytoplasmic male sterility and fertility restoration, various mechanisms - the same effect	61
9. PORT Angela, LEVIȚCHI A., DUCA Maria, MIDONI A., CHILARI Rodica - Genetic distance evaluation, a useful tool in heterosis effect prediction of sunflower genotypes	67
10. BUBURUZAN Laura, GĂLĂȚEANU Bianca, REBEDEA Mariana, DRAGHIA Lucia - Cytometric investigations of genome size and level of ploidy in some plants with ornamental potential	73
11. CRISTEA Tina Oana, CĂLIN Maria, PRISECARU Maria - Studies regarding the cytogenetic characterization of two perspective lines of <i>Allium ursinum</i>	79
12. BEJAN Carmen, VIȘOIU Emilia - Stimulation of stilbene polyphenol biosynthesis, under <i>in vivo</i> controlled conditions, in some grape varieties for red and white quality wine	85

13. CIORNEA Elena, TUTU Elena, COJOCARU Sabina Ioana - Studies concerning the influence of some mineral compounds on the dynamics of some oxidoreductases activity at <i>Monilinia laxa</i> (Aderh.& Ruhl.) Honey parasite on plum trees	91
14. GLIJIN Aliona, MÎȚA Elena, LEVIȚCHI A., ACCIU Adriana, CALMÎȘ Ana, DUCA Maria - Phenylalanine ammonia-lyase in normal and biotic stress conditions	97
15. PRISĂCARU Cornelia - The diminution of sterygmatoecystin toxicity by the antiradicalic action of some vegetal flavonoid containing products	103
16. TUCALIUC Roxana, COTEA V.V., DROCHIOIU G., MANGALAGIU I. - Synthesis and the efect of some pyridazine derivatives in germination	109
17. TUTU Elena, CIORNEA Elena - Studies concerning the influence of some oligoelements on the activity of Krebs cycle dehydrogenases at <i>Monilinia laxa</i> (Aderh.& Ruhl.) Honey parasite on plum trees	115
18. PARASCHIV Nicoleta Luminița, CHELARIU Elena-Liliana - Morph-anatomic studies at species from spontaneous flora with ornamental value	121
19. PETRESCU Lucia, COLIBABA Anca, COLIBABA S., COLIBABA Cintia - Social integration and LSP INTEGRA & TOOL TIPLS projects	127
20. BREZULEANU S., BREZULEANU Carmen Olgața, UNGUREANU G. - Analysis of performance in business of companies in wine making domain by the "Balanced Scorecard" model	133
21. ONEA Angelica-Nicoleta - Educational management – adaptation to cultural specificity	139
22. BREZULEANU S., BREZULEANU Carmen Olgața, CIUREA I.V., MIHALACHE Roxana - Managerial skills necessary for managers of agricultural farms from Vaslui county in order to absorb european funds	145
23. DURBACA Nicoleta, STRATU Anișoara - Extracurricular activities: training methods environmental education at secondary level	151
24. HOZA Gheorghîța, CHIOREAN Ștefania, M. D. DRĂGUȘIN - Research regarding management systems for plants with two stems, cultivated in solar	157
25. BARBAROȘ I., BARBAROȘ Ecaterina - Directions for efficient use of land fund fruit growing in the Republic of Moldova	161

26. **BARBAROȘ M., BUJOREANU N., DASCĂLU N.** - Growth and fruition of raspberry plants for getting in intensive culture of organic production 167
27. **MANZIUC V., CIMPOIEȘ Gh., POPA I., POPA S.** - Comparative efficiency of crown formation systems in intensive apple plantations 171
28. **PEȘTEANU A., BABUC V., GUDUMAC E.** - Productivity of long-term cultivars in the apple tree superintensive culture system 175
29. **AVASILOAIEI D.I., MUNTEANU N., BREZEANU M., MUNTEAN Delia** - Preliminary studies regarding the optimization of some tehnological factors for vegetables growing in an ecological system 181
30. **HOBINCU Marlana, MUNTEANU N., TINCĂ Gabriela, PODARU Doina- Maria, PĂDURARIU Anca Eugenia** - Morphological and physiological characteristics of the species *Origanum vulgare* L. in organic growing conditions in the county of Iassy 187
31. **MUNTEAN Delia, MUNTEANU N., HOBINCU Marlana, AVASILOAIEI D. I.** - On the ornamental features of some vegetable cultivated species 193
32. **TELIBAN G.C., MUNTEANU N., POPA Lorena-Diana, STOLERU V., TINCĂ Gabriela, ȚIBULCĂ L.** - Studies on the preferences for ecological vegetable product of the consumers from Iasi county 199
33. **TINCĂ Gabriela, MUNTEANU N., STOLERU V.** - Optimization of certain technological measures for hyssop (*Hyssopus officinalis*) crops in the ecological conditions 205
34. **ȚIBULCĂ L., MUNTEANU N., BIREESCU L., STOLERU V., GHITĂU Carmen** - Results on the sustainability evaluation of vegetable cultivated soil in the Târgu Frumos conditions 211
35. **VÎNĂTORU C., NEICU – TEODORESCU Eliza, CUCU Elena Ioana** - New melon collection (*Cucumis melo* L.) obtained at V.R.D.S. Buzău 217
36. **DASCĂLU M., ISTRATE M., CÂRDEI E., ZLATI Cristina, MORARIU Aliona, CĂULEȚ Raluca** - Study on the behavior of new varieties of sweet cherry in climatic conditions of NE Romania 223
37. **ISTRATE M., CÂRDEI E., DASCĂLU M., IGNAT C.** - Study on improving the technology of intensive culture of apple plantations in the climatic conditions of NE Romania 227

38. IUREA Elena, GRĂDINARIU G., SÎRBU Sorina, CORNEANU G., PETRE L. - The influence of the climatic factors on the sweet cherry tree growth and fruit-bearing in Iași's conditions	233
39. PAȘCU D. D., GRĂDINARIU G., CIOBOTARI G. - Aspects concerning the quality of some cherry tree fruits ripened in the climatic conditions of 2010 from North-Eastern Romania	237
40. PARTENIE E. - Study on the behavior of certain apple varieties with genetic resistance to diseases located in the Husi fruit basin	241
41. CĂLIN Maria, CRISTEA Tina Oana, DRAGHIA Lucia, AMBĂRUȘ Silvica, BREZEANU Creola, BREZEANU P. M., AVASILOAIEI D. I., BARBU Diana, BARBU Iuliana - Study regarding the influence of growing and irrigation conditions over different ornamental features of some taxa of wild plants at Vegetable Research-Development Station Bacau	245
42. CHELARIU Elena-Liliana, DRAGHIA Lucia - Species from spontaneous flora of Tulcea county, with ornamental value	251
43. CHELARIU Elena-Liliana, DRAGHIA Lucia - Ornamental grasses with cultivation potential in the pedo-climatic conditions of Iași county	257
44. DRAGHIA Lucia, CHELARIU Elena-Liliana - Germplasm sources from spontaneous flora of Constanța county	263
45. BERNARDIS R. - Aspects regarding the ornamental value of some Teahibrida and Floribunda rose varieties from „Tudor Neculai” nursery collection - Iasi county	269
46. GÂTEA M., ȘCHEAU V., BARA V., DOMUȚA C., ȘCHEAU A., BUCUREAN Elena, BARA Camelia, BARA L., BREJEA R., BORZA Ioana - Behavior of disease resistant apple tree cultivars in super-intensive orchards in Oradea	275
47. IRIMIA L., PATRICHE C.V. - The distribution of the ecological suitability for grape growing in Huși wine growing centre, depending on the local variation of the geomorphological factors	281
48. ȚÂRDEA C. - Viticultural biological time - a new viticultural ecological index for the distribution of vine varieties by geographical area	287
49. LĂCUREANU G., COTEA V.V., COLIBABA Cintia, NECHITA B., NICULAU M. - Phenolic compounds from Busuioacă de Bohotin obtained through different maceration technologies	291
50. MAICAN E., TUDORACHE A., MURAD E., DAVID M.F. - Wine blending assisted by expert system	295

51. ANDREI Corina - General issues concerning the ways of contamination horticultural products raw materials for industrialization	301
52. BARCAN (BĂETU) Alina-Loredana, BĂETU M. - General issues concerning on the content of ascorbic acid in fresh horticultural products	307
53. FILIMON V. R., NICULAU M., MIHALACHE ARION Cristina - Anthocyanin pigment content of some cherry varieties grown in Iasi area, Romania	313
54. MIHALACHE (ARION) Cristina, NICULAU M., FILIMON R. V., BECEANU D. - Antiradical activity, total phenolics and anthocyanins content of different plum varieties	319
55. CORNEA V. - Information system for management of grapevine genofond in Republic of Moldova	325
56. ENACHE Viorica, DONICI Alina, MAICAN E. - The data base, oriented to the peculiar soil and climate conditions of vine culture at regional level in the Bujoru vineyard	329
57. MUNTEANU N., CHIRILOV A., CHINTEA P., HARCICU O., SVET S., COZMIC Raisa, BAȘTOVAIA Svetlana, CHIRILOV Eleonara, IUREA Dorina - A new regulator of the physiological processes in grape plants	335
58. BÎRLIGA N., CIUBUCĂ A. - Étude de la maturité phénolique des principaux cépages de cuve rouge du vignoble Dealul Bujorului	341
59. COLIBABA Cintia, COTEA V.V., NECHITA B., NICULAU M., LACUREANU F.G., TUDOSE-SANDU-VILLE St. - Compounds with sensorial character of Tamaioasa romaneasca wines obtained through different maceration technologies	347
60. GEORGESCU O., COTEA V.V., ZAMFIR C.I., ODĂGERIU Ghe., BUBURUZANU C., GHERGHINĂ Nicoleta - Considerations regarding the optimization of the technology for the obtaining of Băbească neagră red wines	353
61. MĂNTĂLUȚĂ Alina, COJOCARU D., VASILE Ancuța, SAVIN C., PAȘA Rodica - Testing new granular yeast strains in secondary fermentation bottles for obtaining sparkling wines	359
62. ANDREI Corina - General issues concerning the ways of contamination on technological flow of processed horticultural products under processing	365
63. BARCAN (BĂETU) Alina-Loredana, BĂETU M. - General issues concerning content of ascorbic acid in processed horticultural products	371

64. **FILIMON V.R., NICULAUA M., MIHALACHE ARION Cristina, COȚOVANU Roxana** - Solid-liquid extractions efficiency in determination of anthocyanin content of the oenological depleted material 377
65. **MIHALACHE (ARION) Cristina, NICULAUA M., FILIMON R.V., BECEANU D.** - Evaluation of the antiradical potential of different cabbage varieties 383
66. **MUSTEA M., ROTARU Liliana, IRIMIA L. M., RĂILEANU M.** - Behaviour of Fetească neagră, Cabernet sauvignon and Merlot vine varieties in the viticol center Bohotin of Iasi vineyard 389
67. **COTIANU R. D.** - Influence of fertilizers on the level and quality of maize 393
68. **ȚENU I., COJOCARIU P., ROȘCA R., CÂRLESCU P., BERCOVICI C.** - Research concerning design and testing of a laboratory rig for the study of the agricultural units active parts-soil interaction 399
69. **COTIANU R. D.** - Influence of fertilizers on the level and quality of soybean production 405
70. **BIREESCU L., CHELARIU Elena Liliana, BIREESCU Geanina, DRAGHIA Lucia** - Eco-pedological and pedo-biologic dyagnosis of some meadows eco-systems from N-E area of Romania 411
71. **BIREESCU Geanina, DRAGHIA Lucia, BIREESCU L., CHELARIU Elena Liliana, SELLITTO M., CIOROIANU T., PATRAȘ Antoanela** - Quality and fertility of soil resources from some protected forest eco-systems from N-E of Romania 417
72. **CONTOMAN Maria, MURARIU Mariea** - Determination and interpretation of indicators of soil fertility in Galati county vineyards 423
73. **BREJEA R., DOMUȚA C., BARA V., ȘANDOR Maria, CIOBANU Gh., BORZA Ioana, BARA Camelia, DOMUȚA Cr., BARA L., GÎTEA M., VUȘCAN A., ONEȚ Aurelia, ONEȚ C.** - Research concerning the influence of the irrigation in potato crop in Crișurilor plain 429
74. **DOMUȚA C., BARA V., ȘCHEAU V., CIOBANU GH., ȘANDOR Maria, BARA Camelia, DOMUȚA Cr., BARA L., BORZA Ioana, BREJEA R., GÎTEA M., PEREȘ Ana, KOTELES Nandor** - Irrigation scheduling in drip irrigated peach-tree in the conditions from Northwestern Romania 435
75. **RADU O.** - Adjusting agricultural drainage to buildings 441

76. BUTNARU C.L. - Research regarding the impact of agricultural machines traffic on some physical properties of the soil at winter wheat crop	447
77. IVAȘCU Antonia, GRĂDINARIU G., CÎNDEA Mirela, UBERTI Marina - Mulberry tree bacterial cancer	453
78. LĂZUREANU A., ALEXA Ersila, BALINT Alina, CARCIU GH., ALDA S., LĂZUREANU D., CRĂCIUNESCU A., CHISĂLIȚĂ I., CUC Liana - Monitoring of nitrogen compounds content in underground water from Timis river	457
79. BĂDEANU Marinela - Research on the relationship between species diversity in deciduous forest and Lumbricide community exists in its ground	463
80. HEREA Monica, TĂLMACIU M., TĂLMACIU Nela - Research on knowledge of species of insects belonging useful fauna in some cherry orchards from Iași county	467
81. TĂLMACIU M., PĂDURARU L. B., TĂLMACIU Nela, HEREA Monica - Observation on useful and harmful entomofauna with prevention and control measures applied in apple orchards from Iasi and Vaslui counties	473
82. MITREA Rodi, STANCIU G. - Results regarding the influence of climatic conditions on dynamics evolution of pathogens in plum culture of S.C. TERRA VIVA LLC Bals during 2007-2009	479
83. STANCIU G., MITREA Rodi - The efficacy of some pesticide complexes in controlling apricot tree culture specific pathogen agents in S.C. TERRA VIVA S.R.L. Bals during 2007-2009 ...	485
84. TRINCĂ Lucia Carmen, VOLF Mariana, AVARVAREI I., BIANU Elisabeta, CĂPRARU Mirela Adina - Comments on cadmium and lead concentration in some plants and feed products from Iasi area	491
85. DRAGHIA Lucia, CHELARIU Elena Liliana - The behaviour in crop conditions of some ornamental spontaneous species	495
86. CIOBĂNAȘU C. - Ecological impact of setting up agroindustrial farms in Prut river meadow	501
87. DASCĂLU Doina Mira - Green architecture, from utopia to reality	507
88. DASCĂLU Doina Mira - Balsh-Sturdza palace gardens of Iassy	513
89. PRALEA Jeni, STANCIU S. T. - Functional and aesthetic adaptation of conventional public means of conveyance into the urban landscape	519
90. PRALEA Jeni, ȘOLTUZ Elena - Ergonomic study about sitting places in landscape design domain	525

91. NEGREA Roxana, ZLATI Cristina - Tree foliage, as main source of color in landscape composition	531
92. ZLATI Cristina, NEGREA Roxana, DRAGHIA Lucia, DASCĂLU Doina Mira - Practical solutions in choosing plant composition for landscaping	537
93. CHIRIAC H. C. - The role of imaginary in the transition from modernism to postmodernism	543
94. ALEXANDROV E., GĂINĂ B. - Particularities of the morphology and the biochemistry of the grape berries of vine inter-specific hybrids of 4 th backcross (<i>Vitis vinifera</i> L. x <i>Muscadinia rotundifolia</i> Michx) and of <i>Vitis vinifera</i> subsp. <i>sylvestris</i> Gmel.	547
95. BARBU Cătălina - The influence of windthrows on ecoprotective functions of the forests. Case study in the forest district Tomnatec, Suceava county	553
96. MURAD E., MAICAN E., HARAGA G., BIRIȘ Ș.S. - Greenhouse heating with biomass	559
97. POSTOLACHE Elena, CIUBUCĂ A., SIMION Cristina, TELIBAN A., TELIBAN Luciana, ENACHE Viorica, DELPORTE Isabelle - Effect of foliar fertilizer „Floravit” on wine quality in the Dealu Bujorului vineyard	565
98. STANCĂ-MOISE Cristina - Lepidoptera (insecta: Lepidoptera) in the collection of Eugen Worell from Natural History Museum of Sibiu, collected from "Dumbrava Sibiului" forest	571

CUPRINS

1. ȘTEFÎRȚĂ Anastasia, TOMA S., BARBĂ N., BRÂNZĂ Lilia, ROBU Ș., MELENCIUC M., BUCEACEAIA Svetlana - Efectul unor derivați ai acidului salicilic asupra creșterii și productivității plantelor	19
2. CĂPRARU Adina-Mirela, UNGUREANU Elena, TRINCĂ Lucia Carmen, POPA I.V. - Cercetări cu privire la modificarea cojii de molid prin reacția de hidroximetilare	25
3. CĂPRARU Adina-Mirela, UNGUREANU Elena, TRINCĂ Lucia Carmen, POPA I.V. - Contribuții privind tratarea furnirului de mesteacăn cu lignine modificate și compuși ai cuprului	31
4. OANCEA Servilia, A.V. OANCEA - Controlul haosului pentru două sisteme disipative	37
5. OANCEA Servilia, A.V. OANCEA - Analiza fractală a modificării rădăcinii de porumb sub acțiunea argilelor anionice	43
6. LISNIC S., TOMA S., CORETSCAIA Iulia - Interacțiunea dintre cationul nichel (Ni^{2+}) și anionii sulfat și clor (SO_4^{2-} și Cl^-) în manifestarea activității peroxidazei la sfecla de zahăr în dependență de dozele de nichel și stresul hidric temporar	49
7. DUCA Maria, PORT Angela, LEVIȚCHI A., ȘESTACOVA Tatiana, SINEAVSKAIA Marina, AKSIONOVA Elena, DAVIDENKO O. - Analiza clusteriană a genotipurilor de floarea-soarelui cultivate în Republica Moldova în baza secvențelor microsatelite	55
8. DUCA Maria, MIDONI A., SHESTAKOVA Tatiana, PORT Angela, NECHIFOR Victoria - Androsterilitatea citoplasmatică și restaurarea fertilității, diverse mecanisme – același efect	61
9. PORT Angela, LEVIȚCHI A., DUCA Maria, MIDONI A., CHILARI Rodica - Evaluarea distanței genetice în scopul pronosticării efectului de heterozis la diverse genotipuri de floarea-soarelui	67
10. BUBURUZAN Laura, GĂLĂȚEANU Bianca, REBEDEA Mariana, DRAGHIA Lucia - Investigații citometrice ale dimensiunii genomului și nivelului de ploidie la unele plante cu potențial ornamental	73
11. CRISTEA Tina Oana, CĂLIN Maria, PRISECARU Maria - Studii privind caracterizarea citogenetică a două linii de perspectivă de <i>Allium ursinum</i>	79

12. BEJAN Carmen, VIȘOIU Emilia - Stimularea biosintezei polifenolilor stilbenici in conditii controlate <i>in vivo</i> la unele soiuri de struguri pentru vinuri rosii si albe de calitate	85
13. CIORNEA Elena, TUTU Elena, COJOCARU Sabina Ioana - Studii privind influența unor compuși minerali asupra dinamicii unor oxidoreductaze la <i>Monilinia laxa</i> (Aderh.& Ruhl.) Honey parazită pe prun	91
14. GLIJIN Aliona, MÎȚA Elena, LEVIȚCHI A., ACCIU Adriana, CALMIȘ Ana, DUCA Maria - Activitatea fenilalanin amonia-liazei în condiții normale și de stres biotic .	97
15. PRISĂCARU Cornelia - Diminuarea toxicității micotoxinelor difuranice prin acțiunea antiradicalară a unor produse vegetale conținând flavonoide	103
16. TUCALIUC Roxana, COTEA V.V., DROCHIOIU G., MANGALAGIU I. – Sinteza și efectul derivaților piridazinici asupra germinației și creșterii plantelor de grâu	109
17. TUTU Elena, CIORNEA Elena - Cercetări privind influența unor oligoelemente asupra activității dehidrogenazelor ciclului krebs la <i>Monilinia laxa</i> (Aderh.& Ruhl.) Honey parazită pe prun	115
18. PARASCHIV Nicoleta Luminița, CHELARIU Elena-Liliana - Studii morfo-anatomice la specii din flora spontană cu valoare ornamentală	121
19. PETRESCU Lucia, COLIBABA Anca, COLIBABA St., COLIBABA Cintia - Integrare socială și predarea limbilor străine pentru scopuri specifice proiectele INTEGRA și TOOL TIPLS	127
20. ONEA Angelica-Nicoleta - Management educațional – adaptarea la specificitatea culturală	133
21. BREZULEANU S., BREZULEANU Carmen Olgața, UNGUREANU G. - Analiza performanței în afaceri la firmele din domeniul viti-vinicol prin modelul „Balanced Scorecard” ..	139
22. BREZULEANU S., BREZULEANU Carmen Olgața, CIUREA I.V., MIHALACHE Roxana - Competențe manageriale necesare managerilor exploatațiilor agricole din județul Vaslui pentru absorbția fondurilor europene	145
23. DURBACA Nicoleta, STRATU Anișoara - Activitățile extrașcolare - modalități de formare a educației ecologice la nivel liceal	151
24. HOZA Gheorghîța, CHIOREAN Ștefania, M. D. DRĂGUȘIN - Cercetări privind conducerea plantelor de tomate cu două tulpini, cultivate în solar	157
25. BARBAROȘ I., BARBAROȘ Ecaterina - Direcțiile utilizării eficiente a fondului funciar în pomicultura Republicii Moldova	161

26. **BARBAROȘ M., BUJOREANU N., DASCĂLU N.** - Creșterea și fructificarea plantelor de zmeur în cultura intensivă pentru obținerea producției ecologice 167
27. **MANZIUC V., CIMPOIEȘ Gh., POPA I., POPA S.** - Eficiența comparativă a sistemelor de formare a coroanei în plantațiile intensive de măr 171
28. **PEȘTEANU A., BABUC V., GUDUMAC E.** - Productivitatea soiurilor de perspectivă în sistemul superintensiv de cultură a mărului 175
29. **AVASILOAIEI D.I., MUNTEANU N., BREZEANU M., MUNTEAN Delia** - Studii preliminare privind optimizarea unor factori tehnologici de cultivare a legumelor în sistem ecologic 181
30. **HOBINCU Marlina, MUNTEANU N., TINCĂ Gabriela, PODARU Doina- Maria, PĂDURARIU Anca Eugenia** - Caracteristici morfologice și fiziologice ale speciei *Origanum vulgare* L. în condiții de cultivare ecologice în județul Iași 187
31. **MUNTEAN Delia, MUNTEANU N., HOBINCU Marlina, AVASILOAIEI D. I.** - Valoarea ornamentală a unor specii legumicole cultivate 193
32. **TELIBAN G.C., MUNTEANU N., POPA Lorena-Diana, STOLERU V., TINCĂ Gabriela, ȚIBULCĂ L.** - Studii asupra preferințelor pentru legumele ecologice a consumatorilor din județul Iași 199
33. **TINCĂ Gabriela, MUNTEANU N., STOLERU V.** - Optimizarea unor verigi tehnologice la cultura de isop (*Hyssopus officinalis*) în sistem ecologic 205
34. **ȚIBULCĂ L., MUNTEANU N., BIREESCU L., STOLERU V., GHIȚĂU Carmen** - Rezultate privind evaluarea sustenabilității solului cultivat cu legume în condițiile de la Târgu Frumos 211
35. **VÎNĂTORU C., NEICU – TEODORESCU Eliza, CUCU Elena Ioana** - Un nou sortiment de pepene galben (*Cucumis melo* L.) obținut la S.C.D.L. Buzău 217
36. **DASCĂLU M., ISTRATE M., CÂRDEI E., ZLATI Cristina, MORARIU Aliona, CĂULEȚ Raluca** - Studiu privind comportarea soiurilor noi de cireș în condițiile pedoclimatice din NE României 223
37. **ISTRATE M., CÂRDEI E., DASCĂLU M., IGNAT C.** - Studiu privind îmbunătățirea tehnologiei de cultură a mărului în plantații intensive în condițiile pedoclimatice din NE României 227

38. IUREA Elena, GRĂDINARIU G., SÎRBU Sorina, CORNEANU G., PETRE L. - Influența factorilor climatici asupra creșterii și rodirii cireșului în condițiile de la Iași	233
39. PAȘCU D. D., GRĂDINARIU G., CIOBOTARI G. - Investigarea calității fructelor unor soiuri de cireș în condițiile climatice ale anului 2010 din zona de Nord-Est a României	237
40. PARTENIE E. - Studiu privind comportarea unor soiuri de măr cu rezistență genetică la boli în bazinul pomicol Huși	241
41. CĂLIN Maria, CRISTEA Tina Oana, DRAGHIA Lucia, AMBĂRUȘ Silvica, BREZEANU Creola, BREZEANU P. M., AVASILOAIEI D. I., BARBU Diana, BARBU Iuliana - Studiul influenței unor condiții de creștere și irigare asupra unor caractere ornamentale ale unor taxoni spontani la Stațiunea de Cercetare-Dezvoltare pentru Legumicultură Bacău	245
42. CHELARIU Elena-Liliana, DRAGHIA Lucia - Specii cu valoare ornamentală din flora spontană a județului Tulcea	251
43. CHELARIU Elena-Liliana, DRAGHIA Lucia - Ierburi ornamentale cu posibilitate de cultivare în condițiile pedoclimatice din județul Iași	257
44. DRAGHIA Lucia, CHELARIU Elena-Liliana - Surse de germoplasmă din flora spontană a județului Constanța	263
45. BERNARDIS R. - Observații privind valoarea ornamentală a unor soiuri de trandafiri din clasa Teahibrida și clasa Floribunda întâlniți în pepiniera „Tudor Neculai” Iași	269
46. GÂTEA M., ȘCHEAU V., BARA V., DOMUȚA C., ȘCHEAU A., BUCUREAN Elena, BARA Camelia, BARA L., BREJEA R., BORZA Ioana - Comportarea soiurilor de măr rezistente la boli în cultură superintensivă în condițiile de la Oradea	275
47. IRIMIA L., PATRICHE C.V. - Distribuția favorabilității ecologice pentru cultura viței de vie în centrul viticol Huși, în funcție de variația locală a factorilor geomorfologici	281
48. ȚÂRDEA C. - Un nou indice ecologic în viticultură, intitulat <i>timpul biologic viticol</i> , pentru zonarea soiurilor de viță de vie	287
49. LĂCUREANU G., COTEA V.V., COLIBABA Cintia, NECHITA B., NICULAU M. - Compuși fenolici în vinurile de Busuioacă de Bohotin obținute prin diverse tehnologii de macerare	291
50. MAICAN E., TUDORACHE A., MURAD E., DAVID M.F. - Cupajarea vinurilor asistată de sistem expert	295
51. ANDREI Corina - Aspecte generale privind căile de contaminare a produselor horticoale materie primă pentru industrializare	301

52. BARCAN (BĂETU) Alina-Loredana, BĂETU M. - Aspecte generale privind conținutul în acid ascorbic la produsele horticoale prelucrate	307
53. FILIMON V.R., NICULAUA M., MIHALACHE ARION Cristina - Conținutul în pigmenți antocianici al unor soiuri de cireș cultivate în zona Iași, România	313
54. MIHALACHE (ARION) Cristina, NICULAUA M., FILIMON R.V., BECEANU D. - Activitatea antiradicalică, conținutul de fenoli totatli și antociani la diferite soiuri de prune	319
55. CORNEA V. - Sistemul informatic de gestiune a genofondului viței de vie în Republica Moldova	325
56. ENACHE Viorica, DONICI Alina, MAICAN E. - Bază de date climatice orientată pe specificul pedo-climatic și regional al culturilor viticole din podgoria Dealu Bujorului	329
57. MUNTEANU N., CHIRILOV A., CHINTEA P., HARCUIUC O., SVET S., COZMIC Raisa, BAȘTOVAIA Svetlana, CHIRILOV Eleonara, IUREA Dorina - Un nou regulator al proceselor fiziologice la plantele de viță de vie	335
58. BÎRLIGA N., CIUBUCĂ A. - Studiul maturării fenolice la principalele soiuri de struguri pentru vinuri roșii din podgoria Dealul Bujorului	341
59. COLIBABA Cintia, COTEA V.V., NECHITA B., NICULAUA M., LACUREANU F.G., TUDOSE-SANDU-VILLE St. - Compuși cu caracter olfactiv din vinurile de Tămâioasă românească obținute prin diverse tehnologii de macerare	347
60. GEORGESCU O., COTEA V.V., ZAMFIR C. I., ODĂGERIU GHE., BUBURUZANU C., GHE.RGHINĂ Nicoleta - Considerații cu privire la optimizarea tehnologiei de obținere a vinurilor roșii de Băbească neagră	353
61. MĂNTĂLUȚĂ Alina, COJOCARU D., VASILE Ancuța, SAVIN C., PAȘA Rodica - Testarea unor sușe noi de levuri granulare în fermentația a doua în butelii pentru obținerea vinurilor spumante	359
62. ANDREI Corina - Aspecte generale privind căile și modul de contaminare pe fluxul tehnologic a produselor horticoale în curs de prelucrare	365
63. BARCAN (BĂETU) Alina-Loredana, BĂETU M. - Aspecte generale privind conținutul în acid ascorbic la produsele horticoale proaspete	371

64. **FILIMON V.R., NICULAUA M., MIHALACHE ARION Cristina, COȚOVANU Roxana** - Randamentul extracțiilor solid-lichid în determinarea conținutului în antociani din material oenologic epuizat 377
65. **MIHALACHE (ARION) Cristina, NICULAUA M., FILIMON R.V., BECEANU D.** - Evaluarea potențialului antiradicalic a diferite soiuri de varză 383
66. **MUSTEA M., ROTARU Liliana, IRIMIA L. M., RĂILEANU M.** - Comportarea soiurilor Fetească neagră, Cabernet Sauvignon și Merlot în centrul viticol Bohotin, din podgoria Iași 389
67. **COTIANU R.D.** - Influența îngrășămintelor asupra nivelului și calității producției de porumb 393
68. **ȚENU I., COJOCARIU P., ROȘCA R., CÂRLESCU P., BERCOVICI C.** - Cercetări privind proiectarea și experimentarea unui stand pentru studiul interacțiunii organelor active ale utilajelor agricole cu solul 399
69. **COTIANU R. D.** - Influența îngrășămintelor asupra nivelului și calității producției de soia 405
70. **BIREESCU L., CHELARIU Elena Liliana, BIREESCU Geanina, DRAGHIA Lucia** - Diagnoza eco-pedologică și pedobiologică a unor ecosisteme practice din NE României 411
71. **BIREESCU Geanina, DRAGHIA Lucia, BIREESCU L., CHELARIU Elena Liliana, SELLITTO M., CIOROIANU T., PATRAȘ Antoanela** - Calitatea și fertilitatea resurselor de sol din unele ecosisteme forestiere protejate din NE României 417
72. **CONTOMAN Maria, MURARIU Mariea** - Determinarea și interpretarea unor indicatori de fertilitate a solurilor în plantațiile viticole din județul Galați 423
73. **BREJEA R., DOMUȚA C., BARA V., ȘANDOR Maria, CIOBANU Gh., BORZA Ioana, BARA Camelia, DOMUȚA Cr., BARA L., GÎTEA M., VUȘCAN A., ONEȚ Aurelia, ONEȚ C.** - Cercetări privind influența irigației asupra culturii cartofului în câmpia crișurilor 429
74. **DOMUȚA C., BARA V., ȘCHEAU V., CIOBANU GH., ȘANDOR Maria, BARA Camelia, DOMUȚA Cr., BARA L., BORZA Ioana, BREJEA R., GÎTEA M., PEREȘ Ana, KOTELES Nandor** - Prognoza irigației la cultura piersicului irigat prin picurare în condițiile din Nord-Vestul României 435
75. **RADU O.** - Adaptarea drenajului agricol la clădiri 441
76. **BUTNARU C.L.** - Cercetări privind impactul traficului utilajelor agricole asupra unor proprietăți fizice ale solului la cultura grâu de toamnă 447

77. IVAȘCU Antonia, GRĂDINARIU G., CÎNDEA Mirela, UBERTI Marina - Cancerul bacterian al dudului	453
78. LĂZUREANU A., ALEXA Ersila, BALINT Alina, CARCIU GH., ALDA S., LĂZUREANU D., CRĂCIUNESCU A., CHISĂLIȚĂ I., CUC Liana - Monitorizarea conținutului în compuși cu azot al apei freatică de pe cursul râului Timiș	457
79. BĂDEANU Marinela - Cercetări privind relația dintre diversitatea speciilor arboricole din pădurea de foioase și comunitatea de Lumbricide existentă în solul acesteia	463
80. HEREA Monica, TĂLMACIU M., TĂLMACIU Nela - Cercetări privind cunoașterea speciilor de insecte aparținând faunei utile în unele plantații de cireș din județul Iași	467
81. TĂLMACIU M., PĂDURARU L. B., TĂLMACIU Nela, HEREA Monica - Observații cu privire la entomofauna utilă și dăunătoare cât și măsurile de prevenire și combatere aplicate în plantațiile pomicole de măr din județele Iași și Vaslui	473
82. MITREA Rodi, STANCIU G. - Rezultate privind influența condițiilor climatice asupra dinamicii evoluției agenților patogeni din cultura de prun din SC TERRA VIVA SRL Balș în perioada 2007 – 2009	479
83. STANCIU G., MITREA Rodi - Eficacitatea unor complexe de pesticide în combaterea agenților patogeni specifici culturii de cais din SC TERRA VIVA SRL Balș în perioada 2007-2009 ...	485
84. TRINCĂ Lucia Carmen, VOLF Mariana, AVARVAREI I., BIANU Elisabeta, CĂPRARU Mirela Adina - Observații privind concentrarea cadmiului și plumbului în unele plante și produse furajere din zona Iașului	491
85. DRAGHIA Lucia, CHELARIU Elena Liliana - Comportarea în condiții de cultură a unor specii ornamentale spontane	495
86. CIOBĂNAȘU C. - Impactul ecologic al înființării unor ferme agroindustriale în lunca Prutului	501
87. DASCĂLU Doina Mira - Arhitectura verde, de la utopie la realitate	507
88. DASCĂLU Doina Mira - Grădinile palatului ieșean Balș – Sturza	513
89. PRALEA Jeni, STANCIU S.T. - Adaptarea funcțională și estetică a mijloacelor de transport public convenționale la peisajul urban	519
90. PRALEA Jeni, ȘOLTUZ Elena - Studiu ergonomic privind locurile de ședere din domeniul proiectării peisagistice	525
91. NEGREA Roxana, ZLATI Cristina - Frunzișul pomilor, privit ca principala sursă de culoare folosită în compozițiile peisagere	531
92. ZLATI Cristina, NEGREA Roxana, DRAGHIA Lucia, DASCĂLU Doina Mira - Soluții practice în realizarea unor	537

compoziții vegetale pentru amenajările peisagistice	
93. CHIRIAC H. C. - Rolul imaginarului în tranziția de la modernism la postmodernism	543
94. ALEXANDROV E., GĂINĂ B. - Particularitățile morfologice și biochimice ale bachelor hibridilor de viță de vie interspecifici (<i>Vitis vinifera</i> L. x <i>Muscadinia rotundifolia</i> Michx.) de F ₄ și <i>Vitis vinifera</i> subsp. <i>sylvestris</i> Gmel	547
95. BARBU Cătălina - Influența doborâturilor de vânt asupra gradului de exercitare a funcțiilor pădurii. Studiu de caz în Ocolul silvic Tomnatec, județul Suceava	553
96. MURAD E., MAICAN E., HARAGA G., BIRIȘ Ș.S. - Încălzirea serelor cu biomasă	559
97. POSTOLACHE Elena, CIUBUCĂ A., SIMION Cristina, TELIBAN A., TELIBAN Luciana, ENACHE Viorica, DELPORTE Isabelle - Efectul fertilizantului foliar „Floravit” asupra calității vinului în podgoria Dealu Bujorului	565
98. STANCĂ-MOISE Cristina - Lepidoptere (insecta: Lepidoptera) din colecția lui Eugen Worell existentă la Muzeul de Istorie naturală din Sibiu și colectate din padurea "Dumbrava Sibiului"	571

EFFECT OF SALICYLIC ACID'S DERIVATES ON PLANT GROWTH AND PRODUCTIVITY

EFFECTUL UNOR DERIVAȚI AI ACIDULUI SALICILIC ASUPRA CREȘTERII ȘI PRODUCTIVITĂȚII PLANTELOR

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Abstract. *It has been studying the effect of salicylic acid's derivatives, in particular of ammonium- and potassium- tioureidosalicilates in combination with bioactive polyvinylpyrrolidone co-polymer on growth and development processes of cucumber, potatoes, corn plants targeting possibility to stabilize / increase the production process, in laboratory, green house and field conditions experiments, during several years. The administration of compounds (by seeds and foliar surface treatments) makes the consumption to be more economical and the use of soil water reserves more productive by increasing water retention capacity in tissues, activation of the biosynthesis and phytobiomass accumulation, which ensure the formation of more vigorous plants with higher productivity. It was established the compatibility of salicylic acid's derivatives with the chemical protective substances against diseases and pathogens, which provides economic advantages and environmental safety of the plant cultivation technology and enables to reduce of the labour and anthropogenic costs.*

Key words: ammonium- and potassium- tioureidosalicylates, polyvinylpyrrolidone co-polymer, plant growth, productivity.

Rezumat. *În experiențele realizate în condiții de câmp pe parcursul a mai multor ani, a fost studiat efectul unor derivați ai acidului salicilic (în particular al tioureidosalicilaților de amoniu și potasiu, în combinație cu copolimerul bioactiv polivinilpirolidon) asupra proceselor de creștere și dezvoltare a plantelor de castraveți, cartof, porumb, vizând posibilitatea stabilizării / majorării procesului de producție. Administrarea preparatului (prin tratarea semințelor și aparatului foliar) condiționează consumul mai economic și utilizarea mai productivă a rezervelor de apă din sol prin majorarea capacității de reținere a apei în țesuturi, activarea biosintezei și acumularea fitomasei, ceea ce asigură formarea unor plante mai viguroase cu o productivitate ridicată. S-a stabilit compatibilitatea preparatelor cu substanțele de protecție chimică contra dăunătorilor și a patogenicilor, ceea ce asigură rentabilitatea economică și siguranța ecologică a tehnologiei de cultivare a plantelor și permite reducerea costurilor de producție.*

Cuvinte cheie: tioureidosalicilați de amoniu și potasiu, co-polimer polivinilpirolidon/ metacrilat, creștere, productivitate.

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INTRODUCTION

Due to the increased frequency of droughty time the problem of increasing resistance to drought of the most important agricultural crops is treated more and more in last years. An important opportunity, and still not exploited, to increase productivity of crops, is considered the use of physiologically active substances (PAS) and also of anti-transpiration substances (ATS), which provides the increasing of adaptive properties of the organism in suboptimal environmental conditions. Currently, the scientific literature accumulates more and more information about the indispensable role of phytohormones, in particular, of salicylic acid (SA), in response reaction of plants to the stress factors' action from the external environment. It is considered (Raskin I., 1992; Shakirova F.M. et. al., 2003; Ștefăriță A. et al., 2006) that an important compound of the mechanism of SA's protective action is to prevent the stress induced disturbance of the phytohormones' balance. It occurs primarily by indolil acetic acid (IAA) accumulation – a plant hormone that regulates growth and secondly, by inducing ABA synthesis – plant hormone that activates antistress programs. In the present study it was investigated the effect of SA compounds with NH_4^+ , K^+ and its derivatives in combination with bioactive co-polymers (co-VP) as well as with chemical protective substances (Confidor, Dithane M45) on water status parameters, plant growth and productivity.

MATERIAL AND METHOD

In present research plants of *Cucumis sativus* L., Concurrent and Mirabella varieties and Rodnicioc F1 and Icar F1 hybrids, *Lycopersicon esculentum* L. Lider cultivar (cv), and Madona, of *Solanum tuberosum* L, Finca, Bellarosa and Carolla varieties, served as object of study. The experiments were set up in the experimental fields of the State Center for Plants' Varieties Testing in Bacioi using block method, in 3 replications with randomized location of variants. Plants grown under agricultural technology served as control. Treatments of seeds and tubers before sowing / planting and of foliar apparatus, were performed in the experimental variants, during the vegetative growth with aqueous solutions of salicylic acid, salicylates of NH_4^+ , K^+ , potassium and ammonium 5-tioureidosalicylates in combination with bioactive co-polymers (co-VP), as well as with chemical protective substances (Confidor, Dithane M45).

The range of physiological optimal concentrations has been established in special laboratory investigations (Ștefăriță A. et al., brevet de invenție MD 3438 G2 2007 12.31; MD 3466 G2 2008.01.31).

The estimation of adaptive reactions was performed by plant height, biomass, leaf area, productivity and yield structure determination. The results were statistically analyzed using the software package for computers "Statistica 7".

RESULTS AND DISCUSSIONS

There are typical suboptimal, constant or recurring conditions, most often of climate provenance (moisture deficit, heat, cold, salinity etc.), characteristic for vegetable growing areas, during the plant active vegetation period. The action of unfavorable environmental conditions considerably reduces yield and its quality.

Testing the effect of ATS on the formation of plant productivity elements and agricultural valuable part of production revealed the positive, beneficial, veridical action of the water-soluble polymer polyvinylpyrrolidone (PVP) and potassium and ammonium methacrylate vinylpyrrolidone co-polymers (coVPK, coVPNH₄) on plant growth, development and yield (table 1).

Table 1

The influence of water-soluble polymers on *Cucumis sativus* L.,
Icar cv. plants productivity

Variant	Number of fruits, un · pl. ⁻¹	The average weight of 1 fruit, g	Production, g · pl. ⁻¹	The yield, kg · m ²	The efficiency, % control
Control, H ₂ O	6,0 ± 0,07	72,0 ± 1,6	432,1 ± 12,5	3,9 ± 0,1	100
PVP	6,7 ± 0,14	70,0 ± 1,4	470,2 ± 15,3	4,2 ± 0,1	108,5
coVPK	7,4 ± 0,08	70,4 ± 0,8	518,8 ± 11,2	4,7 ± 0,1	119,7
coVPNH ₄	7,2 ± 0,19	69,9 ± 1,2	503,9 ± 11,6	4,5 ± 0,1	113,7

Thus, the plant treatments with 0.05% PVP aqueous solution provided a production increase of 8.5 percent, the application of coVPNH₄ and coVPK increased crop from 13.7 to 19.7% compared to the size of control plants' crop. Using water-soluble polymer films contribute to early fructification and getting early vegetable production. It was established that the application of water-soluble polymer PVP has led to increased plant fructification dynamic in the I-IIIrd decade of July with 10% from control and with 13.87% more for plants in the "coVPNH₄" variant. Size of early production of plants treated with "coVPK" exceeded the value of "control" plants' crop with 20.95% and 9.3% compared with the same time harvest of the plants treated with PVP.

Growth, development and productivity of plants, including vegetables, may be regulated by a combination of substances containing orthooxybenzoic acid as growth stimulator. It was established a positive, statistically authentic influence of the plant treatment with biologically active substances (BAS): aqueous solutions of ammonium and potassium salicylates, on biological performances (table 2).

Table 2

The BAS influence on productivity and yield of vegetable plants grown in open field

Variant	Number of fruits, unit pl. ⁻¹	The average weight of 1 fruit, g	Production, g · pl. ⁻¹	The yield, kg · m ²	The efficiency, % control
<i>Cucumis sativus</i> L., cv. Icar					
Control, H ₂ O	5,1 ± 0,17	52,8 ± 1,22	269,0 ± 10,6	2,42 ± 0,11	100,00
salicylates+PVP	6,9 ± 0,24	61,6 ± 0,47	424,9 ± 15,1	3,83 ± 0,15	158,0
<i>Lycopersicon esculentum</i> L., cv. Madona					
Control, H ₂ O	6,1 ± 0,22	62,1 ± 1,52	378,5 ± 14,8	5,68 ± 0,15	100,00
salicylates+PVP	16,2 ± 0,43	67,1 ± 1,85	1088,2 ± 31,4	16,32 ± 0,31	287,4

Salicylates provided an increased yield of cucumbers with 58.0 percents compared to the control. Similar data have been recorded for tomatoes, too, for Leana and Madonna varieties the treatment resulted in significant production surplus.

It is known that ortho-oxy-benzoic acid compounds (SA) with sulfur have properties to regulate plant growth and tolerance to abiotic and biotic factors of the external environment. In order to explore an integrated process of yield increasing and complex resistance of plants it was followed the influence of salicylic acid and sulfur derivatives (5-tioureidosalicylates), used in combination with water-soluble polymers coVPNH₄ and coVPK on plant growth and development. Results are presented in table 3. Obtained experimental data argue authentically the used substances' proprieties to stimulate growth and primary productivity formation of plants. The major influence ensures seed treatment with the 5-TUS-NH₄ solution of 0.0001 and 0.0005% concentration. It was recorded an intensification of growth processes in these variants, with 39.6 and 52.3 percents higher compared with control plants. It was noted a positive effect of 5-TUS-NH₄ on cucumber plants' productivity, in the field experience (table 3).

Table 3

The influence of BAS on crop productivity and yield structure of cucumber plants, Icar cv.

Variant	Number of fruits, unit · pl. ⁻¹	The average weight of 1 fruit, g	Production, g · pl. ⁻¹	The yield, kg · m ²	The efficiency, % control
Control	6,4 ± 0,13	68,8 ± 0,85	440,3 ± 12,1	3,96 ± 0,12	100,0
SA	6,8 ± 0,11	67,9 ± 0,56	461,7 ± 10,8	4,16 ± 0,11	105,1
5-TUS-NH ₄	7,7 ± 0,19	67,2 ± 0,62	517,4 ± 14,3	4,66 ± 0,14	117,7

As mentioned above, the shortage of soil water inhibits plant growth and primary productivity, and the agronomic value part also is linearly dependent on the saturation deficit of organs. A widely accepted way to increase resistance to drought is considered the possibility of increasing water use efficiency by the application of PAS. Moreover, the efficiency of water use is estimated as a component of drought tolerance in natural systems and is considered as an alternative way to increase it (Jones H.G., 1993). The data obtained by us (fig. 1) in experiments conducted under conditions of drought in 2007 prove that treated plants with SA derivatives in combination with NH₄⁺ and K⁺ ions coVP copolymers are able to maintain their degree of hydration at a higher level compared with control plants grown under accepted agricultural technology. The property of tioureidosalicylates to adjust consumption and productive use of water reserves in the soil, ultimately, ensures the formation of more vigorous plants and reduces crop losses under suboptimal moisture conditions.

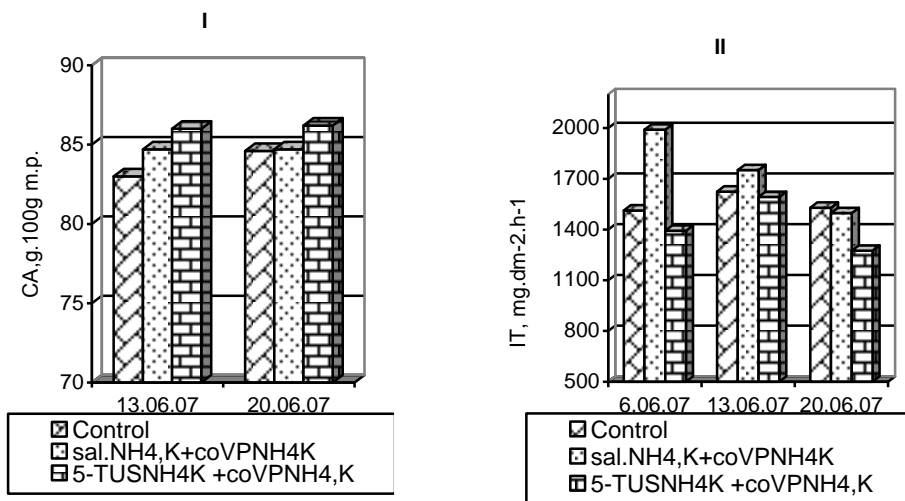


Fig. 1 - The influence of various BAS in combination with water-soluble polymers and DETHANE M45 fungicide on leaf water content and transpiration intensity ($\text{mg} \cdot \text{dm}^{-2} \cdot \text{h}^{-1}$) of *Cucumis sativus* L., Icar cv. plants.

Physiologically active compounds were established to be compatible with substances used to protect chemically the plants - Confidor, DITHANE M45 (fig. 1; table 4).

Table 4

The influence of NH_4^+ , K^+ tioureidosalicylates in combination with bioactive polymers and water-soluble Confidor insecticide on productivity and yield of *Solanum tuberosum* L., s.Finca plants. Field exp. Bacioi, 2007

Variant	Productivity, g. plant		Yield, q. ha	
	2007	2008	2007	2008
Control + Confidor	105,7±2,6	234,8 ± 7,9	52,8± 0,45	117,4 ± 3,9
5-TUS-NH ₄ K + Confidor	126,8± 3,1	265,1± 6,2	63,4 ± 0,34	132,6 ± 4,1
5-TUS-NH ₄ K + coVPHK + Confidor	127,9± 2,0	267,5 ± 4,3	63,9 ± 0,28	133,8 ± 1,1

The plant vigorosity, number of shoots and leaf area are bigger of the plants treated with 5-TUS+Confidor+coVPNH₄. The recording of plants' crop on the experimental areas shows that treatments of tubers before planting and foliar apparatus during the vegetative period with the combination of „5-TUS-NH₄K + Confidor” provided the addition of ≈ 13 to 20% compared with plants harvested from control plots. In the „5-TUS-NH₄K + Confidor” variant it was an increase of harvest with 14.0 -21.0%, compared to the control (Table 4). Crop structure analysis showed that there were tubers of low quality were formed in vegetative period in summer of 2007. The “little” and “very little” fractions predominate in

total mass. However, it is required to mention that from the average fraction of tubers in variants in which plants were treated with salicylic acid derivatives it is higher, compared with control.

Therefore, obtained experimental data allow concluding that tioureidosalicylates NH_4^+ , K^+ have properties of PAS and condition the stimulation of the productive shoots growth and tubers formation, when being administered to the plants by the treatment of tubers before planting and foliar apparatus during the vegetative period. The concomitant use of tioureidosalicylates with Confidor insecticide does not neutralize the effect of preparations.

CONCLUSIONS

1. Ammonium and potassium tioureidosalicylates, and vinilpirolidin / methacrylate co-polymers have properties of physiologically active substances. Being used for treatment of seeds at sowing and foliar apparatus during the vegetation period, they condition the optimization of functional status, plant growth and development in both favorable conditions of humidity and moderate water deficit.

2. Their application in combination with water-soluble polymers has a beneficial effect on the potential achieving of productivity and plant yield.

3. Compounds are compatible with chemical protective substances against pests and pathogens; this provides economic advantages and ecological safety of the plant cultivation technology and enables to reduce labor costs.

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STUDY CONCERNING OF MODIFICATION OF SPRUCE WOOD BARK BY HYDROXYMETHYLATION REACTION

CERCETĂRI CU PRIVIRE LA MODIFICAREA COJII DE MOLID PRIN REACȚIA DE HIDROXIMETILARE

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Abstract. *This work presents a study about reactive extraction of spruce bark by successive treatment of these with an ammonia solution, followed by the hydroxymethylation reaction with formaldehyde and condensation with urea. Products resulting from changes made have been tested for toxicity. For modified and unmodified spruce bark as well as for the products resulting from the extraction were conducted in laboratory tomato plants growing experiments on hard sand. Experimental data showed statistically significant differences according to the sequence of reactions applied to the results of germination experiments. For the sequence of reactions involving the extraction of the shell under the action of ammonia and urea formaldehyde, the results support the recommendation for use as a plant growth stimulator or to obtain slow-release fertilizer.*

Key words: spruce bark, hydroxymethylation, extraction, toxicity, tomato plants.

Rezumat. *Lucrarea prezintă un studiu privind extracția reactivă a cojii de molid prin tratarea succesivă a acesteia cu soluție de amoniac, urmată de reacția de hidroximetilare cu aldehydă formică și condensare cu ureea. Produsele obținute în urma modificărilor efectuate au fost testate din punct de vedere al toxicității. Pentru coaja nemodificată, modificată precum și produsele rezultate în urma extracției s-au realizat în laborator experimente de cultivare a plantelor de tomate pe suport de nisip. Datele experimentale au evidențiat diferențe semnificative statistic funcție de secvența de reacții aplicate pentru rezultatele experimentelor germinative. Pentru secvența de reacții ce implică extracția cojii sub acțiunea amoniacului, aldehydei formice și ureei, rezultatele susțin recomandarea de utilizare ca stimulator al creșterii plantelor sau pentru obținerea de îngrășămintă cu eliberare lentă.*

Cuvinte cheie: coajă de molid, hidroximetilare, extracție, toxicitate, tomate.

INTRODUCTION

Under conditions of intensive cultures in agriculture and forestry, chemical fertilizers have become a valuable means for achieving increased vegetal production. The necessity of organic amendments has increased along

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with mineral fertilizer consumption. In order to satisfy such increasingly bigger requirements, and ameliorate some physical and chemical soil properties, there are a few products used, from which we remind, aside from compost, coal of various origins and composts from vegetal remains. A vegetal waste source, insufficiently capitalized until this day and taken into consideration only at obtaining compost, is represented by the bark and sawdust originating in forestry exploitations and wood processing industry (Stoica L. et al., 1968).

These subproducts can be used in agriculture thanks to the increased content of nutritive elements useful to plants. On the other hand, the bark amounts that are capitalized in the tenant industry are small reported to those that are being produced on a daily basis. Trying to deposit in halls of big dimensions may often lead to spontaneous ignitions, but transporting bark from the inside of the factories is also inhibited by the profitableness barrier, so that this waste becomes a material regarded as disadvantageous in an enterprise administration (Petrovic S., 1979).

Appreciating the bark amounts that result in each year in our country accurately is a difficult task, since the bark amount in industrial wood, reported to the total of raw wooden mass, varies along with the species and the volume of wood taken into processing. One of the simplest ways of using bark waste is their conversion to soil fertilizing and conditioning agents. Analysis of specific data highlights the fact that wood bark presents chemical products with complex structures, from which polyphenolic types are of particular interest. Spruce fir bark is characterized by high polyphenolic compound content (approx. 4.5% compared to only 2.5% in deciduous tree bark) and it is accessible due to processes of mechanical and chemical capitalization of wood.

Treating bark by various means with the goal of enriching its nitrogen content and placing it in the soil presents more advantages from several viewpoints especially where intensive soil exploitation can lead to economically justified harvests (Simionescu C.I. et al., 1989). Considering the contribution of vegetal materials and implicitly of wood bark in the forming of humus, the modification of the latter becomes of interest for efficient usage and as a support for the transport of a nitrogen source. The problem becomes more important when the nitrogen source is represented by urea, which is characterized by increased solubility, hence the risk of it descending in the soil with phreatic water before manifesting its fertilizing agent properties (Dumitru M. et al., 2003, 2006). Previous experiments have shown that there are to be found in bark important amounts of polyphenols with biostimulating role within plant germination and growth and natural products with aromatic structure (polyphenols and lignin) can react with formaldehyde and urea (Căpraru A.M. et al., 2010, Măluțan Th. et al., 2007). For these reasons, in the present study we have analyzed the possibility of applying a reactive extraction that may allow capitalization of the whole content of bark and polyphenols, along with coupling these with urea through a condensation reaction.

MATERIAL AND METHOD

The following materials have been used:

- crumbled spruce fir bark (industrial provenience)
- ammonia solution of 3% concentration
- formaldehyde solution of 37% concentration
- urea.

Work procedure: Spruce fir bark was subjected to successive treatments with ammonia solution, formaldehyde and urea as found in the scheme presented in figure 1:

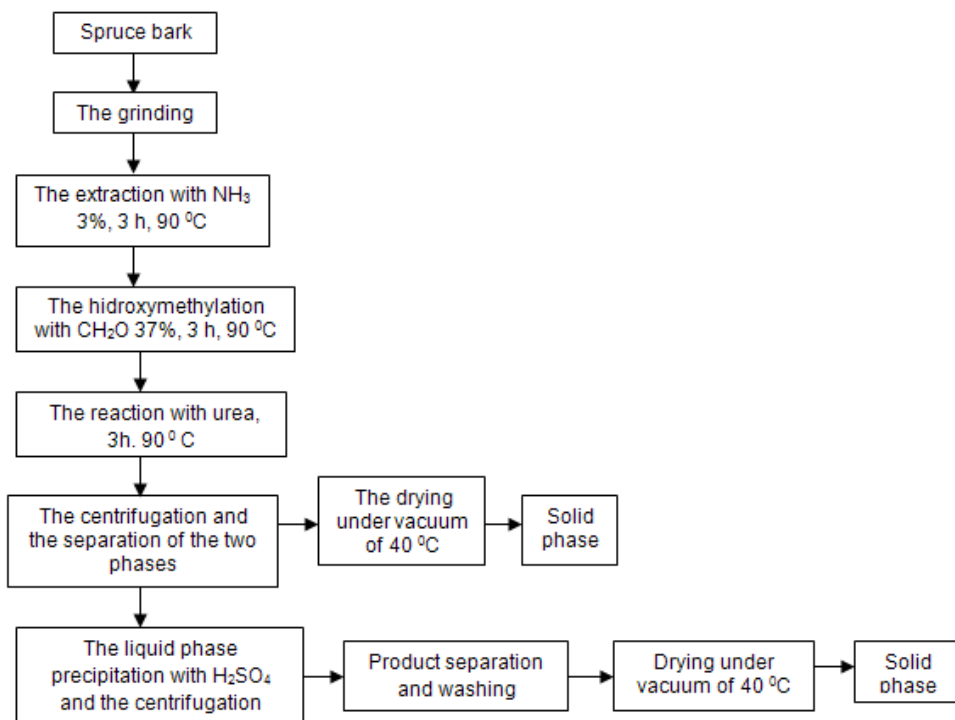


Fig. 1 - Scheme of the reactive extraction of spruce fir bark

Procedure: 5 g of completely dried (U=11.23%) spruce fir bark were introduced in a 250 ml glass reactor with three necks and treated with 3% concentrated ammonia solution on a three hour duration at 90° C under mechanical agitation. Then the reaction was continued with formaldehyde and urea for three hours, at the temperature of 90° C, under agitation.

The experiments have been performed in the following versions:

1. In the first experiment the spruce fir bark was treated with 3% concentrated ammonia solution, at the temperature of 90° C for a three hour time span, and the resulted product was centrifuged at 2500 rpm for 10 minutes, then the liquid phase was separated by the solid one and subjected to drying at 40° C. The resulted supernatant was precipitated with sulfuric acid solution of 1N up to 2 pH. After precipitation, the suspension was subjected to centrifugation for 10 minutes at 2500 rpm, and then the separated products were washed, centrifuged, and dried again.

2. In the second experiment the spruce fir bark was treated with ammonia solution (under the conditions of the first experiment), then formaldehyde solution of 37% concentration was added. After the reaction, the products were separated through centrifugation at 2500 rpm and precipitation.

3. In the third experiment spruce fir bark was treated with a solution of ammonia, formaldehyde and urea. Bark that had been modified under conditions of the second experiment was treated with urea. In this case, the reaction took place at the temperature of 90°C for three hours under agitation. Resulted products were centrifuged at 2500 rpm for ten minutes, then the liquid phase was separated and the solid phase was dried at 40° C. The resulted supernatant was precipitated with sulfuric acid solution of 1N up to 2 pH. After precipitation the suspension was subjected to centrifugation for 10 minutes at 2500 rpm, the resulted product was washed, centrifuged and dried. Products resulted from reactive extraction of spruce fir bark (extracted bark and fraction recovered through precipitation) were tested in order to determine their influence in tomato plant growth. Tests were performed in pots with sand in which 1 gram of treated/untreated bark (with 1 g of precipitate) was added, the witness sample consisting of sand. In each pot were seeded three tomato seeds, irrigated daily with 5 ml of water, while keeping track of the germination and development of plants in the presence of bark and products separated by reactive extraction. The germination of seeds and the evolution of tomato plants were analyzed at 7 days periods within a 3-week interval, by measuring the height. Experimental data were statistically processed with the aid of the *Unscrambler* application.

RESULTS AND DISCUSSIONS

Introducing urea in the reaction environment allows for its interaction with methyloic groups, blocking the possibility of their condensation at the same time. The extraction efficaciousness of the reaction in this case is smaller due to a possible condensation with the participation of hydroxymethyloic groups introduced both in solid phase and dissolved polyphenolic products. Under these conditions, urea can bind with the solid sublayer as well as the products from the liquid phase, with an increased value of the extraction efficaciousness. As for the usage of modified products, these were tested in order to highlight their influence over the growth and development of tomato plants

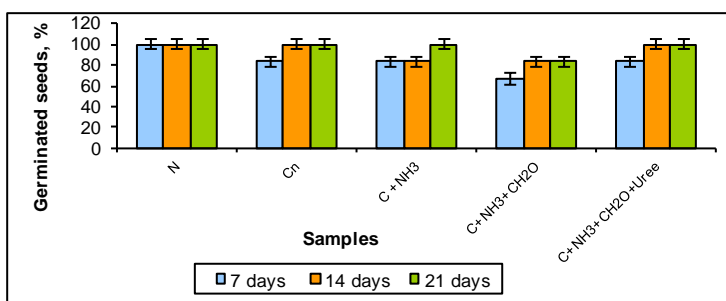


Fig. 2 – The variation of capacity of germination for seeds tomato

N- sand (witness sample); Cn – untreated bark; C+NH₃ – bark treated with ammonia solution; C+NH₃+CH₂O – bark treated with ammonia solution and formaldehyde; C+NH₃+CH₂O+Urea – bark treated with ammonia solution, formaldehyde and urea.

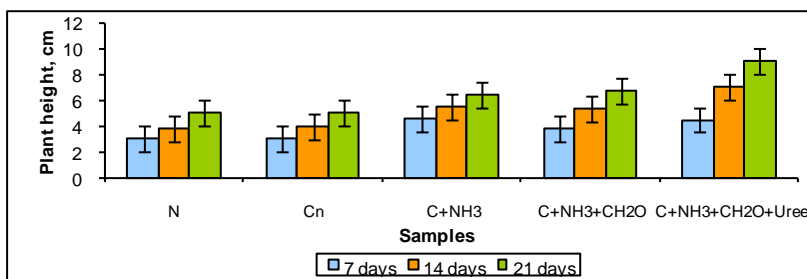


Fig. 3 - Variation the height of tomato plants

In figures 2 and 3 is presented the germination capacity and height variation of tomato plants on a three week time span, treated with bark resulted from centrifugation of the product obtained at extraction.

In figures 4 and 5 is presented the variation of germination capacity and height of tomato plants for a three week timespan, in pots in which precipitates resulted from reactive extraction of spruce fir bark were introduced.

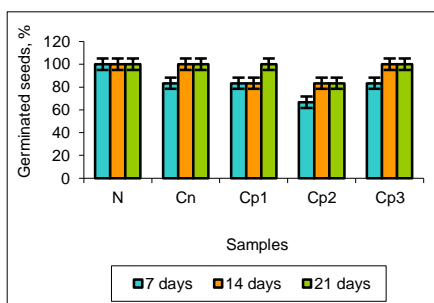


Fig. 4 - The variation of capacity of germination for seeds tomato

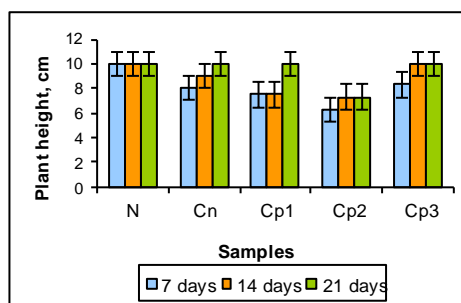


Fig. 5 - Variation the height of tomato plants

N – sand (witness sample); Cn – untreated bark; Cp1 – precipitate resulted from bark treated with ammonia; Cp2 – precipitate resulted from bark treated with ammonia and formaldehyde; Cp3 – precipitate resulted from bark treated with ammonia, formaldehyde and urea.

It was noticed that products resulted in the third version of bark treatment ensures a light stimulation of tomato plant growth determined by the presence of urea. In the case of bark treatment with ammonia and formaldehyde, tomato plant growth is slower and even drying is noticed in a relatively short time. After 21 days, the obtained results were evaluated and we reached the conclusion that favorable effects regarding the growth and development of tomato plants are present in the pot where spruce fir bark treated with ammonia, formaldehyde and urea was introduced.

CONCLUSIONS

1. The extraction of spruce fir bark in which the action of ammonia combines with that of formaldehyde and urea can be recommended in order to obtain components destined to composite structures used in stimulation of growth and development of plants.

2. Data obtained in germination experiments in pots on sand support – as well as those of plant cultivation in the presence of modified products, recommends capitalization of spruce fir bark with the purpose of acting successfully as fertilizer in agriculture.

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CONTRIBUTIONS CONCERNING THE TREATMENT OF BIRCH VENEER WITH LIGNINS MODIFIED AND COPPER COMPOUNDS

CONTIBUȚII PRIVIND TRATAREA FURNIRULUI DE MESTEACĂN CU LIGNINE MODIFICATE ȘI COMPUȘI AI CUPRULUI

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Abstract. *This work presents experimental data on the interaction of birch veneer and copper complexes of some commercial products, lignin's Protobind unmodified and modified by hydroxymethylation and epoxydation. The treatments with these compounds were based in a first stage for its successful immersion in solutions of copper chloride or tetra amino copper hydroxide, followed by impregnation with unmodified or modified lignin's, with a concentration of 5% dissolved in ammonia solution or furfuryl alcohol to achieve in situ of the complexes between the two partners. The efficiency of the treatment was evaluated consecutive by periodically evolution with distilled water to determine the veneer samples impregnated, UV-VIS absorption elution products, and their toxicity experiments by determining the germination of tomato seeds. The results show that the stability of treatment depends on the nature of lignin compound and its ability to copper ion complexity, which ensures optimal interaction with the wood surface.*

Key words: lignin, hydroxymethylation, epoxydation, veneer, biocides.

Rezumat. *Lucrarea prezintă date experimentale privind interacțiunea furnirul de mesteacăn și complexii cuprici ai unor produse ligninice comerciale - Protobind nemodificate și modificate prin hidroximetilare și epoxidare. Tratamentele cu acești compuși aplicate furnirului de mesteacăn s-au bazat într-o primă etapă pe imersarea succesivă a acestuia în soluții de clorură de cupru sau hidroxid tetraaminocupric, urmată de impregnarea cu lignine nemodificate sau modificate, de concentrație 5 % dizolvate în soluție de amoniac sau alcool furfurilic, pentru realizarea în situ a complexilor între cei doi parteneri. Eficiența tratamentului a fost evaluată consecutiv prin eluarea periodică cu apă distilată a epruvetelor de furnir impregnate și determinarea absorbției în UV-VIS a produselor de eluție, precum și prin determinarea toxicității acestora în experimentele de germinare a semințelor de tomate. Rezultatele obținute evidențiază că stabilitatea tratamentului depinde de natura compusului ligninic și capacitatea sa de complexare cu ionul cupric care asigură interacțiunea optimă cu suprafața lemnoasă.*

Cuvinte cheie: lignină, hidroximetilare, epoxidare, furnir, biocizi.

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INTRODUCTION

Lately, one may notice constant interest regarding finding solutions for increasing the resistance of wooden products towards destructive agents, through methods that are acceptable from a viewpoint of compatibility with the environment. It is known that “*products of secondary metabolism of plants*”, namely lignin and polyphenols, are included in the defense mechanisms that plants have developed against pathogenic or non-pathogenic microorganisms. On the other hand, the aforementioned compounds may result as subproducts of the industry of chemically treated wood or from technologies of complex biomass capitalization. On this direction, interaction between birch veneer and a series of biocide compounds has been studied (Ungureanu E. et al., 2007, 2008; Căpraru A. M., 2010). Large scale use of this lignocelluloses compound in various fields and its relatively reduced stability during the action of environmental factors implies usage of chemical compounds in order to ensure partial or total protection against the attack of biological agents. Products that are toxic to microorganisms and insects but largely incompatible with the environment are presently used for wood protection. There are known chemical protection agents in water system, their efficiency relying on the presence of copper. Part of the copper ions are fixated in the wooden sub layer through the hydroxyl or carboxylic groups in the wood, which are found in ionized state under conditions of high pH (Măluțan Th. et al., 2007). Considering the resistance of lignin at the attack of biotic agents and the toxicity of copper ions, the study hereby targeted the way in which the biostability of birch wood is influenced by systems created from regenerable products: chemically modified/unmodified lignin (Căpraru A.M. et al., 2008, Măluțan Th. et al., 2007, 2008) in the absence or presence of copper ions.

MATERIAL AND METHOD

We used birch veneer samples (1x10 cm) and five lignin types: wheat straw lignin (L1), grass lignin (L2) and three commercial products: Protobind 1000 (Pb1000), Protobind 2000 (Pb2000), Protobind 3000 (Pb3000), 5 % dissolved in ammonia 0.1 N or alcohol furfuryl of 5% concentration. Unmodified products (marked as –N) offered by Granit Company (Switzerland) during Ecobinders research program as well as hydroxymethylated and epoxydation lignin in lab conditions (marked as –H and -E) were tested. To this end birch veneer samples were weighed in advance in order to determine the weight of each sample before and after impregnation with established solutions. Impregnation was performed with 5% solutions of unmodified and hydroxymethylated and epoxydation lignin products obtained by dissolving them in a 0.1 N ammonia solution or furfuryl alcohol. After impregnating with cupric solutions (cupric chloride (CuCl₂), Cuproxam (Cuam) and lignin products, the samples were dried in laboratory conditions (25 °C) and were weighed to establish mass increase. The stability of the treatment was evaluated by immersing the samples in distilled water for varying durations (24, 48, 72 and 96 hours) and collecting elutes. After elution we have determined samples' mass loss and the separate elutes were characterized with respect to UV absorption at 280 nm (those derived from samples of lignin or derivatives) and toxicity in tomato seed germination. The UV absorption was

determined using UV/VIS - Jasco 550 spectrophotometer. To assess the toxicity degree tomato seeds germination tests were carried out. Thus, in Petri dishes with 10 cm in diameter the filter paper was introduced as support along with 10 mL of elute.

Thus, in Petri dishes with 10 cm in diameter of, were introduced as filter paper and 10 mL of elute, adding the tomato after 10-seed to determine the percentage germinated seeds (as a measure of toxicity) after 96 hours was used as a control sample of distilled water. The experimental data were subjected to statistical processing using The Unscrambler software.

RESULTS AND DISCUSSIONS

The data presented in figure 1 and 2 refer to treatments with products Protobind 1000 modified lignin is, modified and their complexes with cupric ions.

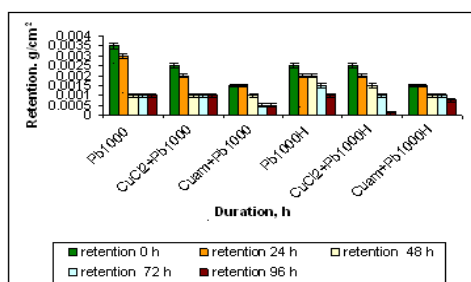


Fig. 1 - Variation of retention degree of Pb1000 lignin unmodified/hydroxymethylated and their complex with copper ions depending on the elution duration

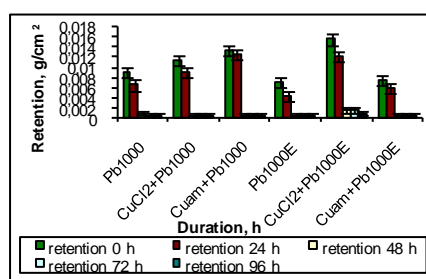


Fig. 2 - Variation of retention degree of Pb1000 lignin unmodified/epoxydated and their complex with copper ions depending on the elution duration

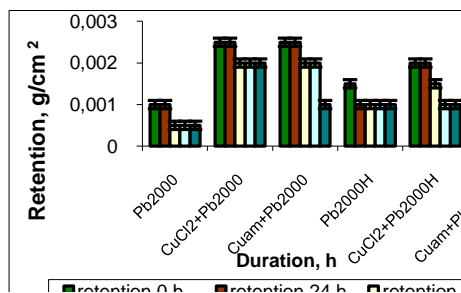


Fig. 3 - Variation of retention degree of Pb2000 lignin unmodified/hydroxymethylated and their complex with copper ions depending on the elution duration

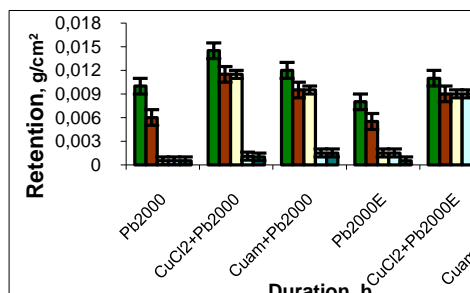


Fig. 4 - Variation of retention degree of Pb2000 lignin unmodified/epoxydated and their complex with copper ions depending on the elution duration

In the case of test tubes treated with modified Protobind products and copper complexes, a larger quality of lignin is retained by the veneer surface, because of increased functionality. Moreover, this fact is also confirmed by a greater stability of copper ion complexes of these derivatives. The amount of lignin retained on the wooden surface reaches around 0.0015 g/cm² for most veneer samples treated with modified lignins. The use of these in the presence of copper

ions leads to a retention rate growth reaching $0.0035\text{g}/\text{cm}^2$ (figures 3 and 4). These studies have been concluded by noticing that the retention level is influenced by the products' nature, by their functionality and complexity degree. The modification of lignin products plays in this case a very important role in wood protection, these products sticking efficiently to the surface and thus offering increased stability in case of increased atmospheric humidity as well as repeated elution.

Characterization of watery extracts

In figures 5 and 6, time-dependent absorption variation in UV-VIS of elution products is presented for samples treated with unmodified/modified lignins and cupric compounds.

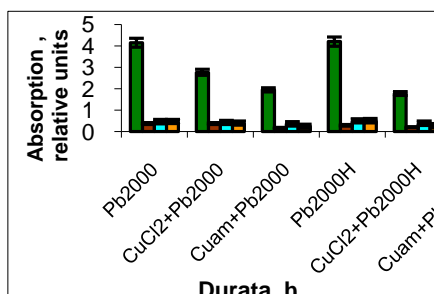


Fig. 5 - Variation of absorption intensity in UV of leachates depending on elution time for the samples treated with Pb 2000 and Pb2000H lignin and their complexes with copper ions

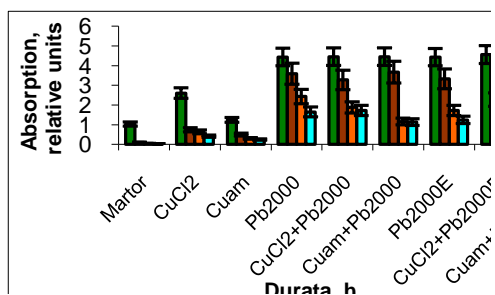


Fig. 6 - Variation of absorption intensity in UV of leachates depending on elution time for the samples treated with Pb 2000 and Pb2000E lignin and their complexes with copper ions

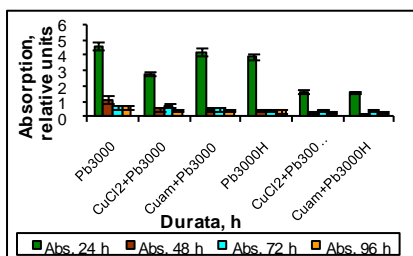


Fig. 7 - Variation of absorption intensity in UV of leachates depending on elution time for the samples treated with Pb3000 and Pb3000H lignin and their complexes with copper ions

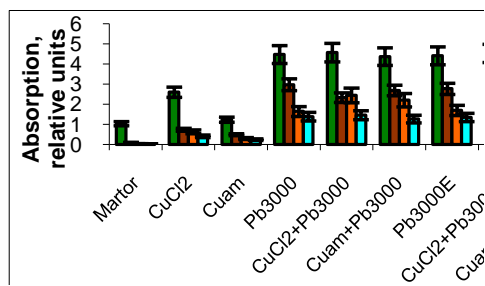


Fig. 8 - Variation of absorption intensity in UV of leachates depending on elution time for the samples treated with Pb3000 and Pb3000E lignin and their complexes with copper ions

Most of the studied products elude after the first 24 hours, and then the absorption values remain constant until the end of the treatment. Absorption values are low in the case of modified Protobind samples and their complexes with copper ions where a direct correlation between retention and absorption value is also noticed (figures 7 and 8).

Determination of the toxicity of solutions eluted from unmodified and modified lignin extraction with distilled water results

Solutions separated after various durations of successive water immersion of birch veneer test tubes were tested from a toxicity viewpoint in experiments of tomato seed germination (figures 9-12).

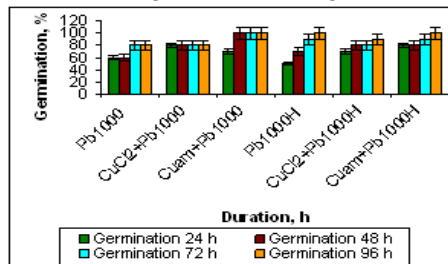


Fig. 9 - The evolution of germination degree of tomato seeds in the presence of leachates resulted after the elution of the veneer treated with Pb1000 and Pb1000 H lignin and with copper ions

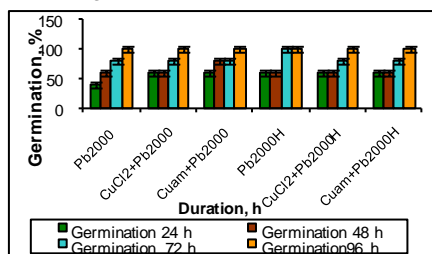


Fig. 11-The evolution of germination degree of tomato seeds in the presence of leachates resulted after the elution of the veneer treated with Pb 2000 and Pb2000H lignin and with copper ions

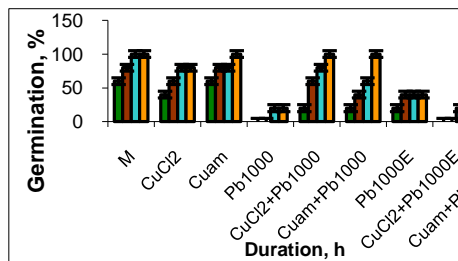


Fig. 10 - The evolution of germination degree of tomato seeds in the presence of leachates resulted after the elution of the veneer treated with Pb1000 and Pb1000E lignin and with copper ions

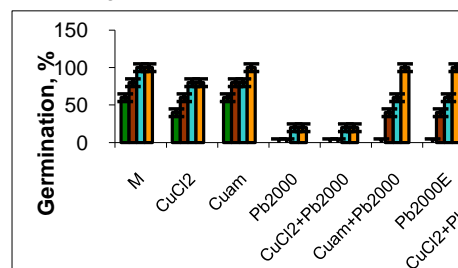


Fig. 12 - The evolution of germination degree of tomato seeds in the presence of leachates resulted after the elution of the veneer treated with Pb1000 and Pb1000H lignin and with copper ions

The toxicity of elution products is insignificant in the case of products eluted after 72 and 96 hours, and seed germination reaches 100% in most cases. The best percentage has been achieved at solutions resulted from elution of test tubes that were treated with hydroxymethylated lignin's and copper based compounds, where the germination capacity presents values above 70% from the first solutions resulted after 24 hours. Thus, after the experiments, it results that there is a strong tie between the three parameters measured within this study. It can be affirmed that there are direct correlations between retention and the absorbance value determined in the UV-VIS field, but also between the germination capacity and the other two studied parameters. From the registered data, it results that the toxicity of elution products varies depending on the used chemical agent and toxic effects are reduced along with the decrease of concentration so they cannot be considered significant.

CONCLUSIONS

1. The stability of treatments that were performed with modified lignin's and their complexes with copper ions was kept track of by successive elution with water of the wooden support impregnated with the aforementioned chemical species and it was concluded that the retention level is influenced by the nature of the products, by their functionality and their complexation degree.

2. By UV-VIS, spectroscopy there was obtained a direct correlation between the absorption of elution products and the retention degree. Significant draining of treatment agents is encountered during the first 24 hours, and then there are no more important losses.

3. The germination capacity of tomato seeds in the presence of solutions resulted from successive water extraction of wooden support treated with products with potentially biocide action does not highlight any significant toxic effects; hence the existence of the premise of achieving biocide systems compatible with the environment.

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CHAOS CONTROL FOR TWO DISSIPATIVE SYSTEMS

CONTROLUL HAOSULUI PENTRU DOUĂ SISTEME DISIPATIVE

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Abstract. *Chaos is an interesting phenomenon closely related to nonlinear systems, which is very important for researchers in many disciplines. In medicine and chemistry the phenomenon of synchronization is of interest in studying cardiac rhythms and reactions in chemistry. In industry, synchronization is also used to ensure exact coincidence of frequencies in secure communications and in agriculture the problem of chaos control is important in biological control of weed populations and pests. In this work the master-slave, mutual synchronization and antisynchronization are used in order to control two chaotic dissipative systems governed by jerk functions. Our results show the transient time until synchronization depends on initial conditions of two systems and on the values of negative part of eigenvalues of control parameters. The synchronization can be achieved for all methods but for amplification of chaos very closed initial conditions need to be chosen.*

Key words: nonlinear systems, dissipative flows, synchronization and antisynchronization

Rezumat. *Controlul haosului este un fenomen interesant legat de sistemele neliniare, care este foarte important pentru cercetătorii din multe discipline. În medicina și chimie fenomenul de sincronizare este de interes în studiul ritmului cardiac și a reacțiilor chimice. În industrie sincronizarea este de asemenea utilizată pentru a asigura coincidența frecvențelor necesară în securizarea comunicațiilor iar în agricultură problema controlului haosului este important în controlul populațiilor de buruieni și dăunători. În această lucrare se folosește metoda de sincronizare master-slave, sincronizarea mutuală și antisincronizarea a două sisteme haotice disipative. Rezultatele noastre arată că timpul de tranziție până la sincronizare depinde de condițiile inițiale și de partea negativă a valorilor proprii ale parametrilor de control. Sincronizarea este obținută în toate cele trei metode dar pentru amplificarea trebuie alese condiții inițiale foarte apropiate pentru cele două sisteme.*

Cuvinte cheie: sisteme neliniare, fluxuri disipative, sincronizare și antisincronizare

INTRODUCTION

Chaos is a very interesting phenomenon closely related to nonlinear systems, which is very important for workers in many disciplines (Mosekilde E. et al., 2002; Pikovsky A. et al., 2001). Chaotic behavior appearing in nonlinear systems has been received more attentions in the literature after Pecora and Carroll paper "Synchronization in chaotic systems" from 1990. Synchronization is a

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fundamental process in coupled dynamical systems. This means to design a controller or interconnections that guarantee synchronization of the multi-composed systems with respect to certain desired functional. In medicine and chemistry the phenomenon of synchronization is of interest in studying cardiac rhythms and reactions in chemistry; in industry, synchronization is also used to ensure exact coincidence of frequencies in secure communications.

Several methods of synchronization have been proposed and implemented. Jackson and Grosu (Jackson E. A and Grosu I., 1995; Grosu, I., 1997) developed the open-plus-closed-loop (OPCL) method. This method gives precise driving for any continuous system in order to reach any desired dynamics and it has been applied to synchronization of two identical systems by Grosu (Grosu I., 2007) and Oancea (Oancea S., 2005). A similar strategy can be used for mutual synchronization (Lerescu A.I. et al., 2006). In addition Grosu and coworkers (Grosu I. et al., 2008) obtained the synchronization and antisynchronization in chaotic systems under parameter mismatch.

In this work the master-slave, mutual synchronization and antisynchronization are used in order to control two chaotic systems governed by jerk functions.

THEORY

1. MASTER-SLAVE SYNCHRONIZATION

Let's consider a general master system:

$$d\mathbf{X}/dt = \mathbf{F}(\mathbf{X}); \mathbf{X} \in \mathbb{R}^n \quad (1)$$

then the slave system:

$$d\mathbf{x}/dt = \mathbf{F}(\mathbf{x}) + \mathbf{D}(\mathbf{x}, \mathbf{X}) \quad (2)$$

where $\mathbf{D}(\mathbf{x}, \mathbf{X}) = (\mathbf{A} - \partial \mathbf{F} / \partial \mathbf{x} |_{\mathbf{x}=\mathbf{X}})(\mathbf{x} - \mathbf{X}) - 1/2 (\partial^2 \mathbf{F} / \partial \mathbf{x}^2)(\mathbf{x} - \mathbf{X})^2 - 1/6 (\partial^3 \mathbf{F} / \partial \mathbf{x}^3)(\mathbf{x} - \mathbf{X})^3 + \dots$

assures $\mathbf{x}(t) \rightarrow \mathbf{X}(t)$ for any $\|\mathbf{x}(0) - \mathbf{X}(0)\|$ small enough.

\mathbf{A} is a constant Hurwitz matrix with negative real part eigenvalues. The matrix \mathbf{A} should be chosen in such a manner in order that the coupling to be as simple as possible. This method was applied for Sprott's collection of chaotic flows (Sprott J.C., 1997).

2. MUTUAL SYNCHRONIZATION

Let's consider two identical general oscillators:

$$d\mathbf{x}/dt = \mathbf{F}(\mathbf{x}); \quad d\mathbf{y}/dt = \mathbf{F}(\mathbf{y}); \quad (3)$$

The coupled systems are:

$$d\mathbf{x}/dt = \mathbf{F}(\mathbf{x}) + \mathbf{u}(\mathbf{x}, \mathbf{y}); \quad d\mathbf{y}/dt = \mathbf{F}(\mathbf{y}) + \mathbf{u}(\mathbf{x}, \mathbf{y}); \quad (4)$$

where $\mathbf{u}(\mathbf{x}, \mathbf{y}) = (\mathbf{A} - d\mathbf{F}(\mathbf{s})/d\mathbf{s})^*(\mathbf{x} - \mathbf{y})/2$, $\mathbf{s} = (\mathbf{x} + \mathbf{y})/2$ and \mathbf{A} is the Hurwitz matrix.

The present method has been also applied to all systems from the Sprott collection

3. SYNCHRONIZATION AND ANTISYNCHRONIZATION OF CHAOTIC SYSTEMS

Grosu and coworkers (Grosu et al., 2008) designed the coupling for stable synchronization and antisynchronization in chaotic systems under parameter mismatch.

The driver is:

$$dy/dt = F(y) + \Delta F(y); \quad (5)$$

$y \in \mathbb{R}^n$, unde $\Delta F(y)$ contains mismatch parameters.

The driven system is given by:

$$dx/dt = F(x) + D(x, \alpha y) \quad (6)$$

where $D(x, \alpha y) = \alpha dy/dt - F(\alpha y) - (A - J F(\alpha y))(x - \alpha y)$

J being the Jacobian and A the arbitrary constant Hurwitz matrix.

4. JERK FUNCTIONS

Gottlieb (Sprott J.C, 1997) showed that the simplest ODE in a single variable that can exhibit chaos is third order and he suggested for chaotic systems the form:

$$\ddot{x} = j(x, \dot{x}, \ddot{x})$$

where j is a jerk function (time derivative of acceleration).

Chaotic flows in three dimensions (3D) can be characterized as either dissipative or conservative, depending on the fractal dimension of the strange attractor. In this work we tried to synchronize two dissipative chaotic systems.

RESULTS AND DISCUSSIONS

The simplest chaotic dissipative system was of the form (Sprott J.C, 1997):

$$\ddot{x} + A\dot{x} - \dot{x}^2 + x = 0 \quad (7)$$

where $2.017... < A < 2.082...$ and which can be written on the form

$$\dot{X}_1 = X_2$$

$$\dot{X}_2 = X_3 \quad (8)$$

$$\dot{X}_3 = -2.017X_3 + X_2^2 - X_1$$

The strange attractor of this system is given in fig.1

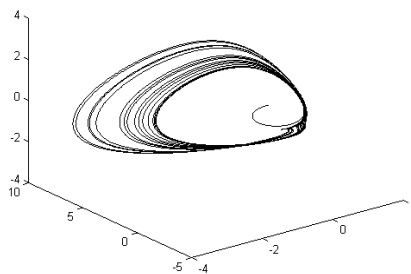


Fig.1 – Phase portrait (X_3, X_1, X_2) for initial conditions [$X_1(0)=1; X_2(0)=0.1; X_3(0)=0.01$]

Choosing $A=2.017$ and the Hurwitz matrix having a single constant parameter, the Routh-Hurwitz conditions give for this parameter p, $p < -5$

With $p=-10$ the slave system is:

$$\begin{aligned}
 \dot{x}_1 &= x_2 \\
 \dot{x}_2 &= x_3 \\
 \dot{x}_3 &= -2.017x_3 + x_2^2 - x_1 + (-10 - 2X_2)(x_2 - X_2) - (x_2 - X_2)^2
 \end{aligned}
 \tag{9}$$

Figures 2, 3 and 4 show the master-slave synchronization.

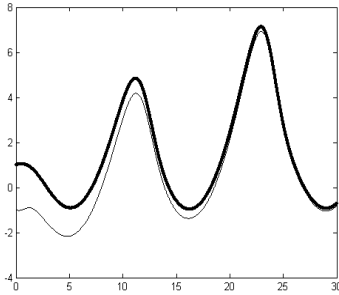


Fig.2 – $(X_1(t) - x_1(t))$ -, for initial conditions $[X_1(0)=1; X_2(0)=0.1; X_3(0)=0.01; x_1(0)=-1; x_2(0)=-0.1; x_3(0)=-0.01]$

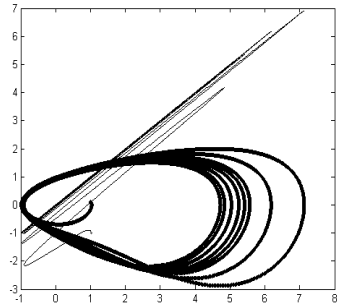


Fig.3 – Phase portrait (X_1, X_2) - and (X_1, x_1) - for the system (8) and (9) and initial conditions $[X_1(0)=1; X_2(0)=0.1; X_3(0)=0.01; x_1(0)=-1; x_2(0)=-0.1; x_3(0)=-0.01]$

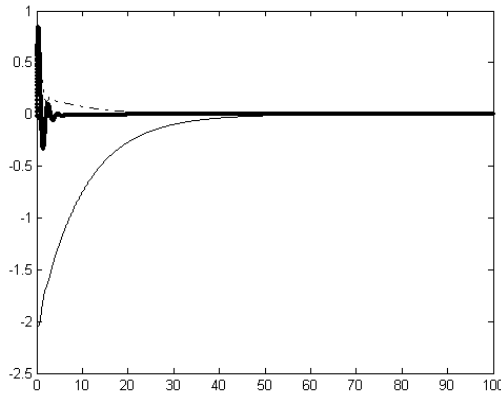


Fig.4 – Synchronization errors for the systems (8)and (9); $[(x_1(t) - X_1(t))$; $x_2(t) - X_2(t)$.-; $x_3(t) - X_3(t)$ -] for (13) and $p=-10$; $[X_1(0)=1; X_2(0)=0.1; X_3(0)=0.01; x_1(0)=-1; x_2(0)=-0.1; x_3(0)=-0.01]$

The mutual method of synchronization for this dissipative system gives:

$$\begin{aligned}\dot{x}_1 &= x_2 \\ \dot{x}_2 &= x_3 \\ \dot{x}_3 &= -2.017x_3 + x_2^2 - x_1 + \\ &(-10 - (x_2 + y_2))(x_2 - y_2)/2\end{aligned}$$

$$\begin{aligned}\dot{y}_1 &= y_2 \\ \dot{y}_2 &= y_3 \\ \dot{y}_3 &= -2.017y_3 + y_2^2 - y_1 + \\ &(-10 - (x_2 + y_2))(x_2 + y_2)/2\end{aligned}\quad (10)$$

Figures 5 and 6 show the mutual synchronization

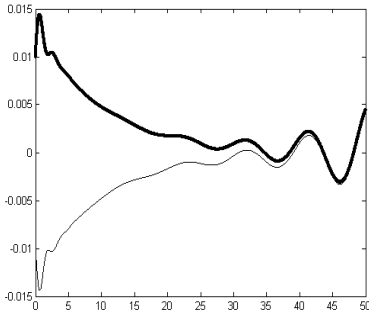


Fig. 5 – $(x_1(t) - y_1(t))$, for $p=-10$ and initial conditions $[x_1(0)=x_2(0)=x_3(0)=0.01; y_1(0)=y_2(0)=y_3(0)=-0.01]$

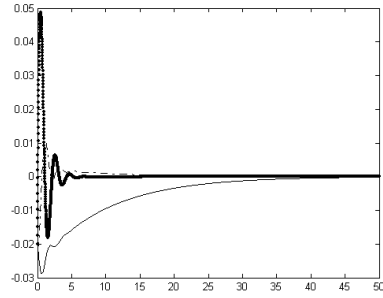


Fig. 6 – Synchronization errors for the system (10); $[(y_1(t) - x_1(t) - y_2(t) - x_2(t) - y_3(t) - x_3(t))]$ for and $p=-10$; $[x_1(0)=x_2(0)=x_3(0)=0.01; y_1(0)=y_2(0)=y_3(0)=-0.01]$

Amplification of chaos for the system (8) is given in the following equations

$$\begin{aligned}\dot{y}_1 &= y_2 & \dot{x}_1 &= x_2 \\ \dot{y}_2 &= y_3 & \dot{x}_2 &= x_3 \\ \dot{y}_3 &= -2.017y_3 + y_2^2 - y_1 - 0.2y_3 & \dot{x}_3 &= -2.017x_3 + x_2^2 - x_1 + 0.4y_3 - 6y_2^2 + \\ & & & (-10 + 4y_2)(x_2 + 2y_2)\end{aligned}\quad (11)$$

Figures 7 and 8 show the antisynchronization of these systems.

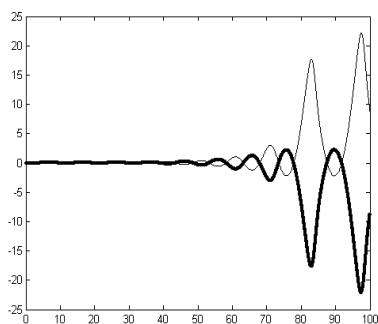


Fig. 7 – $(2y_1(t), x_1(t))$, for $p=-10$ and initial conditions $[x_1(0)=x_2(0)=x_3(0)=0.01; y_1(0)=y_2(0)=y_3(0)=-0.01]$

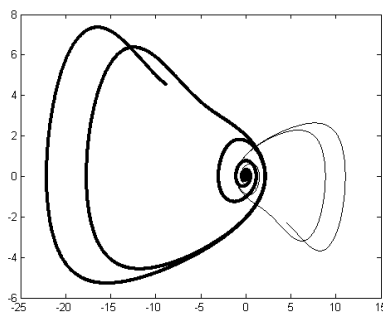


Fig. 8 – Phase portrait (y_1, y_2) - and (x_1, x_2) - for the system (11) and initial conditions $[y_1(0)=y_2(0)=y_3(0)=0.001, x_1(0)=x_2(0)=x_3(0)=-0.001]$

CONCLUSIONS

In this paper we presented master-slave, mutual synchronization and antisynchronization for chaotic systems governed by jerk functions. Our results show that the synchronization can be achieved for all methods. The transient time until synchronization depends on initial conditions of two systems and on the values of negative part of eigenvalues. The methods presented in this work can be useful to be applied to other chaotic systems and can be generalized in order to find the main applications in biology, physics and industry.

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FRACTAL ANALYSIS OF CORN ROOT CHANGE UNDER ANIONIC CLAYS ACTION

ANALIZA FRACTALĂ A MODIFICĂRII RĂDĂCINII DE PORUMB SUB ACȚIUNEA ARGILELOR ANIONICE

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Abstract. *The fractal analysis is a useful method to characterize the structure of branching trees, root of plants, leaves, membrane surface of cells. The main objective of this study was to evaluate the impact of the treatment with LDH on growth of corn roots, using fractal analysis. In order to evaluate the change on root plants we determined the fractal dimension for untreated and treated corn plant roots. Seeds of corn were put into Petri dishes on double filter paper together with suspensions from anionic clay and they were kept here for five days. The germinated seeds were planted in soil where they continued to growth. After four weeks the root plants have been collected and the fractal analysis was performed. Our results demonstrated that the fractal structure of corn roots changed after the treatment with LDHs. We suggest that these anionic clays increased plant capacity to develop complex roots.*

Key words: fractal structure, root architecture, LDH

Rezumat. *Analiza fractală este o metoda uzuală de caracterizare a ramurilor copacilor, a ramificațiilor rădăcinilor plantelor, a frunzelor, a suprafeței membranelor celulare etc. Obiectivul principal al acestei lucrări este de a evalua impactul tratamentului cu LDH în creșterea rădăcinilor plantelor de porumb, folosind analiza fractala. Pentru a evalua modificările rădăcinilor plantelor, am determinat dimensiunea fractală a plantelor tratate și a celor netratate. Semințele de porumb (Zea mais) au fost puse la germinat în sticle Petri pe hârtie de filtru dublă și cu suspensie de argilă anionică unde au fost ținute cinci zile. Semințele germinate au fost plantate apoi în sol unde au continuat să crească. După patru săptămâni au fost colectate rădăcinile și s-a efectuat analiza fractală. Rezultatele arată că rădăcinile plantelor s-au modificat după tratamentul cu LDH prin comparație cu martorul. Noi sugerăm că aceste argile anionice cresc capacitatea plantelor de a dezvolta rădăcini complexe.*

Cuvinte cheie: structura fractală, arhitectura rădăcinii, LDH

INTRODUCTION

The shape of objects has been described using Euclidean geometry. Many biological objects like leaves, roots, cells or sub cellular organelles display irregular shapes and discontinuous morphogenetic pattern in connection with their functional diversity and seem impossible to describe them rigorously or quantitatively using Euclidean geometry. G.B. West (West G.B. et al., 1999)

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showed that the existence of fractal-like network endows life with an additional fourth spatial dimension. Natural selection has tended to maximize both metabolic capacity, by maximizing the scaling of exchange surface areas, and internal efficiency, by minimizing the scaling of transport distances and times.

The complexity of the plant roots has been studied by many researchers but there are few results due the influence of the rizosphere heterogeneity (Akasaka Y. et al., 1998; Berntson G.M., 1994; Campbell R.D., 1996; Eshel A., 1998; Melniciuc Puică N. et al., 2006; Nielsen K.L. et al., 1997; Oancea S., 2006; Puzon K. A. M., 2005). Root growth is related to the consumption of water and nutrients of plants and it directly take the effect of environmental change. By exploring different spatial niches, plants with contrasting root architecture may reduce the extent of competition among neighboring root systems. Root complexity has been difficult to comprehend using simple Euclidean methods. The main objective of this study was to evaluate the impact of the treatment with LDH on growth of corn roots, using fractal analysis.

MATERIAL AND METHOD

To study the effect of anionic clays on root growth, two kinds of clays have been prepared and we sorted the following variants:

- 1 – control;
- 2 - MgALDH+sodium paranitrophenolate.

The experiments were conducted in the Biophysics Department Laboratory of the University of Agronomy from Iasi. As a biological material we used corn (*Zea mays*), the most widely used cereal in our country. 50 seeds of corn were put into Petri dishes on double filter paper together with 5 mL treatment solution (a suspension that contains 0.5g of clay and 50mL bidistilled water). Here the seeds were kept in dark at the optimal temperature (23⁰C) for 5 days. After that the germinated seed were planted in soil in the our laboratory where they developed for two months. For analysis the plants were extracted from the soil, washed and the root were cut from the shoot. Then we make many photos of the root with a Canon camera.



Fig. 1 – The corn roots

These photos were prepared with the PHOTO-PAINT 1 in order to use the HarFA soft to determine the fractal dimension.

There are many other methods to determine the fractal dimension (Box Counting method, Yardstick method, Mass-Dimension Method, Perimeter–Area Method, Slit-Island Method, Asymptotic fractal formulas etc.).

In HarFA is used a modification of traditional Box Counting method. By this modification on obtain three fractal dimensions, which characterise properties of black plane DB, black-white border of black object DBW (and this information is the most interesting) and properties of white background DW.

The fractal dimension is the slope of the straight line „Black&White” (Zmeřkal O. et al., 2001)

RESULTS AND DISCUSSIONS

The diagrams of the fractal dimensions for the four roots from the figure 1 are given in figures 2-5

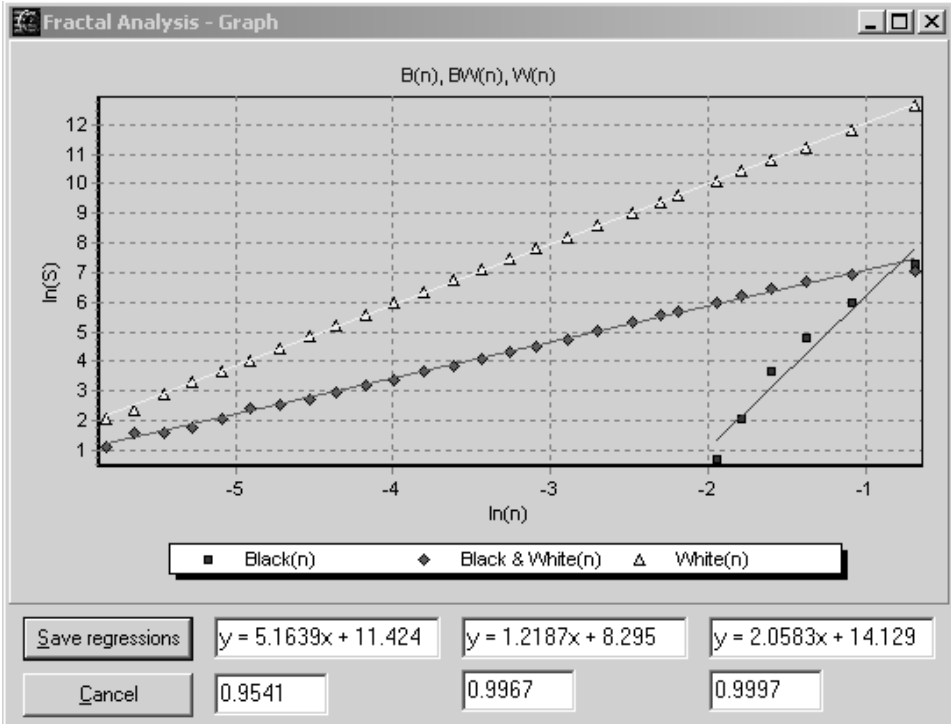


Fig. 2 – The fractal dimension for control root

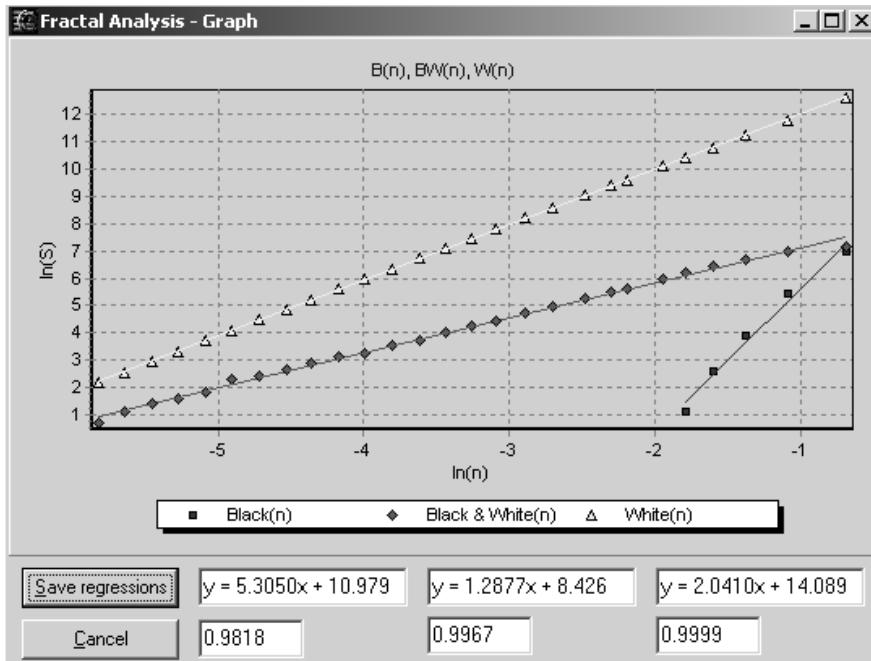


Fig. 3 – The fractal dimension for control root

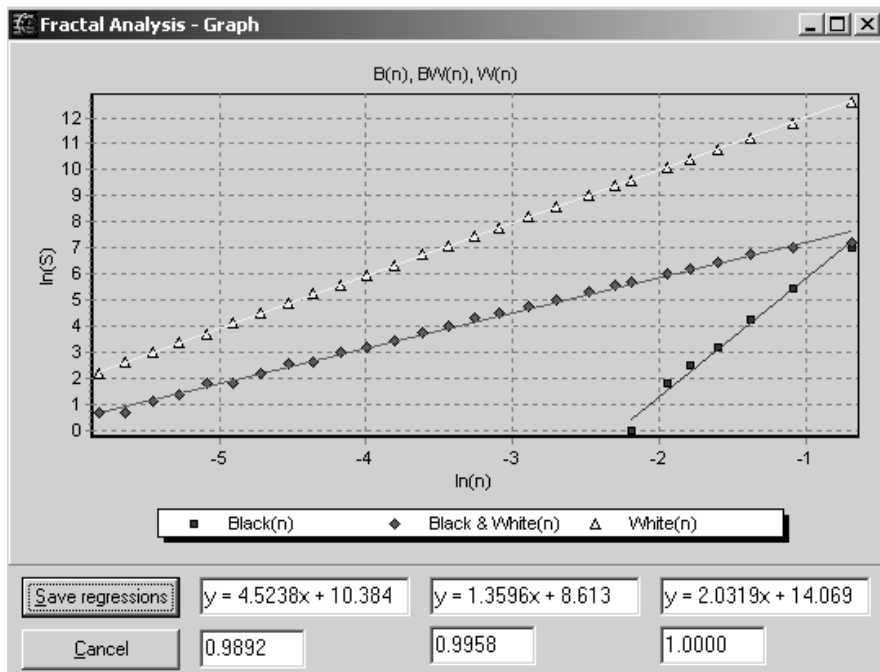


Fig. 4 – The fractal dimension for treated corn root

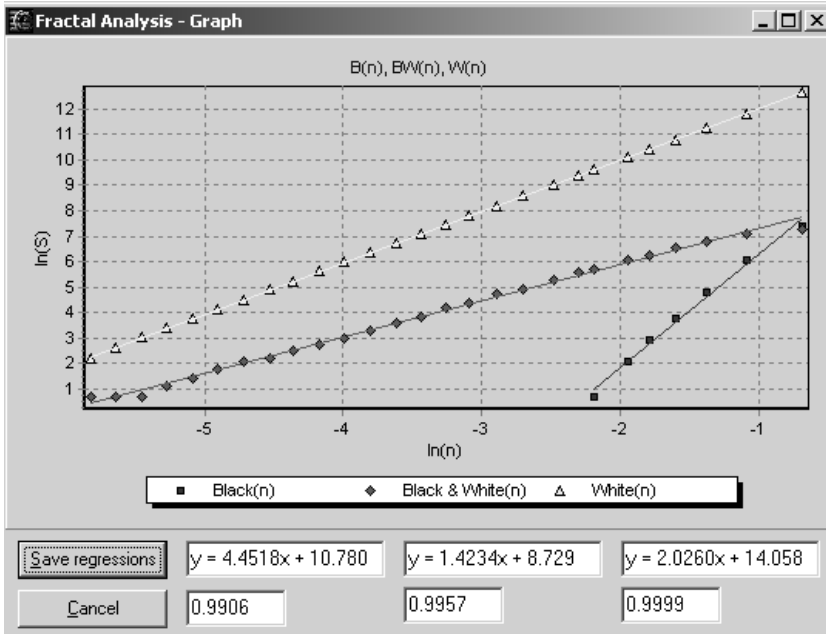


Fig. 5 – The fractal dimension for treated corn root

The above diagrams showed that the fractal dimension increases from 1.2187 (in the case of the control corn roots) to 1.4234 (in the case of the treatment with MgAILDH+sodium paranitrophenolate).

For five roots of the control plants and the treated plants, the mean fractal dimensions are given in figure 6.

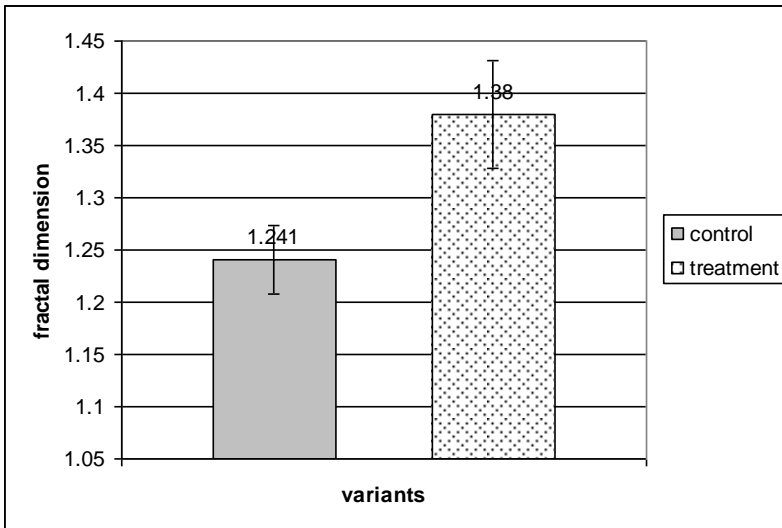


Fig.6 – The fractal dimension for corn root after anionic clay treatments. Error bars are confidence intervals (n=5) (Oancea S., 2007)

From figure 6 we can see that the errors bars don't overlap; this means a highly significant difference exists between fractal dimension from control and treated roots. These results showed that the treatment of the corn plant with this anionic clay increases the fractal dimension of the roots.

CONCLUSIONS

1. In this work we pointed out the importance of concept of fractal structure in physiological characterization of root architecture. Due the fact that the fractal dimension is a direct measure of the relative degree of complexity of the figure, we can conclude that this chemical compound influences the root architecture and this clay contributes to the increase of the root contribution to the water transport in plant and plant development.

2. We determined the planar fractal dimension (2D) of the roots, with the aid of the above mentioned photos, but for better results we must use the 3D fractal dimension and connect it with the morphological changes in root system.

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INTERACTION BETWEEN CATION (Ni^{2+}) AND ANIONS SULFATE AND CHLORINE (SO_4^{2-} AND Cl^-) IN THE EXPRESSION OF PEROXIDASE ACTIVITY OF SUGAR BEET DEPENDING ON THE DOSE OF NICKEL AND TEMPORARY WATER STRESS

INTERACȚIUNEA DINTRE CATIONUL NICHEL (Ni^{2+}) ȘI ANIONII SULFAT ȘI CLOR (SO_4^{2-} ȘI Cl^-) ÎN MANIFESTAREA ACTIVITĂȚII PEROXIDAZEI LA SFECLA DE ZAHĂR ÎN DEPENDENȚĂ DE DOZELE DE NICHEL ȘI STRESUL HIDRIC TEMPORAR

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Abstract. *The excess of Ni in the environment causing significant alterations in plant growth and development, carbohydrate metabolism, increased activity of peroxidase (POD) in leaves, roots and apoplast of these organs. Lower POD activity in leaves and apoplast under Ni environmental pollution of SO_4^{2-} anion compared to Cl^- anion, especially in water culture conditions, demonstrates the interdependence of the Ni cation and anion that accompanies it on the cation in solution nutrition: increased toxicity in the form of chloride Ni compared to sulfate. POD activity in leaves, roots and apoplast of these organs is in the close interdependence of changes in plant metabolism and are crucial in the expression level of tolerance of plants to increasing doses of nickel in the environment. This interdependence is manifested both in optimal soil moisture conditions (70% WSC), and temporary water stress (35% WSC).*

Key words: Nickel, peroxidase, apoplast, sugar beets, water stress.

Rezumat. *Excesul de Ni în mediu cauzează alterări semnificative în creșterea și dezvoltarea plantelor, în metabolismul carbohidraților, majorează activitatea peroxidazei (POD) în frunze, rădăcini și în apoplastul acestor organe. Activitatea mai scăzută a POD în frunze și apoplast la poluarea mediului cu Ni și anionul de SO_4^{2-} în comparație cu anionul de Cl^- , în special în condițiile culturii hidroponice, demonstrează de interdependență dintre cationul de Ni și anionul ce-l însoțește pe cation în soluția nutritivă: majorarea toxicității Ni sub formă de clorură de Ni în comparație cu sulfatul de Ni. Activitatea POD în frunze, rădăcini și apoplastul acestor organe este în strânsă interdependență de modificările în metabolismul plantelor și sunt decisive în manifestarea gradului de toleranță a plantei la dozele crescând de Ni în mediu. Această interdependență se manifestă atât în condiții optimale de umiditate a solului (70% CTAs), cât și de stres hidric temporar (35% CTAs).*

Cuvinte cheie: nichel, peroxidaza, apoplast, sfecla de zahăr, stres hidric.

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INTRODUCTION

Nichel as ultramicroelement influences, like other micronutrients, on various physiological processes and foremost on the enzyme activity in the plants (Walsh, Orme-Johanson, 1987). The influence of Ni on the enzymes' activity can be direct as in the case of urease, where Ni is the direct component of the enzyme molecule (Brown et al., 1987) and, more often - indirectly, as a result of the ions imbalance in the plant due to deviations in the transport of other elements nutrients, like Zn, Fe, Cu and others. Nickel can influence indirect on the enzyme activity by interaction with SH groups of the enzymes, thus changing the conformation of protein molecule, which subsequently leads to inactivation of the certain enzyme activity (Kevresan et. al.1998).

The apoplast plays a significant role in various physiological processes including intercellular signaling, water and nutrients transport. So as it is formed assimilates' balanced background in the apoplast, this space is included in the general scheme of regulation of photosynthesis (Macronosov, 1983), nutrient transport (Bukhard, 2001). As a rule, first reaction, which shows the signs of deficiency or toxicity in nutrients resulting in intercellular space - apoplast, manifested both by the composition of the respective ions and the intensity of antioxidative reactions (Speer, Kaiser, 1991; Ana Lopez-Milan et al., 2000; Fecht Christoffers et al., 2003).

The aim of the current research was to reveal the influence of Ni on the peroxidase activity (POD) in leaves, roots and in the apoplast of these organs under insufficient, optimal supply and excess of Ni in the environment, determining the interaction between Ni and anion that accompanies it (Cl^- or SO_4^{2-}), the expression of plant tolerance potential to environmental pollution with Ni and temporary water stress.

MATERIAL AND METHOD

The effect of Ni on the activity of POD, monosaccharides and sucrose content was studied in water and soil culture experiences. It was used Hoagland-Arnon nutrient solution. On the backdrop of nutrient solution (control) were administered increasing doses of Ni (as NiCl_2 and NiSO_4 , with the equal amount of Ni in compared variants). Volume of the vessel - 250 ml. Variety of sugar beet - Baracuda. Experience scheme: Control - Hoagland-Arnon nutrient solution; Experimental variants with the administration of NiCl_2 and NiSO_4 - 0.05, 50, 100, 200, 300, 400 μM of Ni. In conditions of soil culture the effect of anions and Ni was studied in short-term experience in polyethylene pots, 300 g of soil. Soil - calcareous chernozem. Scheme of the experience: Control, 300 and 900 mg Ni / kg soil. Ni was used as NiCl_2 and NiSO_4 . The POD activity was determined in leaves and roots at the stage of 8-10 leaves. The effect of Ni and chloride and sulphate anions under temporary water stress conditions (35% WSC) was studied at plant foliar treatment. Soil – calcareous chernozem. Foliar treatment was conducted in the intensive plant development phase and temporary water stress (35%WSC, 10 days) was created after 10 days of plants' salt treatment. Experience scheme: 70% WSC- Control, NiSO_4 , NiCl_2 ; 35% WSC- Control, NiSO_4 , NiCl_2 . Extraction of apoplast assimilates (to determine POD activity) was performed by Riabuščhina and Brovcenco method (Brovcenco,Riabuskina, 1971), monosaccharides and sucrose content – by Bertran, POD activity - by Boiarchin (Ermacov, Arasimovici et. al., 1987).

RESULTS AND DISCUSSIONS

Nichel toxicity in plants is manifested by significant alterations in the distribution of macro- and microelements, changes in antioxidant enzyme activity, in the reduction of photosynthetic processes and in the assimilates translocation in plants (Rajni Shukia, Rageev Gopal, 2009; Kevresan et al., 1998; Toma et al., 2002; Pandolini et al., 2006; Lediko Josqak et al., 2008). Researches have shown that the application of the dose of 300 mg Ni / kg soil (table 1) significantly increases the activity of POD in leaves under application of Ni in chloride form. Peroxidase activity in roots under Ni sulphate application is virtually on the level of control variant while the application of nickel chloride significantly increased the enzyme activity. The visual symptoms of toxicity of the pollutant were also more pronounced in the application of nickel chloride salt.

Table 1

POD activity in leaves and roots (conventional units g. fresh weight / min) in sugar beet seedlings (v. Baracuda) depending on the ions Cl⁻ and SO₄²⁻ under soil pollution with Ni (300 mg element/ kg of soil).

Organ	Variant	POD activity
Leaves	Control	29,43
	NiSO ₄	41,89
	NiCl ₂	52,86
Roots	Control	88,53
	NiSO ₄	86,86
	NiCl ₂	138,83

There is of great interest the experimental data obtained in the experience under the conditions of water culture. Nickel dose of 0.05 μM (otherwise the microdose, where Ni has influences as essential micronutrient) acted differently on peroxidase activity in leaves, depending on the anion that accompanies it in nutrient solution. Ni sulphate significantly decreased the enzyme activity while Ni chloride - on the contrary, led to induction of enzyme activity. The effect of anions in the roots was less. Nickel dose of 50 μM significantly increased the enzyme activity in leaves regardless of the anion which shows the action of Ni that manifested as pollutant (table 2). Further increase the dose of Ni (100 and 200 μM) did not significantly affect the enzyme activity because on seedling leaves were observed visual symptoms of toxicity of the pollutant: inhibition, in fact, the accumulation of vegetative mass, the occurrence of chlorosis, partial drying of leaves and plants. Then, after 7-10 days from the Ni toxic dose administration (de facto) the majority of seedlings were dry in these variants and at the 400 μM dosage the seedlings were completely dry. In this case the peroxidase activity decrease is bound, perhaps, to, irreversible changes in plant metabolism.

Table 2

POD activity (conventional units g. fresh weight / min.) in leaves and roots of sugar beet seedlings under environmental pollution with nickel sulphate and chloride. Hoagland-Arnon nutrient solution. Phase of 6-8 leaves.

Variant	NiSO ₄		NiCl ₂	
	Leaves	Roots	Leaves	Roots
Control	47,995	64,065	47,995	64,085
Ni 0,05µM	35,296	64,009	74,105	59,343
Ni 50µM	96,956	55,227	81,963	44,362
Ni 100µM	62,527	49,861	87,759	35,003
Ni 200µM	60,727	46,295	10,453	38,762

In the conditions of temporary water stress (table 3) POD activity in leaves increases significantly and this indicates to the decisive role of the enzyme in the detoxification of free radicals and, ultimately, in reducing the negative effect of drought on plant physiological status. On the other hand, plant foliar treatment with both salts, leads to reducing of POD activity in this organ. It is possible to conclude the positive role of micronutrient in these conditions on physiological processes in plants (non-specific nature), probably by free radical content decrease in leaves.

It was found the most significant effect of Ni sulphate on the activity of POD (after the 3th and 10th days of water stress) compared with nickel chloride. The same regularities in enzyme activity occur, in principle, and in leaf apoplast: more significant decrease of enzyme activity from the application of nickel sulphate in comparison with nickel chloride (the background of increased enzyme activity in leaf apoplast - control variant). More pronounced decrease in apoplast POD activity under the influence of sulfate ions in water stress conditions demonstrates the decisive role of sulphate (except of Ni cation) to include more decisively in plant metabolism and is reflected directly on reducing the negative effect of drought on plants.

Table3

POD activity (conventional units g. fresh weight / min) in leaves and in leaf sugar beet apoplast depending on foliar treatment of plants with solutions of nickel sulphate and chloride and temporary water stress, 10 days, 35% WSC.

Variant	After 3-th days of water stress				After 10-th days of water stress			
	Leaves		Apoplast		Leaves		Apoplast	
	70% WSC	35% WSC	70% WSC	35% WSC	70% WSC	35% WSC	70% WSC	35% WSC
Control	36,52	51,10	1,37	1,41	69,10	79,84	1,38	1,69
NiSO ₄	38,51	39,38	0,87	0,99	58,40	56,26	1,59	1,14
Ni Cl ₂	45,55	36,63	1,48	1,17	83,57	65,11	1,94	1,62

The temporary water stress conditions have not been established an strict regularities in the distribution of monosaccharides in the leaves in dependence of

Cl⁻ and SO₄²⁻ ions: it was observed only the tendency to increase the content of monosaccharides under sulphate application, and maintaining on the same level, or there were an insignificant decrease of their content under the plant foliar treatment solution of 0.01% nickel chloride. Decrease of the monosaccharides' content in the application of Cl⁻ ions is due to increasing transport of these substances to the roots because sucrose content increases more substantially under water stress (with 0.9%, in control - 14.4%, tab. 4).

Table 4

Weight of roots of one plant depending on plant foliar treatment with solutions of nickel sulphate and chloride and temporary water stress

	Variant	Root weight, kg	%	Content of sugar,%	Increase, %
70%WSC	Control	0,67 ± 0,06	100	14,4	0
	NiSO ₄	0,71± 0,02	105,9	14,8	0,4
	NiCl ₂	0,66± 0,08	98,5	14,4	0
35%WSC	Control	0,54± 0,05	100	14,4	0
	NiSO ₄	0,56 ± 0,08	103,1	14,9	0,5
	NiCl ₂	0,52 ± 0,01	96,8	15,3	0,9

The plant foliar treatment with Ni sulfate contributed to the increase of root mass in both the optimal soil moisture conditions (with 5.9%, in the control – 0.67 kg) and temporary water stress (with 3.1 %, in control -0.54 kg). Under Ni chloride treatment the weight of roots was on the level of control but with higher sugar content in them (with 0.9%, in control - 14.4%).

CONCLUSIONS

1. The excess of Ni in the environment causing significant alterations in plant growth and development, carbohydrate metabolism, increased antioxidant enzyme activity of POD in leaves, roots and in the apoplast of these organs.

2. Lower POD activity in leaves and apoplast under Ni environmental pollution and the SO₄²⁻ anion compared to Cl⁻ anion, especially in water culture conditions, demonstrates the interdependence of the Ni cation and anion to accompanies it in nutrient solution: increase toxicity of Ni chloride as compared with nickel sulfate.

3. POD activity in leaves, roots and apoplast of these organs is in the close interdependence of changes in plant metabolism (carbohydrates) and are decisive in the manifestation of the degree of tolerance of plants to increasing doses (pollutants) of Ni in the environment. This interdependence is manifested both in optimal soil moisture conditions (70% WSC) and temporary water stress (35% WSC).

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CLUSTERING ANALYSIS OF SUNFLOWER GENOTYPES CULTIVATED IN MOLDOVA ON THE BASIS OF MICROSATELLITE SEQUENCES

ANALIZA CLUSTERIANĂ A GENOTIPURILOR DE FLOAREA- SOARELUI CULTIVATE ÎN REPUBLICA MOLDOVA ÎN BAZA SECVENȚELOR MICROSATELITE

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Abstract. *A number of 21 homo- and heterozygous sunflower genotypes were studied by applying 13 pairs of SSR primers. Data revealed a relatively high ability of distinction of genotypes based on SSR loci as shown by the general grouping of all analyzed genotypes as well as the separate clusters of parental and hybrid genotypes. Analysis of distribution of genotypes based on microsatellite sequences gives the possibility of usage of selected markers in fingerprinting and hybridization degree estimation.*

Key words: clustering analysis , SSR markers, sunflower

Rezumat. *A fost studiat un număr de 21 genotipuri homo- și heterozifote de floarea-soarelui prin analiza SSR cu 13 perechi de primeri. Datele obținute au pus în evidență capacitatea relativ înaltă de distincție a genotipurilor în baza locilor SSR, fapt demonstrat prin gruparea generală a tuturor genotipurilor analizate, dar și clusterizarea separat a genotipurilor parentale sau hibride. Analiza de repartiție a genotipurilor în baza secvențelor microsatelite demonstrează posibilitatea aplicării markerilor selectați în amprentarea genotipurilor și estimarea gradului de hibridare a formelor hibride.*

Cuvinte cheie: analiza clusteriană, markeri SSR, floarea-soarelui

INTRODUCTION

SSR markers have a very high level of polymorphism, allowing broad use for genomic fingerprinting and mapping, study of genetic and phylogenetic relationships, marker assisted selection and population genetics.

Development of SSR markers for cultivated sunflower (Tang et al., 2002, Yu, 2002) offers solutions to scarcity of DNA markers and obtaining of reference maps by the combination of several genetic linkage maps elaborated independently by different researchers. Tang and coauthors developed the first comprehensive genetic map of sunflower based on SSR makers in 2002. From the set of 1089 SSR markers described by Tang and coauthors (2002) and Yu et al. (2002), 717 showed polymorphism in elite inbred lines and 408 in RHA280 x RHA801.

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Actually, SSR markers are considered the most effective, but their use remains limited, due to the difficulty and time-consuming stages of their development. There are two general strategies in the development of SSR markers:

- identification of microsatellite sequences in available databases;
- obtaining and screening of genomic libraries with corresponding microsatellite probes.

SSR markers selection strategy based on the search of sequences stored in databases - EMBL, GenBank, etc., is relatively simple and quick. It is important to mention that the exploration of data on expressed sequences, contributes to loss of a quantity number of sequences with potential for generating sequence polymorphism, because microsatellites are generally present in non-coding regions of the genome. Most genetic maps based on sunflower SSR markers can be accessed from Sunflower CMap Database <http://sunflower.uga.edu/cmap/>.

SSR profile can be used for estimation of genetic variability, serving as a criterion for selection of parental forms for obtaining of highly productive hybrids, since it is known that genetic distance of various genotypes is positively correlated with hybrid performance (Dua and Yadava, 1985, Miller et al., 1980).

The aim of the research consisted in the SSR analysis performed for 21 homo- and heterozygous genotypes and clustering based on their profiles for determination of the genetic diversity both within the parental lines as well as in relation to hybrid forms.

MATERIAL AND METHOD

As a study material have served 21 sunflower genotypes, which include Rf lines (Drofa, LC Raus, LC 637, LC 7 and LC 39), CMS lines (Drofa, Xenia, LC 40, LC 38 and LC SW 391A) and first generation hybrids (Drofa, Xenia, LC 40 ASC x LC Raus Rf, Drofa ASC x LC Raus Rf, Drofa ASC x LC 637 Rf, Drofa ASC x LC 7 Rf, LC SW 38 ASC x LC 637 Rf, LC SW 38 ASC x LC 4 Rf, Drofa ASC x LC 39 Rf, Xenia ASC x LC 39 Rf și LC 40 ASC x Xenia Rf). Extraction of DNA was performed from etiolate seedlings using CTAB standard protocol (Doyle and Doyle, 1990) with some modifications.

SSR reaction was performed in a final volume of 10 μ l: 1 μ l DNA, 1 μ l 10X buffer with $(\text{NH}_4)_2\text{SO}_4$, 0.8 μ l 25 mM MgCl_2 , 2,5 mM dNTP 1 μ l, 6 pmol primer and 1,25 units of Taq DNA polymerase (Dial, Russia). Touchdown PCR was runed at MyCycler™ Thermal cycler (Bio-Rad) using the following conditions: 94°C for 2 min, 1 cycle at 94°C - 30 s, 63°C - 30 s and 72°C - 45 s, 5 cycles at 94°C - 30 s, 62°C - 30 s - 1°C/cycle and 72°C - 45 s, followed by 30 cycles at 94°C - 30 s, 56°C - 30 s and 72°C - 45s, with final extension at 72°C - 5 min. Were selected primers from ORS series labeled with Cy5 fluorescent dye: 78, 237, 243, 349, 366, 432, 509, 546, 595, 656, 811, 815 and 836. Primers were chosen on the base of information from literature, by the level of polymorphism (Solodenko and Sivolap, 2005).

Amplification profile was analyzed on ALFexpress™ II DNA sequencer Analysis System (Amersham Biosciences) using denaturant gel electrophoresis in 6,0% polyacrylamide gel at a voltage of 400 V for 2 h.

Estimation of genetic distance was done using the software Treecon (<http://bioinformatics.psb.ugent.be/software/details/3>) according to Nei and Li (1979) and clustering was performed using UPGMA method.

RESULTS AND DISCUSSIONS

From 13 pairs of SSR primers used for genotyping of sunflower lines three primer pairs (ORS432, ORS546, ORS595) have not generated a clear profile and thus were excluded from the analysis. Other primers: ORS78, ORS237, ORS243, ORS349, ORS366, ORS509, ORS656, ORS811, ORS815, ORS836 showed different levels of polymorphism. To appreciate the differences between markers, PIC (Polymorphic Information Content) was used, calculated according to Anderson et al. (1993). Thus, the average value of the parameter PIC was 0,589, the highest of 0,85 for the lowest for ORS815 and ORS237 0,59. SSR loci included in the research according to the number of repetitions represented four di-, four three-, and one hexanucleotidic, and one complex repetition.

According to the linkage groups (LG) described for sunflower (Tang et al., 2002) there were identified one locus on LG1, LG2, LG4, LG5, LG6, LG8, LG16 and LG17, and two loci on LG10.

Table 1

Inheritance of SSR markers in hybrids and their parental forms

Genotype	ORS78				ORS237			ORS243				ORS349			
	156	161	165	167	195	198	201	143	147	164	167	171	253	255	263
Drofa ASC															
Drofa Rf															
Drofa F1															
Drofa ASC															
LC Raus Rf															
Drofa ♀ x LC Raus Rf															
Drofa ASC															
LC 637 Rf															
Drofa ♀ x LC 637 Rf															
Drofa ASC															
LC 7 Rf															
Drofa ♀ x LC 7 Rf															
Drofa ASC															
LC 39 Rf															
Drofa ♀ x LC 39 Rf															
LC 40 ASC															
LC Raus Rf															
LC 40 ASC x LC Raus Rf															
LC SW 38 ASC															
LC 637 Rf															
LC SW 38 ASC x LC 637 Rf															
Xenia ASC															
LC 39 Rf															
Xenia ♀ x LC 39 Rf															

Table 1 (continuation)

Inheritance of SSR markers in hybrids and their parental forms		ORS366				ORS509			ORS811			ORS815					ORS836			
Genotype	bp	187	209	211	213	179	193	199	109	113	156	173	178	181	186	190	198	201	207	
Drofa ASC																				
Drofa Rf																				
Drofa F1																				
Drofa ASC																				
LC Raus Rf																				
Drofa ♀ x LC Raus Rf																				
Drofa ASC																				
LC 637 Rf																				
Drofa ♀ x LC 637 Rf																				
Drofa ASC																				
LC 7 Rf																				
Drofa ♀ x LC 7 Rf																				
Drofa ASC																				
LC 39 Rf																				
Drofa ♀ x LC 39 Rf																				
LC 40 ASC																				
LC Raus Rf																				
LC 40 ASC x LC Raus Rf																				
LC SW 38 ASC																				
LC 637 Rf																				
LC SW 38 ASC x LC 637 Rf																				
Xenia ASC																				
LC 39 Rf																				
Xenia ♀ x LC 39 Rf																				

*Grey color indicates the presence of amplicons

SSR loci analysis allows estimation of the hybridization degree of hybrid forms based on the codominant nature of their inheritance. Thus, for F₁ hybrid Drofa ORS237, ORS366, ORS509, ORS811 and ORS836 markers showed codominance (table 1).

In case of experimental hybrid Drofa ♀ x LC Rf Raus, codominance was demonstrated for markers ORS509, ORS811, ORS815 and ORS836. Markers ORS78, ORS243, ORS509, ORS811 and ORS815 showed codominance in the same maternal line in combination with LC 637 Rf.

For hybrid Drofa 7 ♀ x LC Rf ORS78 codominance was revealed for following markers, ORS237, ORS243, ORS509 and ORS811. Hybrid combination of the same maternal line, but with a different paternal line LC 39, showed only two codominant markers: ORS78 and ORS815. Markers ORS349,

ORS815 and ORS836 were inherited codominant by the hybrid LC 40 ASC x LC Raus Rf. Also was highlighted the hybrid LC SW 38 ASC x LC 637 Rf for which were revealed five codominant markers from 10 analyzed (ORS78, ORS243, ORS349, ORS509 and ORS836).

Thus, codominant nature of inheritance was demonstrated for 2-5 loci, depending on the hybrid genotype. However, parental genotypes can be clearly distinguished based on SSR profiles.

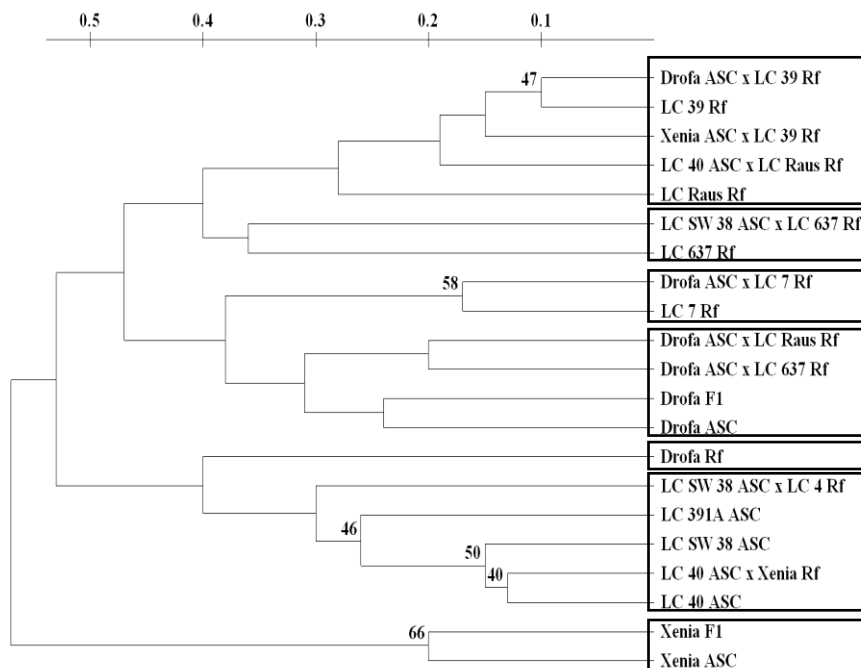


Fig. 1 - Dendrogram of the distribution of sunflower genotypes based on microsatellite sequences

Clustering analysis revealed seven distinct groups (fig. 1). The first group consists of paternal genotypes LC Raus Rf, LC 39 Rf and their hybrids: Drofa ASC x LC 39 Rf, Xenia ASC x LC 39 Rf, LC 40 ASC x LC Raus Rf. Although in hybrid combinations were used different maternal genotypes, the genetic profile is strongly influenced by the paternal form.

The second and third groups include paternal lines and hybrid forms properly: paternal genotype LC 637 Rf and its hybrid LC SW38 ASC x LC 637 and LC 7 Rf and Drofa ASC x LC 7 Rf hybrid, respectively.

Cluster four contains maternal genotype and most of its hybrids: Drofa F₁ și Drofa ASC x LC Raus Rf, Drofa ASC x LC 637 Rf. Only one hybrid genotype obtained using LC 39 Rf parental form was classified in first group.

Drofa Rf genotype was positioned in cluster number five, while the sixth group includes three maternal genotypes LC 391A ASC, LC SW 38 ASC, LC 40 ASC and two hybrids LC 40 ASC x Xenia Rf, LC SW 38 ASC x LC 4 Rf.

The last group consists of genotype Xenia ASC and Xenia F₁ hybrid, which are characterized by high similarity. Also observed that another hybrid, which served as the Xenia ASC maternal form, is classified in the first cluster, which shows comparatively strong influence of the paternal genotype LC 39 Rf in the formation of this hybrid.

Thus, clustering showed substantial similarity between hybrids and maternal or paternal lines, characterizing a particular recombination capacity of parental genotypes. Profile similarity shows the nature of maternal or paternal genotype influence and inheritance of these profiles in hybrids.

CONCLUSIONS

1. 21 homo- and heterozygous genotypes were studied using SSR analysis with 13 primer pairs of which ORS78, ORS237, ORS243, ORS349, ORS366, ORS509, ORS656, ORS811, ORS815, ORS836 showed different levels of polymorphism.

2. Distribution analysis of sunflower genotypes based on microsatellite sequences shows possibility of application of the selected markers in genome fingerprinting and hybridization degree estimation.

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CYTOPLASMIC MALE STERILITY AND FERTILITY RESTORATION, VARIOUS MECHANISMS - THE SAME EFFECT

ANDROSTERILITATEA CITOPLASMATICĂ ȘI RESTAURAREA FERTILITĂȚII, DIVERSE MECANISME – ACELAȘI EFECT

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Abstract. *This work focused a complex study of various modalities of nucleo – cytoplasmic interaction through the prism of CMS-Rf systems of plants. Were evaluated different suppression pathways of cytoplasmic male sterility phenotype. It was elaborated the hypothetical mechanism of CMS-Rf interaction in plants which highlights various mechanisms but the same effect.*

Key words: cytoplasmic male sterility, pollen fertility restoration, nucleo – cytoplasmic interaction, CMS-Rf systems.

Rezumat. *Lucrarea dată reprezintă un studiu complex al diverselor mecanisme de interacțiune nucleu-citoplasmă prin prisma sistemelor ASC-Rf la plante. Analiza diferitelor căi de supresie a androsterilității citoplasmatică a permis elaborarea unui model general de interacțiune ASC-Rf la plante.*

Cuvinte cheie: androsterilitate citoplasmatică, restaurarea fertilității polenului, interacțiune nucleu – citoplasmă, sistemul ASC-Rf.

INTRODUCTION

Investigations regarding molecular mechanisms of cytoplasmic male sterility phenomenon has seen a significant development since the 70s of the last century. The first core assumptions about nucleo-cytoplasmic interaction were exposed by Turbine N.V. and Palilova A.N. (Turbine N.V., Palilova A.N., 1970). According to these authors, cytoplasmic male sterility (CMS) is the result of mitochondrial mutations which affect intracellular communication and determines expression of some repressor proteins that target the mitochondria and are coded by the nucleus. Alteration of mitochondrion biochemical activity triggers apoptotic mechanisms in the male gametophyte (Turbine NV, Palilova AN, 1970).

Recent data show specific features of nucleo-cytoplasmic interaction at different species (Koizuka N. et al., 2003; Duca M., 1998; Leipner J., Horn R., 2002; Mackenzie S.A., McIntosh L., 1999) which can not be completely explained by the general model reported by Palilova A.N. and Turbine N.V. Conducted research represents an analysis of data stored in the NCBI - The National

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Center for Biotechnology Information [www.ncbi.nlm.nih.gov] regarding proteins associated with the CMS and Rf aimed to highlight a general mechanism of interaction between cytoplasmic and nucleus genes using bioinformatics software.

MATERIAL AND METHOD

Different softwares and Web Links (Protein Workbench 5.0.1. [www.clcbio.com], PFAM [www.pfam.sanger.ac.uk / family.acc], ClustalW2 [www.ebi.ac.uk/Tools/clustalw2], PhyloDraw Ver. 0.8 [Graphics Application Lab., Pusan National University]) were applied for analysis of protein domains and motifs.

Gene analysis included: BLAST analysis [http://blast.ncbi.nlm.nih.gov/Blast.cgi] for identification of ESTs presenting high similarity index with the gene of interest; ESTs alignment using CAP3 program [http://www.pbil.univ-lyon1.fr/cap3.php] and translation of the obtained sequence in protein sequence via DNA-RNA-Protein translator. [http://www.attotron.com/cybertory/analysis/trans.htm].

Investigated protein and RNA sequences are summarized in table 1 and table 2.

Table 1

Analysed RNA and protein sequences

Species	Accession number [www.ncbi.nlm.nih.gov] of the protein associated with:	
	CMS	Rf
<i>Petunia spp.</i>	CMS 402 (A.A.A96602)	<i>Rf</i> -PPR591 (A.A.M52340) and <i>Rf</i> -PPR592 (A.A.M52339)
<i>Brassica napus</i>	ORF 222 (A.A.B41354)	<i>Rfo</i> (ACJ70132)
<i>Raphanus sativus</i>	ORF 125 (BAB21870)	<i>orf687</i> (CAD61285)
<i>Oryza sativa</i>	ORF 79 (A.A.18902)	<i>Rf1a</i> , <i>Rf1b</i> and <i>Rf1c</i> (ABC42330, ABC42331 și BAD13711)
<i>Zea mays CMS-T</i>	–	<i>ALDH2</i> , <i>ALDH2b</i> (AAK58370, NP_001105576)
<i>Zea mays CMS-S</i>	ORF 77(A.A.N38288) and ORF 355 (A.A.N38287)	–
<i>Helianthus annuus CMS PET1</i>	ORFH 522 (CAA39429)	–

Table 2

EST and polynucleotide-phosphorilase sequences used in investigation

Species	Model gene and accession number [www.ncbi.nlm.nih.gov]
<i>Arabidopsis thaliana</i>	polynucleotide-phosphorilase (AK117900)
<i>Pisum sativum</i>	polynucleotide-phosphorilase (AAC50039.1)
<i>Oriza sativa</i>	polynucleotide-phosphorilase (BAF20896.1)
ESTs (Expressed sequence tags), NCBI [www.ncbi.nlm.nih.gov]	
(DY912504.1; GE494064.1; EL415574.1 and EL443928.1)	

RESULTS AND DISCUSSIONS

Amino acid sequence analysis revealed *transmembrane* and *cytoplasmic motifs*, protein domains like *Major Facilitator Superfamily*, *Retroviral aspartyl protease* etc. for CMS proteins and cytoplasmic motifs such as "*RRM_1 - RNA recognition motif*" and protein domains of "*ALDH - Aldehyde Dehydrogenase*" for proteins associated with Rf. Integration of these data reveals some general interaction principles of CMS-Rf system (Fig. 1).

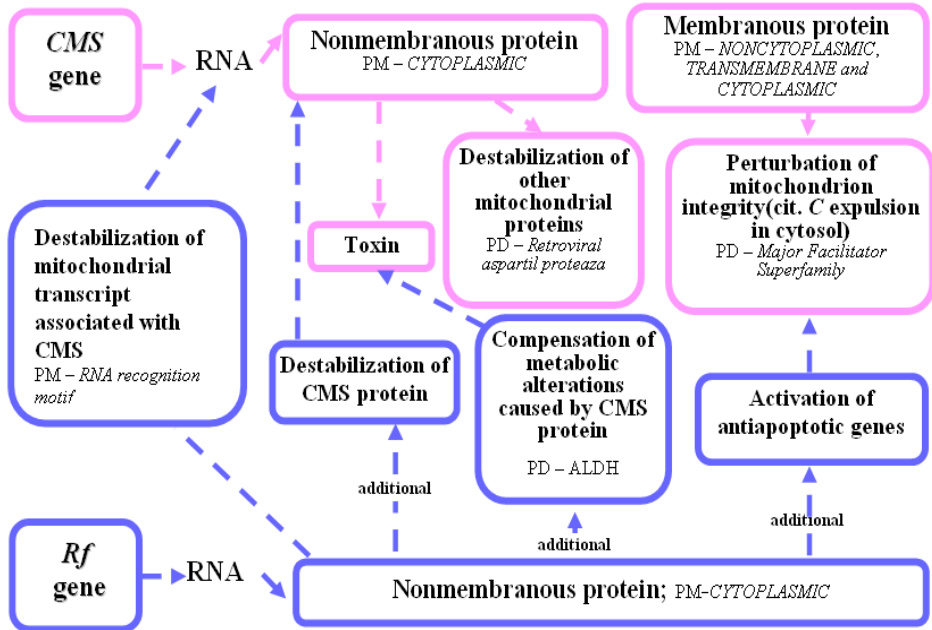


Fig. 1 – General mechanism of interaction between components of CMS-Rf system (PD – protein domain, PM – protein motif) (Midoni A., 2010)

According to bioinformatics data cytoplasmic male sterility is determined by the synthesis of mitochondrial proteins which in most cases contain *transmembrane motif* and domains involved in transmembrane transport of substances, leading to destabilization of mitochondrial membrane integrity and thus altering its function.

In other cases, cytoplasmic male sterility could be the result of proteins with "retroviral aspartyl protease" domain that involved in degradation of core protein with energy metabolism function or cytoplasmic proteins with cytotoxic effect.

Cytoplasmic localization of nuclear Rf gene expression products with motifs involved in RNA recognition of CMS genes represented in figure 2 reveals that the effect of pollen fertility restoration is achieved by specific posttranscriptional modifications changes of CMS precursor.

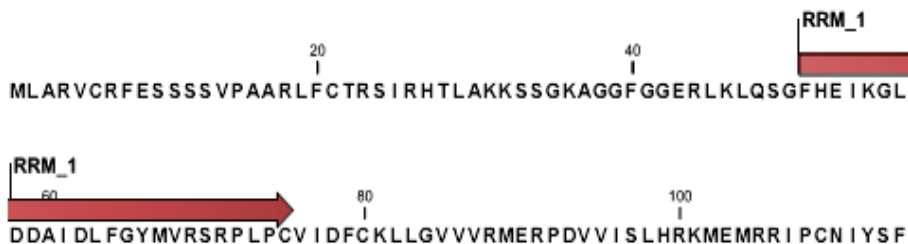


Fig. 2 – RRM_1– RNA recognition motif.

Fertility restorer genes from other plant species (rice, maize, tobacco, etc.) may also have additional role determined by the presence of protein domains of "ALDH - Aldehyde Dehydrogenase", which regulates the cellular content of acetic aldehyde, thus exhibiting a compensatory effect of altered mitochondrial function.

Analysis of phylogenetic trees, protein domains and motifs, spatial structure etc. highlighted similar peculiarities of different systems. For example, phylogenetic clustering of proteins associated with fertility restoration shows a high degree of similarity between the systems described in *Brassica napus* and *Raphanus sativus*. Also protein domains analysis indicates a similarity in the physiological expression of CMS-Rf system in corn with the T type and *Oryza sativa* (Boro II) where cytoplasmic protein with cytotoxic effect is destabilized posttranscriptionally.

Unlike the CMS-Rf system of maize with Texas cytoplasm, S-type cytoplasm closely resembles sunflower PET1 at both structural and functional levels: transmembrane localization, disruption of mitochondrial integrity associated with the expulsion of cytochrome C and other apoptotic signals, CMS transcripts destabilization and pleiotropic effects on specific microsporogenesis genes.

In sunflower was found that decreasing of the stoichiometric content of *ATPase-orfH522* transcript is determined by polyadenylation that targets substrate for RNAase2 degradation. These molecular and biochemical processes is achieved by forming an enzymatic complex including polynucleotide phosphorylase and RNAase.

Complete amino acid sequence of proteins with polynucleotide phosphorylase function were described for a few plants (*Arabidopsis thaliana* - AK117900, *Pisum sativum* - AAC50039.1 and *Oriza sativa* - BAF20896.1). Since this enzyme represents one of the key components of the fertility restoration physiological events it was analyzed *in silico*.

Thus, the study of polynucleotide phosphorylase from model plants and ESTs (Expressed Sequence Tags) from sunflower revealed four sequence with maximum sequence similarity. Through the program CAP3 and DNA-RNA-protein translator was modeled *in silico* polynucleotide phosphorylase protein (fig. 3).

>Contig1

```
ESLTPTPPPSYSSRHHRGSLNLIPNALQPPASMEDRTLTSHIQQPPDTTNPTSALQNLIPHL  
LFALFFHREDPQIASQLGLIVMTSLVLRKKLSRFFLTSIRLRFQSEIDLLLKLVKEDKLVDL  
LLEMERLLSTRQFVCLMFQANLLTFPMSVHYQERFSAAGRSTGGFFKREGRTKDHEVL  
ICRLIDRPLRPTMLKGFYHETQILSWVLSYDGLHSPDSLAVTAAGIAVALSEVPNTNTVA  
GVRIGLIGDKFVVNPTTMMEMEDSKDLLVAGSETGILMIEGYCDFLPEEKLLAEIEVGQD  
AVRAICKEVDNLVKICGKPKMLDSIKLPPPELYKHVEEIIAGDVLVDVLQIKNKVPRRKAL  
SLLEEKVLSILTEEGYSKSESCVGAIEITPDMLEDEDEEEVVVDGEYDEGDVQIKPVFK  
KPTPTFYSEVDVKLVFKSVSSKYLRNRIVKGGKRS DGR TSEEIRVIDAECGLLPRVHGSA  
LFTRGETQALAVVTLVINNG
```

Fig. 3 – Hypotetic sequence of sunflower polynucleotide phosphorylase. *ESTs* used for *in silico* analysis (*DY912504.1*; *GE494064.1*; *EL415574.1* and *EL443928.1*).

This hypothetical protein shows high degree of similarity with polynucleotide phosphorylase from other plant species: 78% - *Ricinus communis*, 77% - *Spinacia oleracea*, 75% - *Pisum sativum* and 72% - *Arabidopsis thaliana*, which confirms the reliability of obtained results.

CONCLUSIONS

1. Proteins associated with CMS in various plant species have domains such as: *Retroviral aspartyl protease*, *Major Facilitator superfamily* etc., demonstrating their involvement in cell apoptosis and those associated with fertility restoration - *RNA recognition motif*, *Radical SAM superfamily*, etc. These data allowed to ascertain a hypothetical mechanism of CMS-Rf system in plants.

2. Similar features have been highlighted for following CMS-Rf systems: sunflower (PET1) and maize (CMS-S); *Brassica napus* and *Raphanus sativus*; maize T type and *Oryza sativa* (Boro II).

3. It was *in silico* modeled enzyme *polynucleotide phosphorylase* from sunflower that potentially could be involved in polyadenylation of orfH522 transcript with subsequent digestion by RNAase, thus restoring pollen fertility.

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GENETIC DISTANCE EVALUATION, A USEFUL TOOL IN HETEROSIS EFFECT PREDICTION OF SUNFLOWER GENOTYPES

EVALUAREA DISTANȚEI GENETICE ÎN SCOPUL PRONOSTICĂRII EFECTULUI DE HETEROZIS LA DIVERSE GENOTIPURI DE FLOAREA-SOARELUI

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Abstract. *The goal of the research was to assess the RAPD banding pattern among different cytoplasmic male sterile, fertility restorer lines and hybrid sunflower genotypes to be associated with restorer of fertility and heterotic traits. It is discussed the efficiency of parental selection based on genetic distance by RAPD polymorphisms clustering. Also, screening of three Operon primers, previously reported as polymorphic, revealed four amplification products (OPG10₅₁₀; OPG10₆₈₀; OPI16₄₅₀ and OPI16₅₅₀) specific only for studied Rf lines, suggesting on their potential use for indirect selection of fertility restorer trait.*

Key words: sunflower, CMS lines, Rf lines, heterosis effect, hybrids

Rezumat. *Scopul cercetării a constat în evaluarea polimorfismului genetic la diverse genotipuri ASC, Rf și F₁ pentru evidențierea gradului de heterozis și identificării unor potențiali markeri asociați cu capacitatea de restaurare a fertilității Polenului. Este discutată eficiența de selecție a liniilor parentale utilizând distanța genetică în baza profilelor RAPD. Totodată, au fost identificați ampliconi RAPD (OPG 10₅₁₀, OPG 10₆₈₀, OPI 16₄₅₀ și OPI 16₅₅₀) specifici liniilor restauratoare care ulterior, pot fi utilizați în elaborarea markerilor moleculari lincați cu acest caracter.*

Cuvinte cheie: floarea-soarelui, linii ASC, linii Rf, vigoare hibridă, hibridi

INTRODUCTION

The RAPD (Random Amplification of Polymorphic DNA) technique is successfully used from various laboratories to investigate the genetic polymorphism, especially due to the experiment low cost. Although, other marker technology are considered more reliable and reproducible, the good experimental optimization could assure the effective parent selection for hybrid breeding related various important qualitative and quantitative traits (productivity, high resistance to different stress factors).

The objective of this study was to assess the genetic distance based on RAPD polymorphism with OPG10, OPI16 and OPH15 primers among different cytoplasmic male sterile, fertility restorer lines and hybrid sunflower genotypes.

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MATERIAL AND METHOD

Six fertility restorer lines (*Xenia*; *Drofa*; *Valentino*; *LC Raus*; *LC 4*; *LC Ciom*), seven cytoplasmic male sterility lines (*Xenia*; *Drofa*; *Valentino*; *LC40*; *SW38*; *VIR101PET1*; *VIR116PET1*), commercial (*Drofa*, *Xenia*, *Valentino*) and experimental (*LC40 CMS x LCRaus Rf*; *Drofa CMS x LC43 Rf*; *Drofa CMS x VIR 681 Rf*) F_1 hybrids were investigated in a three-year field experiment carried out in a randomized complete block design with 3 replications.

Total genomic DNA for RAPD analysis was isolated from young leaves using CTAB (Doyle J.J., 1990). The purity and yield was analyzed by 1% agarose gel electrophoresis and UV absorbance (A260/A280) using PG instruments UV.VIS NC 60 spectrophotometer.

PCR amplification was performed in the following mixture: 25 ng DNA, dNTP 200 μ M of each type, 1,25 U per reaction of GoTaq ADN-polymerase (Promega), 2,5 mM MgCl₂ and 0,1 μ M of decamer primers (Nandini R., 2005): OPG10 (5' -AGGGCCGTCT-3'); OPI16 (5' -TCTCCGCCTT-3') and OPH15 (5' -AATGGCGCAG-3') in the Corbett Research thermocycler, programmed with the cycling profile: initial denaturation at 95°C for 5 min followed by 40 cycles: 95°C - 1 min, 36°C - 1,5 min, 72°C - 2 min. and a final extension at 72° C for 3 min. Amplification products were displayed through electrophoresis in 1,5% agarose gel with 0,5 μ g/ml ethidium bromide in presence of 50 bp DNA ladder (Sigma, Saint Louis, Missouri, USA). The electronic images of ethidium bromide stained gels were documented using Photo-Capt Analysis System. The experiments described above were repeated 2-3 times with the same DNA extract and the negative control samples contain all components of the PCR except genomic DNA. No amplification products were seen for any primer. Obtained amplification products were marked according primer designation and band size, for example: OPG10₅₁₀.

Amplified fragments were scored as the presence (+) or absence (—) of a fragment. Genetic distance (GD) between the genotypes were estimated according to the Nei and Li cited by [PVGILA D., 2005: $GD = 1 - [2N_{xy} / (N_x + N_y)]$], where N_x is the number of bands in individual X, N_y is the number of bands in individual Y, and N_{xy} is the number of RAPD bands present in both X and Y. Dendrogram was constructed with STATISTICA 7 program (using Euclidian distance for clustering).

RESULTS AND DISCUSSIONS

The analyze of three primers profiles (OPG10, OPI16, OPH15) to select new combination between different Moldavian parental lines and especially to identify potential RAPD markers associated with fertility restoration trait, revealed 15 - 27 amplified fragments per primer depends of genotype.

The OPG10 generated a series of specific amplification products in terms of their molecular masses and amounts and was more informative to other studied primers. Twenty bands were polymorphic – table 1.

Significant differences in OPG10 profiles was ascertained among Rf lines especially respecting the banding pattern that comprise primarily of high molecular weight bands. The maternal lines are characterized by more homology between comigrating bands in contrast with F_1 hybrids and paternal forms, their profile including only 4 polymorphic fragments: OPG10₃₅₀, OPG10₉₅₀, OPG10₁₂₀₀ and OPG10₁₄₀₀.

Table 1

RAPD-OPG10 profiles at <i>Rf</i> , <i>CMS</i> and <i>F₁</i> genotypes																				
OPG10	Amplification products																			
	1900	1800	1700	1600	1550	1400	1200	1050	950	800	750	700	680	510	450	440	400	380	350	150
Fertility restorer lines																				
Xenia				+		+			+	+		+	+	+						
Drofa						+			+			+	+	+			+	+	+	+
Valentino				+	+	+	+		+		+		+	+			+	+	+	+
Raus				+			+		+		+		+	+		+		+		+
LC 4				+		+					+		+	+		+		+		+
Cium						+	+			+			+	+						+
Cytoplasmic male sterility lines																				
Xenia				+		+	+		+							+		+		
Drofa				+			+	+		+						+		+		+
Valentino				+			+	+	+							+		+	+	+
LC 40				+					+							+		+	+	+
SW 38				+					+							+		+		
VIR 101				+					+							+		+	+	+
VIR 116	+			+					+							+		+	+	+
Hybrids genotypes (<i>CMS</i> x <i>Rf</i>)																				
Xenia	+	+													+		+		+	
Drofa									+						+			+		+
Valentino							+	+				+			+				+	+
LC 40 x Raus		+						+				+			+	+		+	+	+
Drofa x LC43							+	+				+			+			+	+	
Drofa xVIR 681		+					+	+				+			+			+	+	

The most male specific fragments amplified by the investigated primer were inherited by their respective hybrids, substantiating the hybridizing level. Only two from all ascertained polymorphic fragment: 510 bp and 680 bp have shown a constant presence in all restorer forms (three replicates) denoting an association with fertility restorer trait. These were considered as potential RAPD markers linked to the *Rf* genes - OPG10₅₁₀ and OPG10₆₈₀. The densitometry analysis of these bands at paternal lines showed a variable fluorescence intensity (especially for 680 bp) that could be presented in decreasing order as higher intensity at *LC Cium*, *Xenia*, *Valentino* followed by *LC 4*, *Drofa* and *LC Raus* (figure 1).

The OPI16 RAPD profile as those generated by OPG10 revealed polymorphisms among the amplification products of different homo- and heterozygote genotypes. About 70 percentage of fragments showed absence/presence polymorphism, which could be particularly useful for discriminating most of the hybrids along with their parents. It should be emphasized that these RAPD profiles have differentiated between sunflower lines carrying the dominant (*Rf* lines) and homozygous recessive allele of fertility restorer genes (*CMS* lines) through two weak OPI16₄₅₀ and OPI16₅₅₀ bands, that are more intensive at *Xenia Rf* and *Valentino Rf*. Also, the OPI16₅₉₀ there is present at all parental lines and absent for hybrids – table 2.

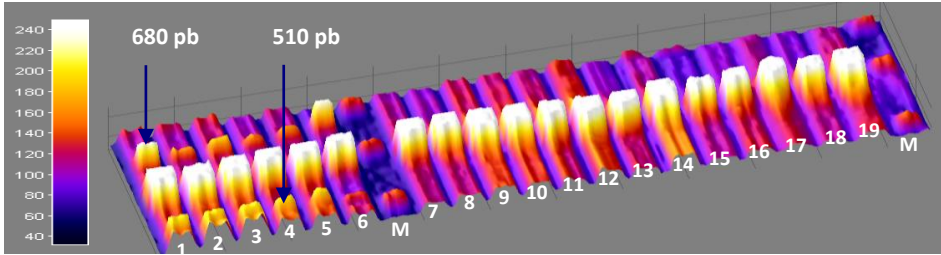


Fig. 1 – Densitometry analysis of OPG10₅₁₀ and OPG10₆₈₀; 1-Xenia; 2-Drofa; 3-Valentino; 4-LC Raus; 5-LC 4; 6-LC Cium; CMS: 7-Xenia; 8-Drofa; 9-Valentino; 10-LC 40; 11-SW 38; 12-VIR 101 PET 1; 13- VIR 116 PET 1; F₁: 14- Xenia; 15- Drofa; 16- Valentino; 17-LC Raus Rf x LC 40 CMS; 18-Drofa ASC x LC 43 Rf; 19-Drofa ASC x VIR 681 Rf.

Table 2

RAPD-OPI 16 profiles at Rf, CMS and F₁ genotypes

OPI 16	Amplification products																		
	2000	1800	1700	1600	1500	1450	1250	1100	1000	950	880	790	600	590	550	500	450	350	320
Fertility restorer lines																			
Xenia				+	+	+			+	+	+	+		+	+	+	+	+	+
Drofa				+		+				+	+	+		+	+	+	+	+	+
Valentino				+					+	+	+	+		+	+	+	+	+	
Raus				+		+			+	+	+	+		+	+	+	+	+	+
LC 4				+		+				+	+	+		+	+	+	+	+	+
Cium				+				+	+		+	+		+	+	+	+	+	+
Cytoplasmic male sterility lines																			
Xenia				+				+			+	+		+		+		+	
Drofa				+								+		+		+		+	
Valentino				+				+			+	+		+		+		+	
LC 40				+		+		+			+	+		+		+		+	
SW 38			+	+		+		+			+	+		+		+		+	
VIR 101				+				+				+		+		+		+	
VIR 116				+				+	+		+	+				+		+	
Hybrids genotypes (CMS x Rf)																			
Xenia	+		+	+	+	+		+		+	+	+			+		+	+	+
Drofa							+					+	+			+		+	
Valentino					+			+			+	+	+			+		+	
Raus x LC 40				+	+	+					+	+	+			+		+	
Drofa x LC 43				+	+						+	+	+			+		+	
Drofa x VIR 681				+	+	+					+	+	+			+		+	+

The analysis of OPH 15 primer's RAPD profiles revealed a total number of 15 amplicons. The more intensive fragments have a length between 350 and 1000

bp. As compared to the previous primers screening that showed a possibility to distinguish one variety from other no relevant heterogeneity can be detected among the amplification products of investigated parental and hybrid forms. Several polymorphisms (absence/ presence type) observed - OPH15₁₇₀₀ and OPH15₁₉₀₀ appear ambiguous and with specificity more of genotype than fertility restorer trait, thus not being useful as genetic markers associated with trait of interest.

In addition to linkage with target traits, the developing of molecular markers is determined by its applicability in efficient parental selection based on genetic distance assaying. Parental selection is the first step in any plant breeding program. It is known that the probability of recovering a superior progeny genotype is greater if genetic distance among parents is greater. Thus, the greatest value of genetic distances among parental genotypes can be seen between: *Xenia ASC* and *Xenia Rf*; *Valentino CMS* and *Cium Rf*; *VIR116 CMS* and *Cium Rf*; *LC40 CMS* and *Xenia Rf*; *LC40 CMS* and *LC Raus Rf*. Such information could be used for the prediction of heterosis and combining ability effects to design of new hybrid combinations (figure 2).

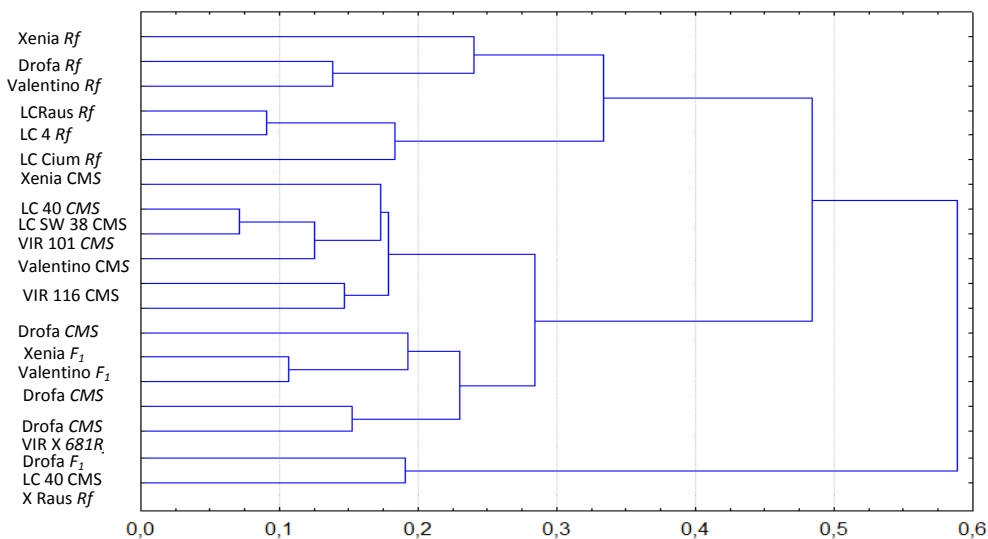


Fig. 2 - Clustering dendrogram of sunflower parental lines and hybrids based on RAPD patterns.

These findings have been verified by phenotype data (Midoni A., 2010) that indicated high values of the experimental hybrids productivity to average of parents and commercial hybrids.

CONCLUSIONS

1. Screening of three Operon primers, revealed four amplification products (OPG10₅₁₀; OPG10₆₈₀; OPI16₄₅₀ and OPI16₅₅₀) specific only for studied *Rf* lines, suggesting on their potential use for indirect selection of fertility restorer trait.

2. The discriminating RAPD polymorphisms revealed the greatest value of genetic distances among following parental genotypes: *Xenia ASC* and *Xenia Rf*; *Valentino CMS* and *Cium Rf*; *VIR116 CMS* and *Cium Rf*; *LC40 CMS* and *Xenia Rf*; *LC40 CMS* and *LC Raus Rf*. Such information could be used for the prediction of heterosis and combining ability effects.

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CYTOMETRIC INVESTIGATIONS OF GENOME SIZE AND LEVEL OF PLOIDY IN SOME PLANTS WITH ORNAMENTAL POTENTIAL

INVESTIGAȚII CITOMETRICE ALE DIMENSIUNII GENOMULUI ȘI NIVELULUI DE PLOIDIE LA UNELE PLANTE CU POTENȚIAL ORNAMENTAL

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Abstract. *Cytometric determination of nuclear DNA content has proved to be useful in studying the variation in interspecific and intraspecific DNA content in plants. The ability to estimate DNA content stimulated a vast array of applications, which ranged from basic research to breeding and seed production. The main objective of this study is to establish the genome size specific to species of plants with ornamental potential and to examine the ploidy level of the species using the technique of flow cytometry. Our results showed that all the investigated species are diploid. We also revealed the quantity of DNA specific to *Allium ursinum* (65,21 pg 2C DNA) and *Lilium martagon* (91,56 pg 2C DNA).*

Key words: genome size, ploidy level, ornamental potential plants.

Rezumat. *Determinările citometrice ale conținutului de ADN nuclear s-au dovedit a fi un parametru util în studierea variațiilor intra- și interspecifice ale cantității de ADN la plante. Posibilitatea estimării cantității de ADN a stimulat un areal vast de aplicații, începând cu cercetarea fundamentală și până la încrucișări și producția de semințe. Obiectivul principal al studiului de față este de a determina mărimea genomului specifică unor specii de plante cu potențial ornamental și de a examina gradul de ploidie al acestor specii folosind tehnica citometriei în flux. Rezultatele noastre au demonstrat că toate speciile investigate sunt diploide. De asemenea, a fost determinată cantitatea de ADN specifică speciilor *Allium ursinum* (65,21 pg 2C DNA) și *Lilium martagon* (91,56 pg 2C DNA).*

Cuvinte cheie: mărimea genomului, grad de ploidie, plante cu potențial ornamental.

INTRODUCTION

The nuclear DNA content and the ploidy level of a cell can be measured at high speed by flow cytometry. Cytometric determination of nuclear DNA content has proved to be useful in studying the variation in interspecific and intraspecific DNA content in plants.

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The first flow cytometers quantified DNA in cells by measuring absorbance of UV light (Kamentsky et al., 1965). This approach was soon abandoned for fluorescence (Dittrich and Gohde, 1969; Van Dilla et al., 1969). DNA analysis by flow cytometry has been used extensively in biomedical research to detect aneuploidy (Kawara et al., 1999), apoptosis (Vermes et al., 2000) and to monitor cell cycle kinetics and its perturbations (Rabinovitch, 1994). Attempts to apply the method in plants were hampered by difficulties in preparation of suspensions of intact cells and nuclei suitable for flow cytometry. In the first successful experiment, Heller (1973) stained nuclear DNA with ethidium bromide.

The ability to estimate DNA content stimulated a vast array of applications, which ranged from basic research to breeding and seed production, and included estimation of nuclear genome size (Hulgenhof et al., 1988), ploidy screening (De Laat et al., 1987), detection mixoploidy (Roux et al., 2001) and aneuploidy (Roux et al., 2003), assessment of the degree of polysomaty, reproductive pathways (Matzk et al., 2000), and cell cycle kinetics (Sandoval et al., 2003).

For cell DNA quantity measurements, the results are expressed in picograms (pg) and the status of the nuclei is expressed in C values. A haploid nucleus has a C quantity of DNA, and a diploid nucleus has a 2C quantity of DNA (Dolezel et al. 2007; Roberts A.V. 2009). The cytometric method implies also the simultaneous measurement of DNA content in the nuclei of an internal control which has the role of calibrating the 2C DNA content for the investigated species (Greilhuber et al., 2005). As for the investigations on ploidy level, the calibrator is an external control belonging to the same species as the analyzed one (Dolezel et al. 2007).

The main objective of the study is to establish the genome size specific to species of plants with ornamental potential and to examine the ploidy level of the species using the technique of flow cytometry.

MATERIAL AND METHOD

The biological samples were received from the University of Agricultural Sciences and Veterinary Medicine „Ion Ionescu de la Brad”, and consist of dried seeds belonging to the following species with ornamental potential: *Parnassia palustris* (Botanical Garden, Iasi); *Allium ursinum* (Barnova); *Lilium martagon*; *Aconitum degenii* (Botanical Garden, Iasi); *Centaurea phrygia* (Botanical Garden, Iasi).

Flow cytometry analysis of ploidy level and DNA quantity. This method requires a cytometer equipped with an excitation source (laser) and a detector suitable for capturing fluorescence emission of propidium iodide (PI). Because PI also stains double-stranded RNA, a previous RNase treatment is required.

Isolating and staining the nuclei. For the estimation of the specific DNA quantity, the tissue corresponding to 3-20 seeds is placed in a plastic Petri dish together with the internal standard tissue (*Allium cepa* seeds - 32,97pg/2C), they are chopped into fine pieces using a sharp razor blade together in 500 µl nuclei isolation/staining buffer containing 50 µg/ml PI and 50 µg/ml RNase. The nuclear suspension is filtered through a 30- or 50-µm nylon mesh to remove large debris. The sample is incubated for 20 to 60 min at room temperature. For ploidy level analysis

the internal standard is prepared separately from the target sample, following the same steps and is analyzed before the other samples.

Flow cytometric analysis was performed on a FC 500 Cytometer (Beckman Coulter). Approximately 10000 events (20-50 events/sec) were acquired on flow cytometer and analyzed using CXP 2.2 software. The cytometer was calibrated with Flow Check fluorescent beads (Beckman Coulter) before the determinations.

RESULTS AND DISCUSSIONS

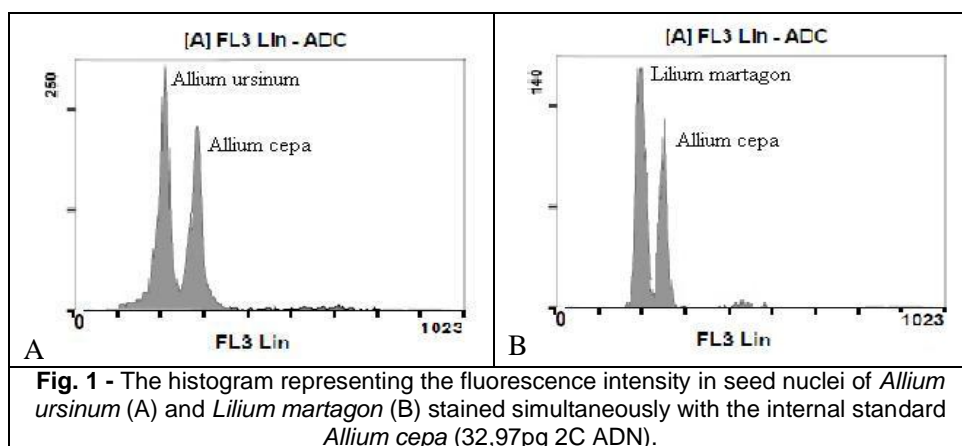
Quantification of DNA quantity specific to the investigated species

Estimation of DNA quantity for the target sample has been obtained following the formula:

$$\text{sample 2C DNA content (pg DNA)} = \frac{\text{sample G1 peak mean}}{\text{standard G1 peak mean}} \times \text{standard 2C DNA content}$$

Considering a 1:1 ratio of AT:GC base pairs and ignoring the presence of modified nucleotides, Dolezel et al. (2005) stated that 1 pg DNA = 0.978×10^9 bp. This formula was used to convert the amount of DNA expressed in picograms, in number of base pairs. We worked with three replicates per species in three different days to avoid cytometer fluctuations.

Two species with ornamental potential were investigated for the detection of specific DNA quantity: *Allium ursinum* and *Lilium martagon* (figure 1).



The amount of DNA 2C specific to each species was calculated based on the above mentioned formula. The determined genome size in *Allium ursinum* is 65,21pg 2C DNA, and for *Lilium martagon* – 91,56pg 2C DNA (table 1).

Table 1

Ploidy level and DNA quantity specific to the analyzed species

Species	Ploidy level	ADN 1C (pg) amount	ADN 1C (bp) amount	ADN 2C (pg) amount
<i>Allium ursinum</i>	2n = 14	32,6	$31,88 \times 10^9$ bp	65,21
<i>Lilium martagon</i>	2n = 24	45,78	$44,77 \times 10^9$ bp	91,56

Our data confirm the previous results obtained during other scientific studies.

Analyzing the specific content of DNA for nearly 300 species of angiosperms, Zonneveld and his team (2005), reported for *Lilium martagon* a DNA amount value of 93.2 pg (DNA - 2C). According to their studies, Baranyi and Greilhuber (1999), found a value of 60.34pg 2C DNA specific to *Allium ursinum*; Labani and Elkington (1987) – 71,39pg 2C ADN for the same species and Ohri et al. (1998) – 63, 57pg.

Analysis of the ploidy level specific to the investigated species

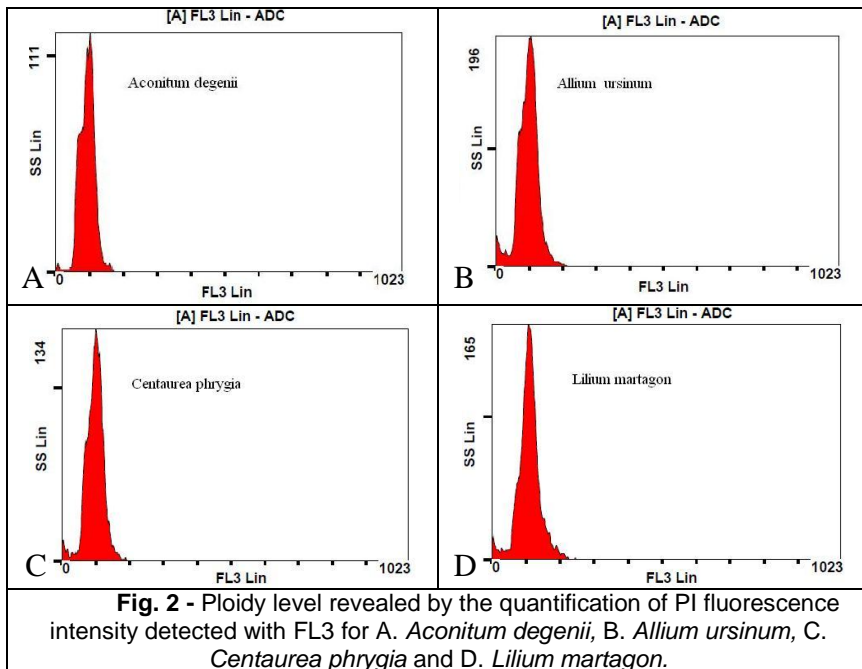
For ploidy estimation, the channel number of the sample G1 peak is determined and the ploidy of the sample is calculated according to the following equation:

$$\text{sample ploidy} = \frac{\text{external standard G1 peak mean}}{\text{sample G1 peak mean}} \times \text{external standard ploidy level}$$

If the linear scale is used and the G1 peak of the diploid external standard is set at channel 50, the G1 peak of a triploid should appear at channel 75, a tetraploid at 100, and so on.

For analysis of seed ploidy, two seeds were included in one sample. Detection of a single G0/G1 peak in the resulting histogram indicates that both seeds are of the same ploidy. If two G0/G1 peaks appear, the seeds differ in ploidy.

The ploidy level was determined for the following species: *Aconitum degenii*, *Allium ursinum*, *Centaurea phrygia* and *Lilium martagon*.



The histogram reveals that the analyzed samples belonging to *Aconitum degenii* species are diploid, the G1 peak appears at channel 50 (figure 2A).

This result is similar to the previous studies of Joachimiak and his collaborators 1999, who revealed the diploid status ($2n=16$) of this species. For the other investigated species, the presence of the diploid cytotypes was also certified by histograms with the same pattern as the one for *Aconitum degenii* (figure 2-B,C,D).

The diploid status of *Allium ursinum* was also mentioned by Ricroch et al., (2005), Ohri et al., (1998) and Baranyi and Greilhuber, (1999) in their previous studies.

As for *Centaurea phrygia*, its diploid status was showed in the research studies of Dydak (2009) and Koutecky (2007). Koutecky mentions the existence of two cytotypes of this species in the area of the Carpathian mountains. The tetraploid cytotype belongs to the Western Carpathians (Slovakia, Poland) and the diploid cytotype - found also in our study - belongs to the Eastern Carpathians (Romania).

The samples belonging to *Lilium martagon* analysed by us, are diploid. Our results are confirmed by Zonneveld et al., (2005) and Ambrozova et al. (2011) in their previous studies.

CONCLUSIONS

1. Using the technique of flow cytometry, the genomic size specific to *Allium ursinum* (65,21pg 2C DNA) and *Lilium martagon* (91,56 pg 2C DNA) species were determined. Our data certify the values obtained in previous studies.

2. The ploidy level specific to the species *Aconitum degenii*, *Allium ursinum*, *Centaurea phrygia* and *Lilium martagon* was determined. All the analyzed samples are diploid. Our results are confirmed by the studies of other different researchers from abroad.

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STUDIES REGARDING THE CYTOGENETIC CHARACTERIZATION OF TWO PERSPECTIVE LINES OF *ALLIUM URSINUM*

STUDII PRIVIND CARACTERIZAREA CITOGENETICĂ A DOUĂ LINII DE PERSPECTIVĂ DE *ALLIUM URSINUM*

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Abstract. *The size of chromosomes and their morphology are important indicators used to identify the evolutionary relationships of different species of plants. The scope of genetic studies is based on very broad areas of fundamental studies (taxonomy), reaching up to fields applied (eg plant breeding). Genetic characterization is important to identify the species or hybrid population analysis. Counting chromosomes and genetic determinations include determining karyotype, mitotic index, determination and analysis of mitotic abnormalities. According with the literature, chromosome aberrations have been used as a measure of reproductive success in plants for many years and have been correlated with morphological changes, fertility-sterility relationships, mutations etc. The study focused toward the cytogenetic characterisation of two perspective lines of Allium ursinum from Vegetable Research and Development Station Bacau field collection. The investigations were focused toward the determination of the main cellular indexes (mitotic index, prophase index, metaphase index, telophase index and anaphase index) as indicators of growth and development processes speed. Another objective of the present paper is screening of some aspects regarding the type and frequency of chromosomes aberrations that appeared at Allium ursinum plants. The main types of aberrations identified at these plants are: contraction, stickiness, fragmentation, inter-chromatin bridges, ring chromosomes, C-mitosis.*

Key words: chromosomes, mitotic, index, genetic, aberrations.

Rezumat. *Mărimea cromosomilor și morfologia lor sunt indicatori importanți utilizați în identificarea relațiilor evoluționare ale diferitelor specii de plante. Aria de aplicabilitate a studiilor de genetică este extrem de amplă plecând de la domeniul de studii fundamentale (taxonomie), ajungând până la domeniul aplicative (de exemplu ameliorarea plantelor). Caracterizarea genetică este importantă pentru identificarea speciei sau pentru analiza populațiilor hibride. Determinările genetice includ numărarea cromosomilor și stabilirea cariotipului, determinarea indexului mitotic și analiza anomaliilor mitotice. Conform literaturii de specialitate, aberațiile cromozomiale au fost utilizate ca o măsură a succesului de multiplicare a plantelor de mulți ani și aceste aberații fiind corelate cu schimbări în morfologia plantelor, în relația fertilitate-sterilitate, mutații etc. Prezentul studiu s-a concentrat pe caracterizarea citogenetică a două linii de perspectivă de Allium ursinum aflate în colecția în câmp de la Stațiunea de Cercetare Dezvoltare pentru Legumicultură Bacău. Investigațiile au vizat determinarea principalilor indici celulari (indicele mitotic, indicele profazic, metafazic, anafazic și telofazic), ca indicatori ai vitezei proceselor de creștere și dezvoltare. Un alt obiectiv subsidiar a fost realizarea unui screening privind*

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prezența și tipul aberațiilor cromosomiale din ana-telofaza mitozelor plantelor de Allium ursinum.

Cuvinte cheie: cromozomi, mitotic, index, genetic, aberații

INTRODUCTION

Cell cycle is a unidirectional process in which cells passes through different phases, without omission or returning to a previous one (Harbage, 2011). Once inside the cell cycle, the cell must undergo division. Proportionality of cell division in different genotypes intensity is kept constant during the different phases of plant development, so determining the mitotic activity in roots of 1-2 cm (2-3 days after germination), could help to reveal the peculiarities of cell division genotypes studied.

Genetic characterization is important to identify the species or to analyse a hybrid population. The genetic determinations include counting chromosomes, karyotype determination, mitotic index and analysis of mitotic abnormalities (Li, 1991).

With these studies it is possible to determine the following parameters (Hassell, 2004): determine the number, shape and size of chromosomes in mitosis and karyotype species composition; study the influence of physical and chemical mutagens on the karyotype; determining the ploidy of the plant; determining the degree of homology of the chromosomes in metaphase 1 of meiosis, as well as chromosomes disjunction in other phases at plants with different degrees of ploidy and interspecific hybrids; study of aneuploid organisms and the placement of genes on the chromosome; the intra and interspecific transfer of genes and chromosomes or chromosomal segments etc..

Cytogenetic studies in *Allium ursinum* species focused on the following specific objectives:

- establishing the mitotic index (represented by the percentage of mitotic cells (M) over the total number of cells, expressed as a percentage basis.
- in order to establish the main cell indices for each of these plants the percentage of cells in various stages of division: prophase, metaphase, anaphase and telophase were calculated.
- observations about the presence and type of chromosomal aberrations present in the cell, knowing that these aberrations in various stages of division are an indicator of the stability of studied genotypes.

MATERIAL AND METHOD

The biological material is represented by root tips from germinated seeds of two perspective lines of *Allium ursinum*, originated from the field collection from Vegetable Research and Development Station Bacau, Romania.

The cytogenetic studies were accomplished in meristematic root cells, stained in Carnoy fixing solution for 24 hours at 4⁰C then hydrolyzed with HCl for 7 minutes and colored with the basic coloring solution Carr. The root meristems were displayed using squash technique and for each genotype 4000 cells were counted.

Chromosome slides were then observed microscopically. Numbers of dividing cells at different levels of mitosis were recorded. Mitotic data were subjected to statistical analysis by calculating the mitotic index (% cells in division per total number of examined cells), prophase index (% cells in prophase per total number of examined cells), metaphasic index (% cells in metaphases per total number of examined cells), anaphasic index (% cells in anaphase per total number of examined cells) and telophasic index (% cells in telophase per total number of examined cells). In the same time we monitored the incidence of abnormalities in ana-telophasic stage.

RESULTS AND DISCUSSIONS

After the seeds germinated, the root tips of about 1-1.5 mm were used for chromosome studies. After excision, the tips were placed in Carnoy stain for at least 24 h, in refrigerator. After fixation, the roots were repeatedly washed with sterile distilled water, hydrolyzed in HCl and stained with Carnoy solution.

One of the objectives of the present study was the establishment of the main division indexes (mitotic index, prophase index, metaphasic index, anaphasic index, telophasic index) The results, calculated for each variant (variant 1 – plants from perspective breeding line I and variant 2 – plant from breeding line II) are shown in table 1, 2.

Table 1

The number of cells identified in different phases of mitotic cycle at *Allium ursinum* plants

Variant	Total no of cells analyzed	Interphase	No. of cells in active division	Repartition of cells in different division phases			
				P*	M*	A*	T*
Variant 1	4226	3602	624	239	163	114	108
Variant 2	4564	3813	751	259	204	180	108
Media	4395	3707	687	249	183	147	108

*P – prophase, M – metaphase, A – anaphase, T - telophase

Table 2

The values of the main indexes registered in the meristematic cells of *Allium ursinum* plants

Variant	IM	Repartition of cells percentage/phases of division			
		% P	% M	% A	% T
Variant 1	14,76	38,30	26,12	18,26	17,30
Variant 2	16,45	34,48	27,16	23,96	14,38
Media	15,6	36,39	26,64	21,11	15,84

As it is illustrated in the previous tables, the values obtained are similar, which denotes the fact the values of media calculated for each type of index are the correct one that represents the characteristic of the repartition of cell phases.

Regarding the repartition of cells per each phases of division the results obtained showed that most of the cells are in prophase (36,39%), followed by metaphase (26,64%), anaphase (21,11%) and telophase (15,84%) (fig. 1-5).

The value of the mitotic index was 15,6, which denotes that the plant was in a phase of active growth.

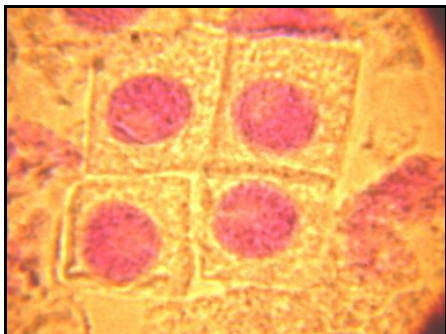


Fig. 1 – Cells in interphase



Fig. 2 – Cells in prophase

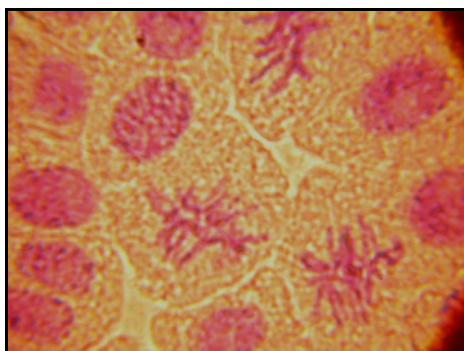


Fig. 3 – Cells in methaphase

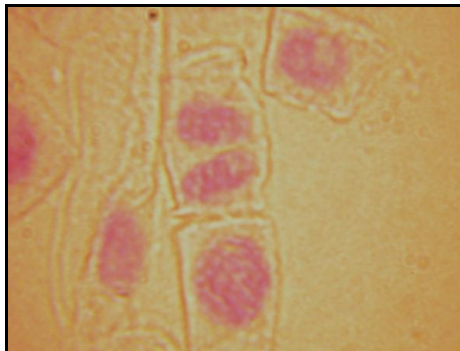


Fig. 4 – Cells in anaphase

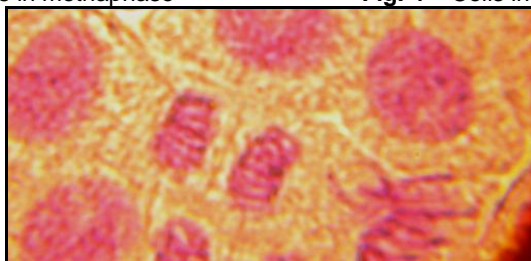


Fig. 5 – Cells in late telophase

A subsidiary objective of our study was the determination of the main types of abnormalities observed in the root cells of *Allium ursinum*. The results are presented in table 3 and graphically represented in figure 6.

Table 3

The frequency of cells with chromosomal aberrations and their spectrum identified in the ana-telophase of *Allium ursinum* plants

Variant	Total A-T studied	A-T aberrance %	$\bar{x} \pm s$	from which	
				A-T with bridges%	A-T with fragments%
Variant 1	287	24	8,36	58,7	40,2
Variant 2	460	42	9,13	60,2	39,8

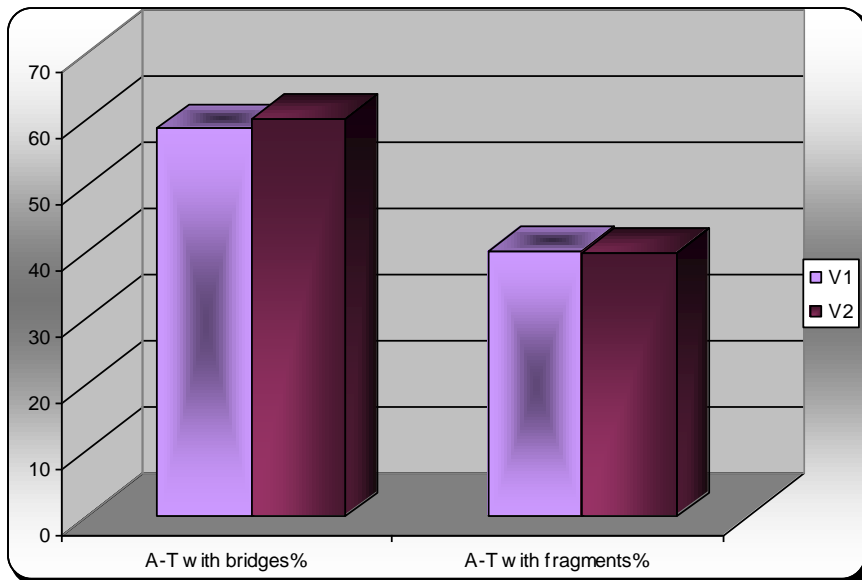


Fig. 6 – Graphical representation of frequency of cells with chromosomal aberrations at *Allium ursinum* lines

The chromosomal aberrations observed can be classified as: aberrations that affect the chromosome, aberrations that affect the chromatid, mixed or others. Thus, among chromatid-type aberrations we underline the following ones: single fragments, two or more fragments of unequal size; single bridges, two or more bridges with or without fragments of unequal size. Chromosome-type aberrations comprised of one or more double fragments; one or more double bridges with or without double fragments. Where both chromatid and chromosome-type aberrations were observed within a cell, the aberration was classified as mixed.

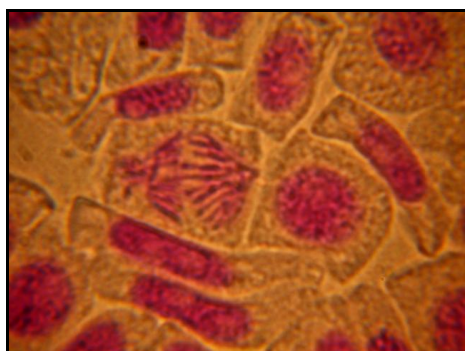


Fig. 7 – A-T with multiple bridges



Fig. 8 – Disorganised ana-telophase

A small category, other damage including lagging chromosomes with or without any of the other groups was also observed.

CONCLUSIONS

1. The value of the mitotic index was 15,6 which denotes that the plant was in a phase of active growth.

2. The results related with the repartition of cells per each phases of division showed that most of the cells are in prophase (36,39%), followed by metaphase (26,64%), anaphase (21,11%) and telophase (15,84%).

3. The chromosomal aberration observed in the ana-telophases of cells was mainly ana-telophases with simple or multiple bridges and ana-telophases with fragments, but also expelled or late chromosomes and multipolar ana-telophases. All the aberration observed could be classified as: aberrations that affect the chromosome, aberrations that affect the chromatid, mixed or others. But we also observed metaphases with lagging chromosomes, expelled chromosomes or ring chromosomes, multipolar ana-telophases, as well as binucleate cells and interphases with micro-nucleuses.

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STIMULATION OF STILBENE POLYPHENOL BIOSYNTHESIS, UNDER *IN VIVO* CONTROLLED CONDITIONS, IN SOME GRAPE VARIETIES FOR RED AND WHITE QUALITY WINE

STIMULAREA BIOSINTEZEI POLIFENOLILOR STILBENICI ÎN CONDIȚII CONTROLATE *IN VIVO* LA UNELE SOIURI DE STRUGURI PENTRU VINURI ROȘII ȘI ALBE DE CALITATE

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Abstract. *It is known that, in response to stress (physical or chemical elicitors, a parasitic infection), the vine can synthesize natural molecules, generally called phytoalexins, enabling it to adapt to this stress. Stilbene polyphenols are the major constituents of these molecules, with the resveratrol (trans-3, 5, 4-trihydroxystilbene), as the major one. Among the chemical agents able to induce the synthesis of resveratrol in the grape-vine plants they come in contact with, the aluminium chloride is the most effective. The undertaken study aimed to determine the active usable doses of AlCl₃, able to stimulate the biosynthesis of polyphenols and implicitly of resveratrol in the vine plants, under in vivo controlled conditions. Several Vitis vinifera L. genotypes for obtaining red and white quality wines were selected for this purpose. Four different experiments, with different doses of AlCl₃ aqueous solution, were initiated in order to determine the optimal concentration of aluminium chloride solution, which would lead to the accumulation of large amounts of resveratrol in the vine plants.*

Key words: resveratrol, elicitors, (grape-) vine

Rezumat. *Se cunoaște faptul că, vița de vie poate sintetiza, ca răspuns la un stres (agenți elicitori fizici sau chimici, o infecție parazitară) molecule naturale, denumite generic fitoalexine, care îi permit să se adapteze acestui stres. Polifenolii stilbenici reprezintă constituenți importanți ai acestor molecule, resveratrolul (trans-3,5,4-trihidroxistilben), fiind reprezentantul principal. Printre agenții chimici capabili să inducă sinteza resveratrolului în plantele de viță-de-vie cu care vin în contact, clorura de aluminiu este cea mai eficientă. Studiul efectuat a avut scopul de a determina dozele active utilizabile de AlCl₃, capabile să stimuleze biosinteza polifenolilor și, implicit a resveratrolului, în plantele de viță-de-vie, în condiții controlate in vivo. În acest scop au fost selectate câteva genotipuri Vitis vinifera L. destinate obținerii de vinuri roșii și albe de calitate. În vederea stabilirii concentrației optime de soluție de clorură de aluminiu, care să conducă la acumularea unor cantități importante de resveratrol în plantele de viță de vie, s-au inițiat patru variante experimentale, utilizându-se doze diferite de soluție apoasă de AlCl₃.*

Cuvinte cheie: resveratrol, agenți elicitori, viță-de-vie.

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INTRODUCTION

Like the other plants, in response to a biotic or an abiotic stress, the vines can synthesize natural molecules, generally called phytoalexins, enabling them to adapt to that stress. The phytoalexins are antibiotics formed in the vine tissues, as a result of the interaction of the two metabolic systems. The initiation signal for the phytoalexins synthesis is given by the "elicitors". They can be biotic (organic molecules present in parasites, peptides, glycoproteins) or abiotic (some metals, detergents, UV radiation, heat, cold). Stilbene analytical interest was primarily due to their role as natural fungicides. Recent studies show that the trans-resveratrol in physiological concentrations is an effective fungus toxic against *Botrytis cinerea* (Adrian M. et al., 1997, Jeandet P. et al., 1995). Moreover, they show that stilbene polyphenols such as resveratrol pterostilbene and ϵ -viniferine are involved in the vine resistance mechanism against other pathogens too, such as *Plasmopara viticola* (Dai et al., 1995) and *Phomopsis viticola* (Hoos and Blaich, 1990). In this context, it is of interest to stimulate the vine defence mechanisms against the phytopathogenic agents like fungus (*Plasmopara viticola* and *Oidium necator*), by inducing the stilbene polyphenol synthesis of in the grapevine leaves.

In addition, it is also currently highlighted the role of viticultural phytoalexins in the human metabolism (Hain et al., 1993, Jeandet et al., 2002) with stress on the importance of phytoalexins in the phenolic compounds group, whose major representative in the human health is the resveratrol.

The objective of this study is to stimulate the stilbene polyphenols biosynthesis (resveratrol, in particular) in the leaf by elicitors (AlCl_3), when the vine is cultivated under *in vivo* controlled conditions, without letting the aluminium salt have a harmful effect on the vine plants.

MATERIAL AND METHOD

The experiment was conducted in controlled growing conditions (greenhouse), taking into account the fact that this model behaves as the vine plant in the vineyard. Varieties of vines, intended for the red and white wines, were tested during this study, to quantify the amounts of total polyphenols and resveratrol produced by the plant after treatments with different concentrations of aluminium chloride. Schematically, the experimental factors were:

1. *The concentration of AlCl_3 solution with the graduations:*

V_1 – control plant; V_2 - 1% AlCl_3 ; V_3 - 2% AlCl_3 ; V_4 - 4% AlCl_3

2. *The variety:*

Varieties for red wines: B_1 - Burgundy, B_2 – Busuioaca de Bohotin, B_3 - Cabernet Sauvignon, B_4 - Cabernet Franc, B_5 - Feteasca neagra, B_6 - Pinot noir, B_7 - Merlot, B_8 – Negru aromat;

Varieties for white wines: S_1 - Neuburger, S_2 - Tamaioasa romaneasca, S_3 – Chardonnay.

Plants propagated through one stem cell cuttings were used. The cuttings were invigorated in pots with an improved nutrient substrate (fertilized soil -30%, -30% forest land, 30% peat soil, sand or perlite 10%), according to the vine propagation technology. When plants developed (10-12 leaves), treatments with different concentrations of AlCl_3 aqueous solution, were applied by fine spraying. Three

treatments were performed at an interval of one week; the samples, consisting of leaves collected from the same level of the shoots, were taken after the last treatment with AlCl_3 . They were rinsed with demineralised water and dried in an oven (90°C) for the biochemical analysis. The biosynthesis of the phenolic compounds from the plant material in the intermediate metabolism was quantified by determining the content of the total polyphenols and resveratrol in the experimental variants.

The working protocol on the quantity analysis of the total polyphenols and resveratrol produced in the leaves involved several steps: extraction of polyphenols from the plant material and purification of the obtained extract and the TPP analysis by UV/Visible spectrophotometer. The resveratrol HPLC dosage was performed with a Merck-Lachrom UV detector-chromatograph for liquids under pressure.

RESULTS AND DISCUSSIONS

The performed analyses aimed to see the amounts of total polyphenols and resveratrol biosynthesised in the plant as a result of the treatment with AlCl_3 , used as an elicitor. Since the differences compared to the control sample were not significant in the variants V_2 (1% AlCl_3) and V_3 (2% AlCl_3), the results in V_4 (4% AlCl_3) were interpreted in comparison with the untreated control sample plant. We also point out that no anticryptogamic treatments were applied to the vine cuttings, kept under controlled conditions, during the experiment, even if there were favourable conditions for fungal infection. In this way, the tolerance of the experimental varieties was also tested against the phytopathogenic fungi attack of *Plasmopara viticola* and *Uncinula Necator*. It is noted that the grape-vine plants of the tested varieties had no infections throughout the experiment and up to the leaf fall, and the beginning of their rest period, as seen in Figures 1 and 2, made when sampling leaves for the biochemical analysis were taken.



Fig. 1-2 - Vine cuttings to which the trans-resveratrol biosynthesis was induced by applying different concentrations of AlCl_3 aqueous solution treatments

The histogram shown in figure 3 shows the variation of the total polyphenols in the tested group of the red grape varieties. The TPP content is between 2.27 - 10.9% s.u. in the control plants, the varieties of Negru aromat, Feteasca neagra and Merlot standing out by a high content of polyphenols. The foliar treatments to the elicitor (AlCl_3 solution in different concentrations) increased the polyphenols content in all the tested varieties, significant increases occurring in the variants V_3 (2% AlCl_3) and, especially V_4 (4% AlCl_3) in the varieties of Negru aromat (12.8%), Merlot (10.85%) and Pinot noir (9.96%).

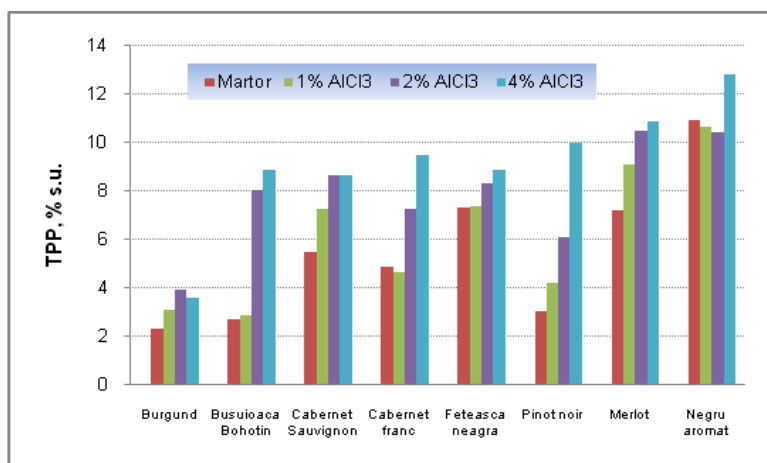


Fig. 3 – Histogram representing the leaf total polyphenols content to the red varieties with AICl₃ as elicitor compared with the control plant

Resveratrol (trans-3, 5, 4'-trihydroxystilben) is a low molecular weight compound, a constituent of phytoalexins, belonging to the family of stilbenes polyphenols. As it is known, the stilbenes play an important role in grape-vine protection against fungal infections.

As with polyphenols, the amount of resveratrol produced by the plant as a result of the action of the elicitor, increases according to the vine variety. The histogram in figure 4 shows the trans-resveratrol content of the red varieties with 4% AICl₃ as elicitor, compared with the untreated control plant. The Negru aromat variety has had a nearly four-time increase of resveratrol, and the Pinot noir variety has tripled its content of this compound after the treatment with aluminium chloride. A significant increase, similar to the Negru variation in polyphenols, was also recorded for the Cabernet and Feteasca neagra varieties.

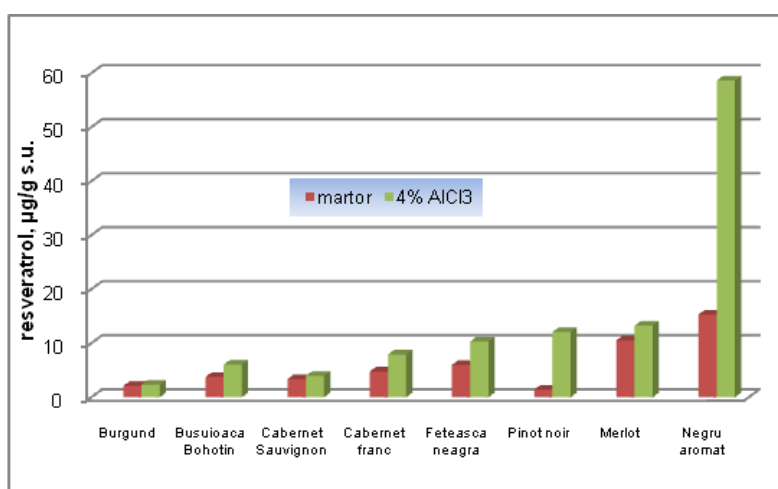


Fig. 4 – The trans-resveratrol leaf accumulation in the V₄ variant (4% AICl₃) in red grape tested varieties

It may be pointed out that in the group of red grape varieties with elicitors, significant amounts of resveratrol produced in the secondary metabolism under the action of aluminium chloride were found only in five genotypes. They are: Negru aromat, Pinot noir, Feteasca neagra, Cabernet franc and Merlot.

Although the synthesis of resveratrol, as a result of the action of stress has been reported especially for the red grape varieties, the white grape varieties are also capable of producing varying amounts of resveratrol following the use of an elicitor (AlCl_3 , in this case).

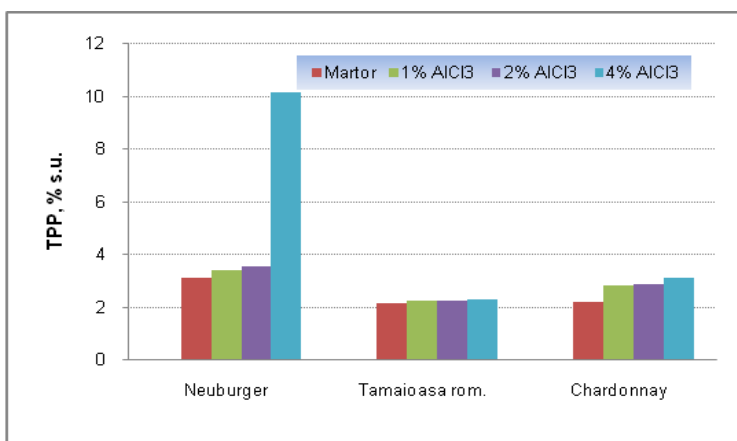


Fig. 5 – Histogram representing the total polyphenols leaf content to the white grape varieties with AlCl_3 as elicitor compared with the control plant

The histogram in figure 5 shows the variation of total polyphenols in the tested group of the white grape varieties. The TPP content is between 2.14% (Tamaioasa romaneasca variety), and 3.14% (Neuburger variety). The treatments with AlCl_3 solution had a noticeable effect on the biosynthesis of polyphenols only for the Neuburger variety (V_4 - 10.18% total polyphenols). The accumulations of these compounds to the other white grape varieties were quite low.

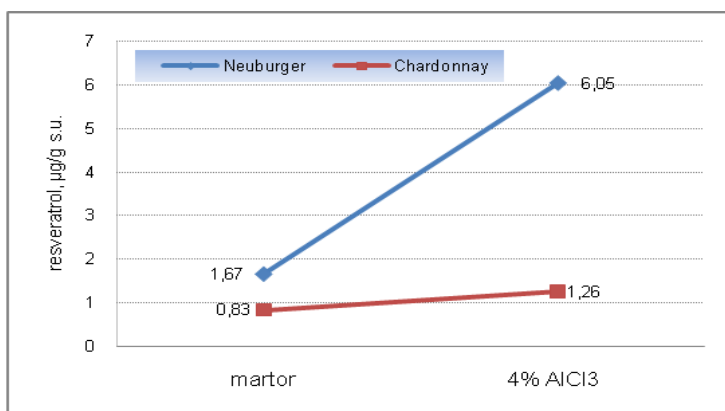


Fig. 6 –The trans-resveratrol leaf accumulation in the V_4 variant (4% AlCl_3) for two white grape varieties

Among the tested control plants, the Chardonnay variety has the lowest content of trans-resveratrol. The control plant for the Neuburger variety had content of $1.67 \mu\text{g}\cdot\text{g}^{-1}$ s.u. and after treatments with the AlCl_3 solution in concentration of 4%, the resveratrol content tripled, reaching a value of $6.05 \mu\text{g}\cdot\text{g}^{-1}$ s.u. Under the same conditions, in the Chardonnay variety (and the other white grape varieties under the experiment) the resveratrol biosynthesis was lower (figure 6).

CONCLUSIONS

1. The foliar use of 4% solution of AlCl_3 to the vine plants intended for the *in vivo* production of the red wines, lead to the generation of large quantities of polyphenols, their levels being higher in the plants with elicitors compared to the control plants;

2. The biosynthesis of resveratrol under the action of an elicitor agent (4% AlCl_3) occurred with greater intensity in the Negru aromat variety, the quantity of trans-resveratrol synthesised in the leaves reaching a value of $58.64 \mu\text{g}\cdot\text{g}^{-1}$ s.u.;

3. Among the varieties designed to provide high quality red wines, the following varieties have shown a greater capacity to synthesize trans-resveratrol, under the action of 4% AlCl_3 solution: Negru aromat, Pinot noir, Feteasca neagra, Cabernet franc and Merlot.

4. The 4% AlCl_3 treatments in greenhouse conditions, led to the tripling of the total polyphenols concentration in the leaves of the Neuburger variety;

5. Under *in vivo* culture conditions, the ability of the white grape tested varieties to produce resveratrol is lower compared with the red grape varieties, the Neuburger variety proving to be the most capable in this respect.

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STUDIES CONCERNING THE INFLUENCE OF SOME MINERAL COMPOUNDS ON THE DYNAMICS OF SOME OXIDOREDUCTASES ACTIVITY AT *MONILINIA LAXA* (ADERH.& RUHL.) HONEY PARASITE ON PLUM TREES

STUDII PRIVIND INFLUENȚA UNOR COMPUȘI MINERALI ASUPRA DINAMICII UNOR OXIDOREDUCTAZE LA *MONILINIA LAXA* (ADERH.& RUHL.) HONEY PARAZITĂ PE PRUN

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Abstract. *This study, orientated in two directions, aimed, on one hand, to evaluate the Monilinia laxa (Aderh.&Ruhl.)Honey fungus response to oxidative stress generated by the action of inorganic compounds, knowing the concept that enzymes are involved in pathogenically manifestation induced by biotic agents in microorganisms and, on the other hand, the estimation of antifungal effect „in vitro” of the mineral compounds. We used H₃BO₃, CuSO₄ x 5H₂O, MnCl₂ x 4H₂O, Na₂MoO₄ x 2H₂O, FeCl₃ x 6H₂O, ZnSO₄ x 7H₂O and a mixture of them and also, a control sample. The experimental determinations were made at two time intervals and the results showed the clear fungistatic effect of copper and zinc salts, and of the mix of mineral substances, but also the significant differences in the activity of catalase and peroxidase*

Key words: *Monilinia laxa*, mineral compounds, catalase, peroxidase

Rezumat. *Studiul de față, orientat în două direcții, a urmărit pe de o parte evaluarea răspunsului fungului Monilinia laxa (Aderh.&Ruhl.)Honey la stresul oxidativ generat de acțiunea compușilor anorganici, ținând cont de conceptul conform căruia enzimele sunt implicate în manifestările patogenice induse de către agenții biotici în microorganismele, iar pe de altă parte, estimarea efectului fungistatic „in vitro” asupra patogenului a compușilor minerali. S-au folosit în acest sens, H₃BO₃, CuSO₄ x H₂O, MnCl₂ x 4H₂O, Na₂MoO₄ x 2H₂O, FeCl₃ x 6H₂O, ZnSO₄ x 7H₂O, o mixtură a acestor compuși precum și o variantă martor. Determinările experimentale s-au desfășurat la două intervale de timp, iar rezultatele au demonstrat efectul net fungistatic al sărurilor de cupru, de zinc și al amestecului de substanțe minerale, dar și diferențe semnificative în activitatea catalazei și a peroxidazei.*

Cuvinte cheie: *Monilinia laxa*, compuși minerali, catalaza, peroxidaza

INTRODUCTION

Brown rot caused by *Monilinia laxa* (Aderh.&Ruhl.) Honey is considered one of the most important diseases which affects the species of the *Prunus* genus, being able to generate significant damage by destroying flowers and fruit, and finally, the entire tree (Ogawa J.M., English H., 1991; Four P.H., Holz G., 2003; Holb I., 2008; Michailides T.J. *et al*, 2011). Known as an effective resource, nontoxic and affordable to control diseases caused by fungi, inorganic salts are widely accepted today as an alternative method for

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their control techniques. The main effects are fungistatic and/or fungicides, but, while pure water sometimes inhibit spore germination, such as *Monilinia fructicola*'s spores (Kirk P.M. *et al.*, 2008), very low concentrations of some fungicides, even if they are of mineral nature can stimulate germination of spores or even maintain on the other hand, the mycelium growth. Moreover, the data from literature shows that certain nutritional fungal communities react differently to the presence of toxic metals in the environment - some groups (e.g. micorises) decreased for other groups of fungi when the environment is contaminated with metals (Kelly J.J. *et al.*, 1999). The fungi can also be highly efficient bio-accumulators of the soluble and particulate forms of metals (Baldrian P., 2003; Gadd G.M., 2010). The behaviour of the fungi towards the mineral compounds and implicitly, towards the metals is dictated by abiotic environmental factors - pH of the medium but also by genetic background and phenotypic expression of the fungus – for example, the cell wall, with is content of melanin (Gadd G.M., 2006). Some researches considers that the anionic composition of the environment influences the toxicity of heavy metals (eg. zinc). Some studies have shown interaction between Zn^{2+} and other divalent cations (e.g. Cd^{2+} , Mg^{2+} , Cu^{2+}) and their combined effects on fungi (Laborey F., Lavollay J., 1973).

This study, conducted in two directions aims, on the one hand, to evaluate the response to oxidative stress of the fungus *Monilinia laxa* (Aderh.&Ruhl.) Honey, stress caused by direct action of „in vitro” inorganic compounds hypothesis sustained by the concept that some enzymes are involved in pathogenic events induced by the biotic agents in microorganisms and, on the other hand, to estimate the fungistatic and /or fungicide „in vitro” effect of the mineral compounds as are H_3BO_3 , $CuSO_4 \times 5H_2O$, $MnCl_2 \times 4H_2O$, $Na_2MoO_4 \times 2H_2O$, $FeCl_3 \times 6H_2O$, $ZnSO_4 \times 7H_2O$ or their cumulative effect on the fungus.

MATERIAL AND METHOD

The isolates of the *Monilinia laxa* (Aderh.&Ruhl) Honey was collected from mummified fruit of *Prunus domestica* harvested from the Research and Development Station for Fruit Tree Growing Iasi, Miroslava farm, and pure cultures were selected after qualitative screening in the Laboratory of Microbiology Research Institute of Biological Sciences. The fungus was cultivated „in vitro” on malt medium acidified with 2% streptomycin (Malvárez G. *et al.*, 2001) in Erlenmeyer flasks containing 100 ml of medium. In order to study the effects that in exces metals ions have on the activity of oxidoreductases, we used seven medium variants added after Constantinescu's formula (Constantinescu, 1974). The mineral salts that increased the concentrations were H_3BO_3 – 0,01%, $CuSO_4 \times 5H_2O$ – 0,1% , $MnCl_2 \times 4H_2O$ – 0,02%, $Na_2MoO_4 \times 2H_2O$ – 0,02%, $FeCl_3 \times 6H_2O$ – 0,02%, $ZnSO_4 \times 7H_2O$ – 0,2%. Each was added separately, one in the culture medium and in one variant, all compounds were added together. We used in parallel a control variant whose culture medium was not supplemented with any of these mineral compounds. This eight medium were seeded with slices of 8 mm in diameter from a *Monilinia laxa* culture at the age of 7 days and cultivated under similar conditions for “in vivo” development: light/dark photoperiod and variable temperature. The practical study consisting of three consecutive experimental measurements was conducted in two intervals, at 7 days and respectively 14 days after inoculation of the culture and the catalase and peroxidase activity was determined both from the fungus mycelium and from the culture liquid. The catalase activity was assayed by iodometric method whose principle

is based on the determination of hydrogen peroxide that remained un-decomposed after stopping the enzyme activity with sodium thiosulfate, in the presence of starch as an indicator and for the determination of the peroxidase activity the o-dianisidine method was used (Cojocar, 2009).

RESULTS AND DISCUSSIONS

A first objective of this study was the determination of catalase activity in both the mycelium and the culture liquid of the fungus *Monilinia laxa* (Aderh. &Ruhl.) Honey parasite on plum. In the initial analysis, we can see that this oxidoreductase activity varies depending on the age of the fungus and the type of mineral compound that was used to supplement the culture medium.

As shown in figure 1, the activity of catalase in the mycelium of the fungus at 7 days after inoculation for the control variant present value of 3.7143 CU/g/min. Because $\text{CuSO}_4 \times 5\text{H}_2\text{O}$, $\text{ZnSO}_4 \times 7\text{H}_2\text{O}$ and respectively, the mixture of mineral compounds inhibited completely the growth of the fungus mycelium, the value of the catalase activity in these variants was noted 0. All medium variants showed, reported to the control variant, lower values of the endoenzyme, except $\text{FeCl}_3 \times 6\text{H}_2\text{O}$ version, which activity peaked at 4.6304 CU/g/min., followed by the variants $\text{MnCl}_2 \times 4\text{H}_2\text{O}$ - 1.0054 CU/g/min., H_3BO_3 - 0.5777CU/g/min., respectively $\text{Na}_2\text{MoO}_4 \times 2\text{H}_2\text{O}$ - 0.2720 CU/g/min.

After 14 days of incubation, the catalase activity in the fungus mycelium has reached 5.0038 CU/g/min in the control variant and, for the remaining samples the intracellular enzyme activity is inhibited. Lowest catalase activity was present for variant V4 - 1.4026 CU/g/min., followed by variant V1 - 1.7739 CU/g/min., variant V3 - 1.0054 CU/g/min and for variant V5 - 2.2019 CU/g/min.

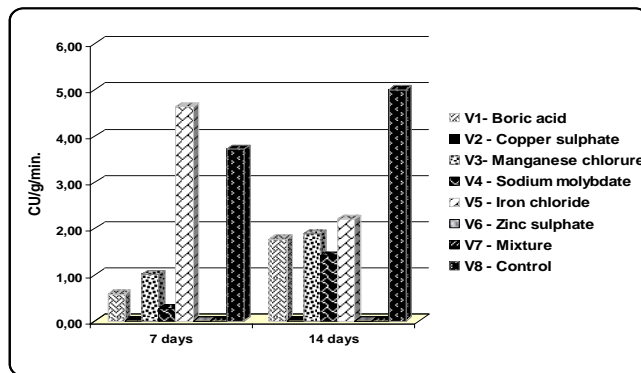


Fig. 1 - The catalase activity in the mycelium of *Monilinia laxa* (Aderh.&Ruhl.) Honey specie's cultivated on the medium supplemented with various mineral compounds

A critical analysis on the dynamics of the enzyme activity shows an increase of the catalase activity with the aging of the culture medium to all variants, except variant $\text{FeCl}_3 \times 6\text{H}_2\text{O}$, in which the enzyme activity decreased very slightly (from 4.6304 CU/g/min. at 2.2019CU /g/min).

The experimental data regarding the influence exercised by the boric acid and mineral salts used in this study on the extracellular catalase activity are plotted in

figure 2, and, in their analysis it could be found that all the samples studied had inferior levels of the exoenzyme activity of the control variant, which registered a value of 1.3260 CU/ml /min. Compared with that, more diminished activity was recorded for variant containing $\text{FeCl}_3 \times 6\text{H}_2\text{O}$ - 1.1560 CU/ml/min., while $\text{Na}_2\text{MoO}_4 \times 4\text{H}_2\text{O}$ and $\text{MnCl}_2 \times 2\text{H}_2\text{O}$ recorded almost identical values - 0.8250 CU/ml/min. respectively, 0.8500 CU/ml/min. Minimum point of the activity of this biochemical parameter was noted in the medium variant containing H_3BO_3 - 0.6120 CU/ml/min. and to the working variants V2, V6 and V7, the enzyme activity was null.

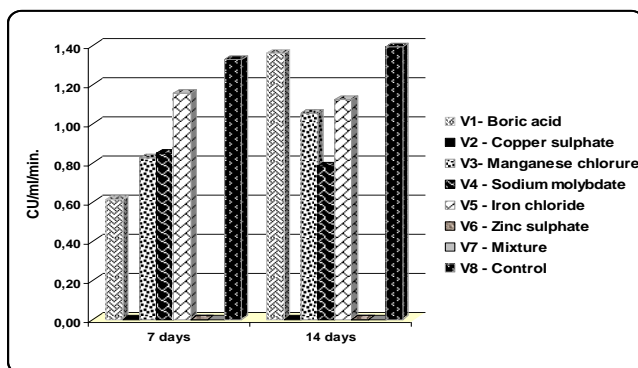


Fig. 2 - Catalase activity in the liquid culture of the *Monilinia laxa* (Aderh.&Ruhl.) Honey specie's cultivated on the medium supplemented with various mineral compounds

The aging of the culture entailed a moderate increase in the catalase activity in liquid culture medium at all options. The control recorded the value of extracellular catalase 1.3940 CU/ml/ min. and the minimal activity was found in the medium variant containing $\text{Na}_2\text{MoO}_4 \times 2\text{H}_2\text{O}$ - 0.7820 CU/ ml/min. this time Boron had the most intense effect (although less than that of the control sample) - 1.3600 CU/ml/min. followed in descending order of variant with $\text{FeCl}_3 \times 6\text{H}_2\text{O}$ - 1.1220 CU/ml/min. and variant with $\text{MnCl}_2 \times 4\text{H}_2\text{O}$ - 1.0540 CU/ml/min. Detailed examination of the dynamics of catalase activity in the liquid culture revealed that all medium variants have been stimulated by this enzyme, less variant V5, which decreased from 1.1560 CU/ml/min. to 1.1220 CU/ml/min. and V4, which decreased from 0.8500 CU/ml/min to 0.7820 CU/ml/min., all medium variants having lower values than the control sample.

Another objective of this study was the determination of the peroxidase activity in the mycelium of the fungus *Monilinia laxa* (Aderh.&Ruhl.) Honey at 7 days after seeding, the values obtained being systematized in figure 3. A first observation indicates that both minerals used in the experiment and boric acid also showed inhibitory effect, the strongest being recorded at medium variant containing $\text{FeCl}_3 \times 6\text{H}_2\text{O}$ - 0.0893 PU/g/min., versus control sample, an activity that has been of 0.4119 PU/g/min. V4 variant showed a value of 0.2768 PU/g/min. while the version with boric acid had the most intense activity of all mineral compounds (0.3418 PU/g /min.). At 14 days after seeding inoculation, the culture with mycelium peroxidase activity has registered in the control version values of 0.43907 PU/g/min., the minimum point of the endoenzyme activity at this time being found in the medium

variant containing $\text{FeCl}_3 \times 6\text{H}_2\text{O}$ (0.0616 PU/g/min.). Intermediate values were recorded as follow: $\text{MnCl}_2 \times 4\text{H}_2\text{O}$ - 0.3178 PU/g/min., H_3BO_3 - 0.2703 PU/g/min., $\text{Na}_2\text{MoO}_4 \times 2\text{H}_2\text{O}$ - 0.2528 PU/g/min.

Extracellular peroxidase (fig. 4) reached in the control variant at 7 days after inoculation of the culture, the value of 0.2229PU/ml/min.

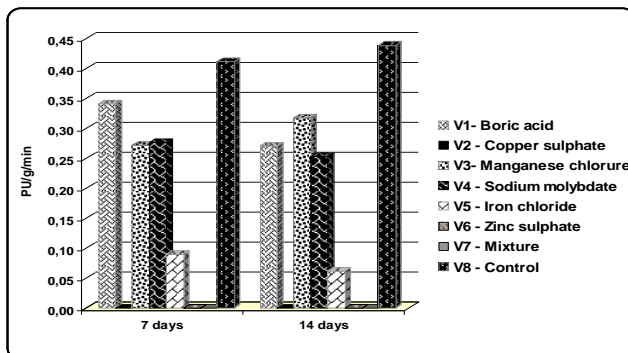


Fig. 3 - Peroxidase activity in the *Monilinia laxa* (Aderh.&Ruhl.) Honey specie's mycelium cultivated on the medium supplemented with various mineral compounds

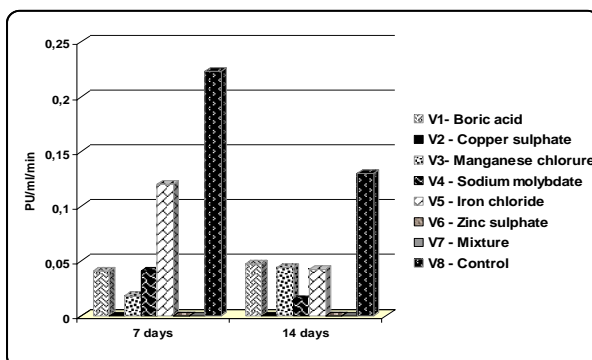


Fig. 4 - Peroxidase activity in liquid culture of the *Monilinia laxa* (Aderh.&Ruhl.) Honey specie's cultivated on the medium supplemented with various mineral compounds

Boric acid induced a peroxidase activity outside of the mycelium, from 0.0406 PU/ml/min. having like the rest of mineral salts, an inhibitory action on the exoenzyme. Minimum point was highlighted in the medium variant containing $\text{MnCl}_2 \times 4\text{H}_2\text{O}$ (0.0182 PU/ml/min) and the variant with $\text{Na}_2\text{MoO}_4 \times 2\text{H}_2\text{O}$ peroxidase activity was given an identical amount of boric acid (0.0406 PU/ml/min). In liquid culture, the peroxidase activity was relatively uniform, after 14 days of incubation in the medium used in all variants, except variant V4 ($\text{Na}_2\text{MoO}_4 \times 2\text{H}_2\text{O}$) who detected the minimum value (0.01458 PU/ml/min), the control having the highest threshold of enzyme activity in the liquid culture (0.1302 PU/ml/min). The results confirm data from literature according to which $\text{CuSO}_4 \times 5\text{H}_2\text{O}$ is fungicide (Krieger 2001; Nasim G., 2008) as $\text{ZnSO}_4 \times 7\text{H}_2\text{O}$ (Matolcsy D.G. et al, 1988), its effect being, however, lower to copper, confirmed by the Horsfall order of metal toxicity: $\text{Ag} > \text{Hg} > \text{As} > \text{Cd} > \text{Ni} > \text{Pb} > \text{Co} > \text{Zn} > \text{Fe} > \text{Ca}$.

CONCLUSIONS

The analysis of experimental results regarding the influence of the mineral compounds on the dynamics of some oxidoreductases activity in *Monilinia laxa* (Aderh.&Ruhl.) Honey parasite on plum has allowed us to draw the following general conclusions:

1. In all medium variants, both in fungus mycelium and in liquid culture, catalase and peroxidase were inhibited to a greater or lesser measure by the use of mineral compounds, finding values for the lower activity exhibited by the control.

2. $\text{CuSO}_4 \times 5\text{H}_2\text{O}$, $\text{ZnSO}_4 \times 7\text{H}_2\text{O}$ and the mixture of mineral compounds had an clear antifungal effect on the *Monilinia laxa* (Aderh.&Ruhl.) Honey fungus.

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PHENYLALANINE AMMONIA-LYASE IN NORMAL AND BIOTIC STRESS CONDITIONS

ACTIVITATEA FENILALANIN AMONIA-LIAZEI ÎN CONDIȚII DE NORMALE ȘI DE STRES BIOTIC

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Abstract. Phenylalanine ammonia-lyase (PAL) is a key enzyme that converts L-phenylalanine to trans-cinnamic acid, a precursor of various metabolites produced in response to environmental stress, including biotic factors. Artificial infection of different sunflower genotypes with *Orobanche cumana* Wallr. collected from the South part of Republic of Moldova showed significant modification on PAL activity. *O. cumana* induced a significant increase of PAL activity in the root system at all sunflower genotypes resistant and tolerant to the broomrape (race E), from 20 - 30 days until the final investigated ontogenetic phase (60 days), which confirms the role of PAL in the expression of biochemical mechanisms of host-plant resistance to broomrape attack.

Key words: sunflower, broomrape, phenylalanine ammonia-lyase, biotic stress

Rezumat. Fenilalanin amonia-liaza (PAL) reprezintă o enzimă cheie care transformă L-fenilalanina în acid trans-cinamic, precursor al diferitor metaboliți produși ca răspuns la stresul de mediu, inclusiv la factorii biotici. Infectarea artificială a diferitor genotipuri de floarea-soarelui cu *Orobanche cumana* Wallr. colectată din partea de sud a Republicii Moldova a demonstrat inducerea unor modificări semnificative ale activității PAL. Astfel, *O. cumana* induce majorarea activității PAL în sistemul radicular la toate genotipurilor de floarea-soarelui rezistente și tolerante la rasa E de lupoaie, începând cu 20 - 30 zile până la ultima fază ontogenetică cercetată (60 zile), ceea ce confirmă rolul PAL în manifestarea mecanismelor biochimice de rezistență a plantei-gazdă la atacul lupoaiei.

Cuvinte cheie: floarea-soarelui, lupoaia, fenilalanin amonia-liaza, stres biotic

INTRODUCTION

Plants have potential to mobilize biochemical response mechanisms against pathogenic attack including lignification (Köhle H. et al., 1985), suberization (Espelie K. E. et al., 1986), synthesis of phytoalexins (Kuc J., Ruch J. S., 1985), induction of hydrolytic enzymes (Broetto F., 1995) and activation of the antioxidative response system (Broetto F. et al., 2002). The regulation of enzymes involved in the biosynthesis of metabolites produced in response to environmental stress has been studied in cell cultures of different plant species (Messner B. et al., 1991). Schell & Parker (1990) suggested that the activation to the phenylpropanoid

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metabolism can be easily detected by the variation in the activity of phenylalanine ammonia-lyase (PAL, E.C.4.3.1.5.).

PAL is a key enzyme that converts L-phenylalanine to trans-cinnamic acid, a precursor of various phenylpropanoids, such as lignins, coumarins and flavonoids (Birgid Schuster and Janos Rjetey, 1995 Phenylpropanoids play key roles in plant development and in protection against environmental stresses.

The downstream products of PAL activity in plants have been reported to influence the host response to pathogen invasion (Felton G. W. et al., 1999; Beno-Moualem and Prusky D., 2000), wounding reactions (Ismail M. A. and Brown G. E. 1979; Bucciarelli B. et. al., 1998), chilling susceptibility (Sanchez-Ballesta M. T. et al., 2000) and environmental stress (Lavola A. et al., 2000; Dixon R. A. and Paiva N. L., 1995; Byoung K. L. et. al. 2003). Numerous reports have demonstrated a positive correlation between increased enzyme activity, PAL protein accumulation and PAL gene expression (Kostenyuka I. A., Zonb J and Burns J. K., 2002).

The products of the phenylpropanoid pathway are important building blocks in several biosynthetic pathways (Bennet R. N. and Wallsgrove R. M., 1994). From cinnamic acid flavonoids and anthocyanins, lignin precursors (ferulic and pyrocatechol acid), coumarins, phytoalexins, and salicylic acid (SA) are derived. Salicylic acid is one of the precursors of catechols, tannins, saligenin, methyl salicylate and hydroxybenzoic acids (Bennet R. N. and Wallsgrove R. M., 1994). SA mediates the defence mechanisms of plants towards pathogens. The expression of pathogenesis related proteins and the establishment of systemic acquired resistance are results of SA (Loake G and Grant M., 2007). Plants respond similarly to aphid infestation by inducing SA and pathogenesis related proteins (Mohase L. and Van Der Westhuizen A. J., 2002; Berner J. M. and A.J. Van Der Westhuizen, 2010).

Since broomrape is a root parasite, his first contact with the host plant is the root system, so the purpose of this work included the PAL activity determination in roots of different genotypes of sunflower (*Helianthus annuus* L.) artificially infected with broomrape (*Orobanche cumana* Wallr.).

MATERIAL AND METHOD

Plant materials and growth conditions. The plant materials used for the study were 17 genotypes. Broomrape seeds were collected from the South of Moldova. The PAL activity was studied under artificial infestation conditions. Sunflower plants were grown in a sand/compost mixture (1:1, V/v) in 10,0 kg plastic pots. The mixture of each pot was mixed with 50 mg of broomrape seeds per pot.

PAL assay. PAL activity was determined spectrophotometrically by following the absorption of the reaction product, cinnamate (Adamovskaia V. G. et al., 2007). Standard mixture for the PAL assay consisted of 100 μ l enzymatic extract (0.1 M tampon borate, pH 8,8) and 400 μ l 12 mM L-phenylalanine. The mixture was incubated at 37°C (16 hours) and absorbance measured at 290 nm. The absorbance of the reaction mixture contained L-Phe as a substrate. Control reaction mixture contained distilled water instead a substrate. The enzyme activity was expressed in optical density units to 1 mg of protein. The total protein concentration in soluble enzyme extracts was determined by the Bradford protocol (Bradford M. M., 1976).

RESULTS AND DISCUSSIONS

Like other higher plants, in sunflower were identified physiological and biochemical defense mechanisms that block broomrape development at different ontogenetic stages (Echevarría-Zomeño S. et al., 2006; Labrousse P. et al., 2001; Serghini K. et al., 2001). Broomrape shows a different parasitic activity, what manifested on the intensity of the disease, causing varying degrees disorders, sometimes reaching up to the total destruction of organs or the whole plant.

It is well known that an important role in providing of plants resistance to pathogens attack has different ontogenetic biochemical mechanisms (Dickinson M, 2003; Goldwasser Y. et al., 1999; Labrousse P. et al., 2001), and phenylalanine ammonia-lyase has the primary role in triggering the metabolic pathways of synthesis of key metabolites involved in providing host plant resistance to the action of biotic factors. Moreover, it was demonstrated that the increase in PAL activity is an index of resistance (Shadle, G. L. et al., 2003).

Spectrophotometric determination of PAL activity was performed on 17 sunflower genotypes, previously ranked (Duca M. et al., 2009) in three groups (sensitive, tolerant and resistant) depending on the response to the attack of phanerogam *Orobancha cumana*, collected in the south part of the Republic Moldova. Comparative analysis of PAL activity in these three groups of sunflower revealed significant differences dependent on the response to the broomrape attack. Thus, the four tolerant genotypes, showed the significant increase in enzymatic activity in all four periods (20, 30, 50 and 60 days post infection) of host plant development in the presence of phytopathogenic (fig. 1).

Sunflower resistant genotypes to the broomrape, race E showed the significant increase in PAL activity from 30 days ontogenetic phase. During the first 20 days, three resistant genotypes have been increased enzymatic activity, while the other three, showed a decrease of it, probably because of lack of contact between pathogen seeds and host plant. The same regularity was demonstrated at sensitive genotypes (fig. 1). Comparative analysis of phenylalanine ammonia-lyase activity at different ontogenetic stages of the host plant allowed us to determine the increase of enzyme activity referred to the period of 30 days, at which over 94% of the examined genotypes (except ASC1 line) had increased values, regardless of group (resistant, tolerant, sensitive). Probably, this ontogenetic phase is decisive in the manifestation of biochemical mechanisms of resistance where is involved key enzyme PAL. At later stages (50 and 60 days), already there is a strict dependency relation to groups of sunflower. Thus, both genotypes resistant and tolerant have maintained the increased enzyme activity, whereas susceptible genotypes, conversely, most have been lower values of PAL activity compared with control. This regularity may be explained by the fact that broomrape seeds that have the ability to germinate at any ontogenetic stage of host plant, determine the synthesis of PAL in an amount greater than the entire period, the host roots are in immediate proximity to phitoparasite seeds. In susceptible genotypes, which has already triggered the infection is not maintained the laws established.

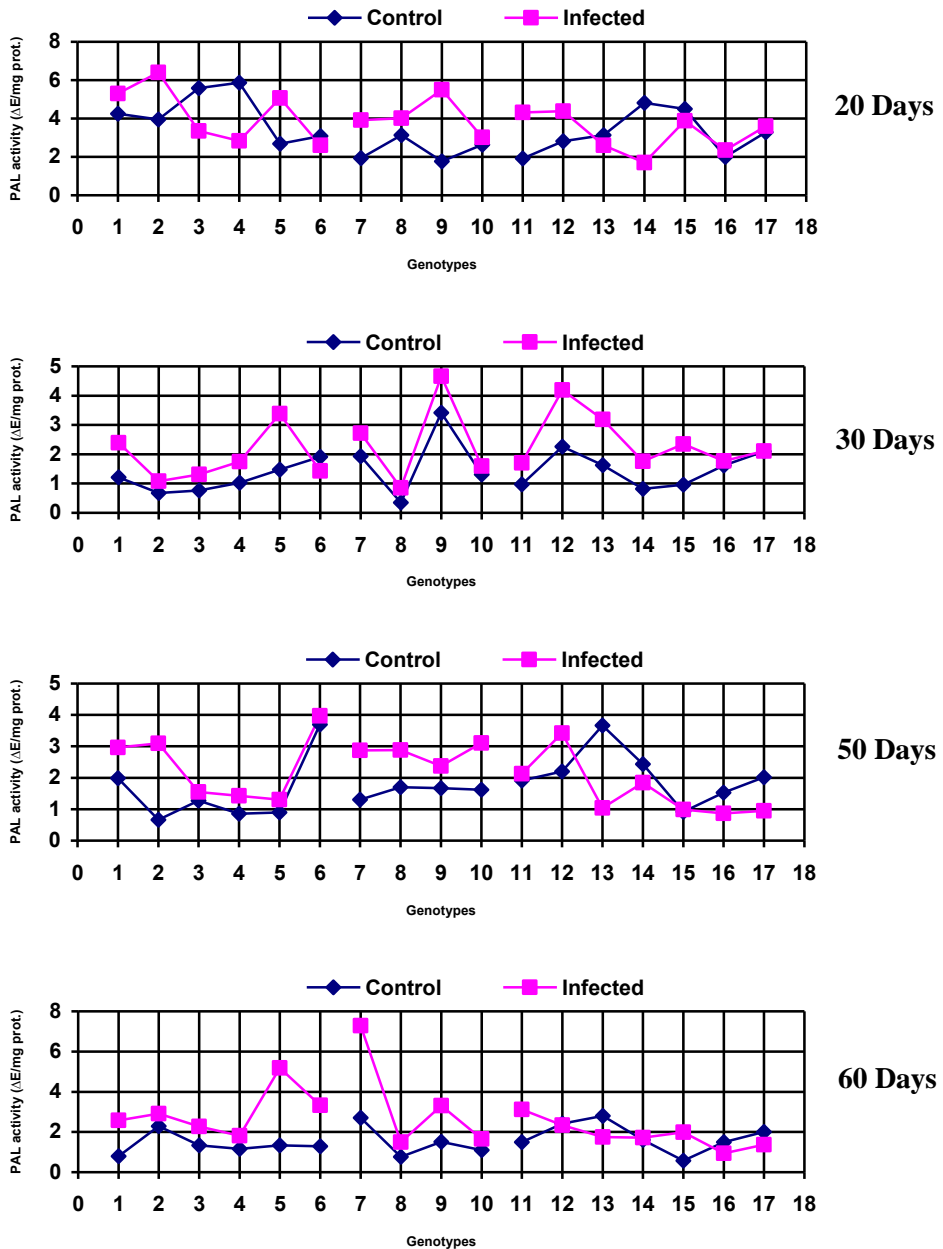


Fig. 1 – Phenylalanin ammonia-lyase activity in roots at different sunflower genotypes 1, 2, 3, 4, 5, 6 – resistant genotypes (FS9, FS12, FS17, FS21, FS26, ASC1 respectively); 7, 8, 9, 10 – tolerant genotypes (FS4, FS8, FS11, ASC2 respectively); 11, 12, 13, 14, 15, 16, 17 – sensitive genotypes (FS19, ASC10, Valentino ♀, Valentino ♂, Valentino F₁, Olea F₁, Performer F₁ respectively).

CONCLUSIONS

1. Artificial applying of *Orobanche cumana* Wallr. induces a significant increase of PAL activity in the root system at all sunflower genotypes resistant and tolerant to broomrape (race E), from 20 – 30 days to the final ontogenetic investigated phase (60 days), which confirms the role of PAL in the expression of biochemical resistance mechanisms of host plant to broomrape attack.

2. Ontogenetic development phase of the sunflower, of which more than 94% of genotypes have been significant increases in PAL activity, proved to be the 30 days probably be decisive in triggering mechanisms of resistance to *Orobanche cumana*.

3. Genotypes resistant to the broomrape, race E maintain the increased PAL activity, which demonstrates the continuing manifestation of resistance mechanisms, whereas broomrape has the ability to germinate throughout the period of ontogenetic development of the host.

4. After 30 days, susceptible genotypes showed no increase in PAL activity, probably due to already trigger the infection process.

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THE DIMINUTION OF STERIGMATOCYSTIN TOXICITY BY THE ANTIRADICALIC ACTION OF SOME VEGETAL FLAVONOID CONTAINING PRODUCTS

DIMINUAREA TOXICITĂȚII MICOTOXINELOR DIFURANICE PRIN ACȚIUNEA ANTIRADICALARĂ A UNOR PRODUSE VEGETALE CONȚINÂND FLAVONOIDE

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Abstract. *Sterigmatocystin is a mycotoxin derived from difuran, structurally related to aflatoxins, which withdraws the attention of the human and veterinary pathology by having a high incidence in vegetal aliments from the temperate-continental climate. The present paper is part of a more ample experiment which deals with the reduction of the toxicity of this mycotoxin that has been included in first grade carcinogenic category. Taking into consideration the hypothesis that sterigmatocystin acts as a free radical in the form of epoxy-sterigmatocystin, the experiment presented in this paper stresses upon the use of some pharmaceutical preparates of *Hipophäe rhamnoides*. The experiment included four groups of five white Wistar rats each. The first group was the reference group, while the second one experimentally reproduced the chronic sterigmatocystin intoxication. Besides the sterigmatocystin dose, the animals from the third group were given ascorbic acid, a nonenzymatic antioxidant. The third group received *Hipophäe fructus*, along with the sterigmatocystin dose. In the end, the animals were sacrificed and the blood samples were analysed for biochemical investigations with relevance upon the hepatic function and integrity.*

Key words: 8,9- epoxy-sterigmatocystin, *Hipophäes fructus*, aminotransferases

Rezumat. *Sterigmatocistina este o micotoxină difuranică, înrudită structural cu aflatoxinele, a cărei incidență crescută în alimentele de origine vegetală din zona temperat-continentală atrage atenția patologiei umane și veterinare. Prezenta lucrare face parte dintr-un experiment mai amplu ce vizează reducerea toxicității sterigmatocistinei, micotoxină inclusă în categoria carcinogenilor umani de gradul I. Luând în considerare ipoteza că sterigmatocistina acționează sub forma unui radical liber derivat de la epoxy-sterigmatocistină, experimentul redat în această lucrare vizează utilizarea unor preparate farmaceutice provenite de la *Hipophäe rhamnoides*. Experimentul a cuprins 4 loturi de câte 5 șobolani albi, linia Wistar. Primul lot a constituit lotul de referință, în timp ce lotul al doilea a servit pentru reproducerea experimentală a intoxicației cronice cu sterigmatocistină. Animalele din lotul al treilea, au primit, pe lângă doza de sterigmatocistină, acid ascorbic, dat fiind rolul său de antioxidant neenzimatic. Celui de al patrulea lot i s-a administrat concomitent cu sterigmatocistina un extract de *Hipophäes fructus*. La sfârșitul experimentului, animalele au fost sacrificate, iar pe sângele prelevat au fost*

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efectuate investigații biochimice cu relevanță pentru integritatea și funcția hepatică. Indicatorii de citoliză hepatică investigate (aspartat aminotransferaza, alanil aminotransferaza) au evidențiat o ameliorare a integrității hepatocitului pentru animalele din lotul protejat cu fitopreparat pe bază de *Hipophäe fructus*.

Cuvinte-cheie: 8,9-epoxi-sterigmatocistina, *Hipophäe fructus*, aminotransferaze

INTRODUCTION

Sterigmatocystin, a difuran-coumarin derivative, is a mycotoxin produced by molds from the genera *Aspergillus*, *Biplaris*, *Eurotium*, *Emericella*, but the main source remains *A. versicolor* (Keller, N.P. et al. 1995). Chemically related to aflatoxin B₁ from which it differs by the presence of the xanthone nucleus instead of the coumarin one, sterigmatocystin reveals toxicokinetic and toxicodynamic aspects similar to its chemically related toxin. The toxic effects of sterigmatocystin, expressed by the means of carcinogenicity, teratogenicity and immunosuppression, are caused by the metabolic activation at the level of the hepatic microsomes, where the mycotoxin is converted by the enzymatic system of cytochrome P₄₅₀₋₄₈₀-monooxygenase into the 8,9-epoxyde derivative (Shimada, T., et al. 1996, Prisăcaru, 1998).

The toxicological active form of sterigmatocystin is represented by its epoxidic metabolite that is easily converted into the free radical. The seabuckthorn berries are appreciated in therapy due to their antioxidant potential. Among the compounds with antiradicalic effect there is to be mentioned the L-ascorbic acid protected by the presence of flavonoids that have a synergic activity. The high concentrations of vitamin C (up to 1500-1800 mg%) along with the flavonoids and tocopherols make *Hipophäe fructus* one of the vegetal products with the highest antioxidant activity (Kensler, T.W. et al., 1997, Brad, I. et al, 2002, Prisăcaru, C., 2010). Taking into consideration these arguments, there can be considered the fact that the necessity of annihilating the oxidative stress generated by the epoxidic metabolite of sterigmatocystin includes as priority the therapeutical use of phytopreparates from *Hipophäe fructus*

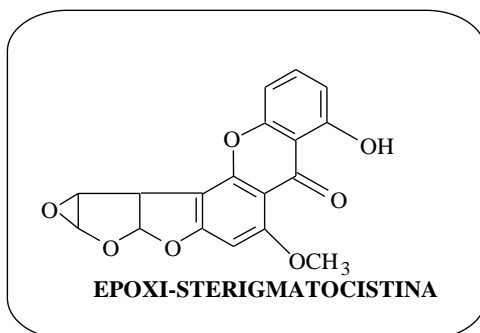


Fig. 1 - The chemical structure of the main metabolite of sterigmatocystin

MATERIAL AND METHOD

The experimental model (table 1) was achieved in order to evaluate the antioxidant activity of the active principles from the berries of *Hipophäe rhamnoides* in the oxidative stress produced by the epoxidic metabolite of sterigmatocystin. The experiment comprises 4 groups of 5 Wistar rats each, having a mean weight of 185,6 g. The first group was the reference group that has been maintained in standard conditions regarding food and habitat. The second group was conceived as the control group of the sterigmatocystin intoxication and was treated with a dose of 10 ppm of mycotoxin per day that was introduced in daily food. The third group (experimental group 1) was administered both sterigmatocystin (10 ppm) and 3,5% hydroalcoholic solution of *Hipophäes fructus* (XX drops). The animals of the fourth group received, along with the daily mycotoxin dose (10 ppm) and the *Hipophäes fructus* phytopreparate (xx drops), the additional protection of a 5% aqueous solution of ascorbic acid in daily doses of XV drops, administered in drinking water. The experiment was unfolded on a period of 8 weeks. In the end, blood samples were collected in order to evaluate the biochemical parameters relevant for the hepatic cytolysis (aspartate aminotransferase - AST, alanine aminotransferase - ALT) and oxidative stress (catalase - CAT, superoxid dismutase - SOD, and gluathione peroxidase - G-Px).

Table 1

Experimental model

Groups	STG [ppm]	<i>Hipophäes fructus</i> (Hydroalc. sol. 3,5%)	AA (Aqueous sol.5%)	Biochemical parameters
Reference group	-	-	-	AST, ALT CAT, SOD, G-Px,
Control group	10	-	-	
Experimental group 1	10	XX guttes	-	
Experimental group 2	10	XX guttes	XV guttes	

Legend: STG = sterigmatocystin; AA= ascorbic acid (5% aqueous solution); CAT = catalase; SOD = superoxide dismutase; G-Px = glutathione peroxidase; AST =aspartate aminotransferase; ALT = alanine aminotransferase.

RESULTS AND DISCUSSIONS

The results obtained from the quantification of the hepatic cytolysis parameters (table 2) emphasize aleatory and different evolutions. The activity of alanine aminotransferase is not conclusive for the present experiment, illustrating decreased values both for the group intoxicated with sterigmatocystin and the groups protected with phytopreparates obtained from *Hipophäes fructus*. Unexpectedly, the lowest values for ALT (14,43 UI) are registered for the group of animals that were exclusively given the difuran mycotoxin that is known to have as target organ the liver. Contrary to the unexpected evolution of ALT, the second parameter illustrating the hepatic cytolysis, AST, shows a significant increase for the group aggressed by the epoxidic radicals of sterigmatocystin (39,73

UI compared to 31,53 UI, the value for the reference group). The activity of AST from the blood samples of the animals treated with hydroalcoholic extract of *Hipophäes fructus* is discreetly decreased compared to the intoxicated group, suggesting the antiradicalic intervention of the active principles from the sea-buckthorn berries. Unfortunately, the evolution of AST for the group that was further treated with ascorbic acid leads to a highly raised value (39,7 UI), value that is almost identical to the value obtained for the intoxicated group (39,73 UI), thus infirming the antitoxic-antioxidant role of the sea-buckthorn berries.

Table 2

The evolution of the hepatic cytolysis parameters

Groups	Alanine aminotransferase (ALT) [UI]			Aspartate aminotransferase (AST) [UI]		
	minimum	Mean	MAXIMUM	minimum	Mean	MAXIMUM
Reference group	11.30	16.90	19.20	28.50	31.53	37.90
Control group	11.20	14.43	18.50	29.80	39.73	54.30
Experimental group 1	12.30	15.36	16.60	29.00	37.00	54.40
Experimental group 2	11.90	15.66	17.20	31.00	39.70	51.00

The evaluation of the oxidative stress markers reveals a different image, thus confirming the antioxidant potential of the active principles from *Hipophäes fructus*. Catalase (CAT), as there can be seen in table 3, fig. 4, decreases its values in the case of the group that was given the difuran derived mycotoxin with 40 units (246.00 U/L) compared to the reference group (280,3 U/L), thus suggesting the presence of the oxidative stress produced by the epoxidic metabolite of sterigmatocystin.

The activity of CAT from the serum of the animals treated with hydroalcoholic solution from sea-buckthorn berries reaches normal values, the highest level being obtained for the experimental group 2 that benefit from the additional treatment with ascorbic acid. These variations suggest the fact that the antioxidant phytocomplex from the sea-buckthorn berries and ascorbic acid annihilate the oxidative stress generating free radicals.

Table 3

The evolution of catalase

	CATALASE (U/L)		
	Minimum	Mean	MAXIMUM
Reference group	220.0	280.3	339.0
Control group	125.0	246.0	315.0
Experimental group 1	170.0	281.6	351.0
Experimental group 2	112.0	287.3	337.0

Evaluating the activity of superoxide dismutase as shown in table 4 , there can be noticed an evolution that emphasizes the consumption of the enzyme by the free radicals produced by the presence of the difuran mycotoxin in the intoxicated group and discrete improvements for the groups protected with the hydroalcoholic extract of *Hipophäe rhamnoides*. The improvement of the SOD activity for the group protected both with the phytopreparate from the sea-buckthorn berries and the ascorbic acid solution is not significant (296.8 U/L compared to 293.9 U/L, value of the intoxicated group), therefore there cannot be taken into consideration a significant antioxidant potential.

Table 4

The evolution of superoxide dismutase

SUPEROXIDE DISMUTASE (U/L)			
	minimum	Mean	MAXIMUM
Reference group	311.0	324.9	369.0
Control group	211.0	293.5	371.0
Experimental group 1	258.0	303.5	332.0
Experimental group 2	217.9	296.8	366.0

The evolution of the third parameter relevant for the oxidative stress (table 5), glutathione peroxidase, leads to values that sustain the presence of the oxidative stress in the control group and the antioxidant effect of the phytopreparate from the sea-buckthorn berries, effect that becomes stronger when associated with the exogen ascorbic acid.

Table 5

The evolution of glutathione peroxidase

GLUTATHIONE PEROXIDASE (U/L)			
	minimum	Mean	MAXIMUM
Reference group	58.0	80.33	88.0
Control group	50.5	75.96	85.3
Experimental group 1	49.5	80.36	84.9
Experimental group 2	44.5	77.57	89.5

CONCLUSIONS

1. The quantification of the two parameters relevant for the hepatic cytolysis (AST and ALT) leads to insignificant aleatory results;
2. The evolution of serum catalase emphasize the fact that the antioxidant phytocomplex from the sea-buckthorn berries and the additional ascorbic acid intake decrease the oxidative stress produced by the epoxidic metabolite of sterigmatocystin;

3. The evolution of superoxide dismutase reveals a reduced and insignificant antioxidant effect for the group treated with sea-buckthorn berries and ascorbic acid;

4. The values of glutathione peroxidase confirm that the antioxidant phytocomplex from *Hipophäe rhamnoides* is efficient.

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SYNTHESIS AND THE EFFECT OF SOME PYRIDAZINE DERIVATIVES IN GERMINATION AND SEEDLING GROWTH OF WHEAT

SINTEZA ȘI EFECTUL DERIVAȚILOR PIRIDAZINICI ASUPRA GERMINAȚIEI ȘI CREȘTERII PLANTELOR DE GRÂU

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Abstract. *1,3-Dipolar cycloaddition is one the most important methods of constructing the diazinic derivatives. Several studies to test the biologic effect of pyridazine derivatives have been done using simple experiments of wheat germination/ develop of the wheat plantlets. The results showed that the influence for tested compounds in germination percentage, shoot and root length, fresh weight varied as a function of structure of each investigated compound.*

Key words: pyridazine compounds, biological activity, wheat, germination, total height.

Rezumat. *Reacțiile de cicloadiție 1,3-dipolare sunt cea mai convenabilă metodă pentru obținerea derivaților diazinici. Pentru a testa efectul biologic al derivaților de piridazină, au fost efectuate diferite studii, folosind experimente simple de germinare a semințelor de grâu / dezvoltare a plantulelor de grâu. Conform rezultatelor, activitatea compușilor testați în procesul de germinare, lungimea rădăcinii și greutatea plantulelor în stare proaspătă a variat în funcție de structura fiecărui compus investigat.*

Cuvinte cheie: derivați piridazini, activitate biologică, semințe de grâu, germinare, înălțimea totală a plantelor.

INTRODUCTION

The bioactives substances are used in the treatment seeds, planting or on the field during the growing season. These substances are synthesis products and have chemical structure similar with hormones present in plant (auxine inhibitors, gibberellinic) excepting retardants, which are not synthesized in plants, but are produced by synthetic processes

Pyridazine compounds are commonly used as anticancer (Rodriguez-Ciria et al., 2003) antituberculosis (Butnariu et al., 2007) antihypertensive (Gokçe, 2001) antifungal (Dodge, 1989) or antimicrobial (Druță et al., 2002) agents due to their intense biological activity. Also, they have a rapid systemic effect on the plants and are active at very low concentration (Butnariu (Tucaliuc) et al., 2008; Tucaliuc et al., 2010). The dates presented in the literature demonstrates the possibility to use

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the pyridazine derivatives in growth and development of horticultural plants or as potential practical applications as insecticides, herbicides and pesticides (Rișcă et al., 2006; Mangalagiu et al., 2005).

In this manner, the work is focused to go on with the study (Butnariu (Tucaliuc) et al., 2008; Tucaliuc et al., 2010) and proposes to wide the products array used in treatment of wheat, specifically the use of azaheterocyclic compounds with 1,2 diazinic structure substituted with fluor. Targeted compounds are azaheterocycles with fluor, because since 1950 the interest for organic compounds with fluor is in accession, due to potential applications in medicine and biochemistry (Filler, 1986).

In 1970, only 2% from this derivatives were as pharmaceutically products, but nowadays the statistics are above 21%. Also, many compounds with fluor are used in complementary area, e.g. agro-chemistry where the diagram is increasing, furthermore 32%.

Therefore, we expect that the products we have obtained to present possible practical applications as biologically active compounds and for this reason we tested their effect on germination and growth plants.

MATERIAL AND METHOD

Synthesis of pyridazinic coumpounds (fig. 1) was made in the classical method to obtain bicyclic adducts (cycloaddition reaction): quaternization of nuclear nitrogen, which in alkaline medium (triethylamine) generated the ylide in situ and cycloaddition of ylide to corresponding dipolarophile (Butnariu (Tucaliuc) et al., 2008; Tucaliuc, 2008; Zbancioc et al., 2010).

After purification, the structure of the compounds was proved by elemental and spectral analysis (FT-IR, MS, ¹H NMR, ¹³C NMR, and two-dimensional experiments 2D-COSY, 2D-HETCOR (HMQC), long-range 2D-HETCOR (HMBC).

The following compounds were used in this study:

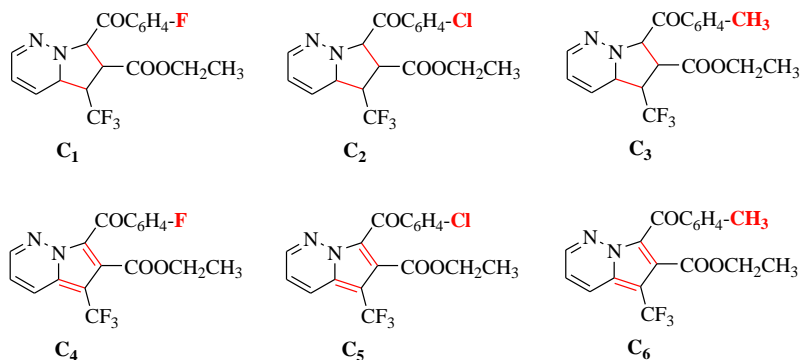


Fig. 1 - The structure of pyridazinic compounds tested.

Germination tests were performed in a growth chamber Conviron MP4030 model G30 with programmed temperature, humidity and light. We used seed samples of wheat (*Triticum aestivum*), with specific weight 37.2 g / 1000 seeds.¹⁷ The procedures are simple, cheap and are considered a good way to test toxicity of new compounds.

For the experiment, the determinations were realized in triplicate or duplicate, with 20 seed samples of wheat. Each sample was treated with 5 mL of $5 \cdot 10^{-3}$ M solutions of pyridazine derivatives obtained, in paralleled with a redistilled water blank (**B**). Initially, the seed with analyzed solutions, were shaken in the tubes, at short time interval, for one hour. Then, the seeds with their treatment solutions, were taken out and put into Petri dishes on double filter paper together. The samples were maintained in the growth chamber at constant temperature and humidity regimes (21°C and 95%, respectively) and under illumination (12h/24h) until embryo elongation (hypocotyls and radicles) was establish.

The seeds were periodically watered and the percent of germinated seeds were reported 3 days later (germination rate, **GR**). A seed with visible coleorhizae was considered germinated. On the 7-th day were harvest of young wheat plants, from their seeds, was measured height (**H**, expressed as cm) and weight (**W**, expressed as grams).

The dates were validated using the Tukey test, (Snedecor, 1994) with a probability of 95 %.

RESULTS AND DISCUSSIONS

The cycloadducts might be considered as classical bioisosteres due to the presence of F, Cl and CH_3 substituents. (Silverman, 1992) Considering the pyridazine – acetophenone skeleton (fig. 2) as the pharmacophoric active group, we tested the biological activity of some pyridazine derivatives on wheat germination and seedling growth, having in mind two structural modifications: introduction of a pyrrolo (**I**) ring, and a classical isosteres substitute R (R= F, Cl, CH_3) in the para- position of the benzoyl system.

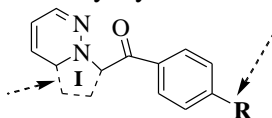


Fig. 2 - The pzridayine-acetophenone skeleton.

Experiments were conducted to determine the biological activity of the diazinium derivatives on the germination of spruce seed. The obtained results demonstrated that the main influence factor in germination percentage (the 3rd day of treatment), root length and weight of seedlings fresh (the 7th day of treatment), is dependent with the structure for each investigated compound (table 1 and table 2).



Fig. 2 – The first day of treatment.



Fig. 3 - The 3rd day of treatment.



Fig. 4 - The 7rd day of treatment

Pyridazine derivatives tested did not show a toxic action in wheat seed germination and did not inhibit the growth / development of wheat seedlings.

Table 1

The effect of pyridazine derivatives on wheat germination (RG).

Comp.	Germination Rate (GR, %)	Number of plantlets	Comp.	Germination Rate (GR, %)	Number of plantlets
C1	14 ± 4	11 ± 1	C4	17 ± 6	15 ± 1
C2	13 ± 5	11 ± 1	C5	18 ± 4	15 ± 2
C3	14 ± 4	12 ± 1	C6	17 ± 3	15 ± 1
B	14 ± 2	10 ± 1	B	14 ± 2	10 ± 1

The structure of the tested piridazinic derivatives has an important role in wheat germination. Thus, for the azaheterocycles compounds (**C₁-C₃**), with dehydrogenated pyrrolo ring, the values for germination rate are comparable with values for blank sample. Instead, the pyridazine derivatives (**C₄-C₆**), with complete aromatized pyrrolo ring, influenced the germination process of the wheat seeds. According with results, this pyridazine derivatives presented relatively higher values for germination rate. Thus, the treatments with compound **C₅** slowly activated the number of plantlets obtained from the 20-seed lots (from 10 ± 1 (blank) to 15 ± 2 in the case of the compound **C₅**). (Table 1)

In addition, both height and weight of the plantlets in the lots increased accordingly (table 2). The compound **C₅** induced the height of the lot from 82.5 cm (blank) to 87.5 cm, and the weight from 0.58 g to 0.67 g.

The total height of the plantlets, **H**, was a more effective parameter to show the effect of the investigated compounds on wheat germination. Whereas, the **H** value for the blank sample was 82.5 cm, the solution of compound (**C₄-C₆**) slowly influenced the height of the plantlets in the treated lots - have the total height of the lot more than 50% of the blank sample (table 2).

Table 2

The effect of pyridazine derivatives on wheat germination and seedling growth (the total height and the mean height of plantlets in the lot (**H**, **H_{med}**), (**W**, **W_{med}**))

Comp	H (cm)	H_{med} (cm)	W (g)	W_{med} (mg)
C1	83,8 ± 11,72	8,6 ± 0.01	0,64 ± 0,01	42.52 ± 13.30
C2	82,9 ± 10,36	7,9 ± 0.7	0,63 ± 0.30	43,60 ± 4.79
C3	83,4 ± 10,42	7,8 ± 0,5	0,63 ± 0,16	42,65 ± 4.35
C4	85,0 ± 10,87	8,0 ± 0.6	0.68 ± 0.15	45,84 ± 0.01
C5	87,5 ± 10,18	9,0 ± 0.9	0.67 ± 0.19	44,45 ± 2.14
C6	86,5 ± 10,18	8,0 ± 0.3	0,69 ± 0,14	45,86 ± 3.69
B	82,5 ± 10,93	7,8 ± 0.3	0.58 ± 0.08	40.32 ± 3.36

The investigated compounds with aromatized structure acted present a different and unknown mechanism in germination and development of wheat seedlings

The research will be continue on other azaheterocyaales compounds with similar structure and functional groups with increase reactivity.

CONCLUSIONS

According to the obtained results, the tested pyridazine derivatives may influence germination rate, shoot and root length and fresh weights, as a function of structures on investigated compounds. The compounds (C₄-C₆) presented a stimulatory effect in the growth and development of wheat plants, while the compounds (C₁-C₃), with values comparable with blank sample, were inerts.

The most active pyridazinic derivative of the series was compound (C₅). It presented benefic effect on plant growth and development.

Nevertheless, additional research is required to assess the impact of pyridazine derivatives on germination and development of agricultural plants.

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STUDIES CONCERNING THE INFLUENCE OF SOME OLIGOELEMENTS ON THE ACTIVITY OF KREBS CYCLE DEHYDROGENASES AT *MONILINIA LAXA* (ADERH.& RUHL.) HONEY PARASITE ON PLUM TREES

CERCETĂRI PRIVIND INFLUENȚA UNOR OLIGOELEMENTE ASUPRA ACTIVITĂȚII DEHIDROGENAZELOR CICLULUI KREBS LA *MONILINIA LAXA* (ADERH.& RUHL.) HONEY PARAZITĂ PE PRUN

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Abstract. Present in microorganisms in small quantities, trace elements have the ability to interfere with some important biological functions, including enzymatic activities on some important metabolic pathways. This study systematizes the experimental results concerning the „in vitro” activity modulation of enzymes that defines each step of the tricarboxylic acids cycle by microelements like – B, Cu, Mn, Mo, Zn, Fe, or their mixture at *Monilinia laxa* (Aderh.&Ruhl.) Honey parasite on different types of plum tree species. The researches were made using the fungus mycelium sampled at 7 and 14 days from the inoculation on Leonian medium. The activity of the dehydrogenases complex was determined by spectrofotometry using the Sisoiev and Krasna method's (modified by Artenie). The studies showed the main differences in the enzymes activity dynamics related to the type of oligoelement added to the culture

Key words: *Monilinia laxa*, dehydrogenases, Krebs cycle, trace elements

Rezumat: Prezente în microorganisme în cantități foarte mici, oligoelementele posedă abilitatea de a interfera cu importante funcții biologice incluzând activități enzimatică din căi metabolice cheie. Studiul de față sistematizează rezultatele experimentale privind modularea activității „in vitro” a enzimelor ce caracterizează fiecare etapă a ciclului acizilor tricarboxilici de către microelementele de genul – B, Cu, Mn, Mo, Zn, Fe, dar și a unui amestec din acestea, la specia *Monilinia laxa* (Aderh.&Ruhl.) Honey parazită pe diferite soiuri de prun. Cercetările au fost efectuate în miceliul ciupercii la 7, respectiv 14 zile de la însămânțarea pe mediul Leonian, activitatea complexului dehidrogenazelor fiind determinată spectrofotometric prin metoda Sisoiev și Krasna (modificată de Artenie). Studiile au relevat diferențe semnificative în dinamica activității enzimelor în funcție de tipul oligoelementului introdus în mediul de cultură.

Cuvinte cheie: *Monilinia laxa*, dehidrogenaze, ciclul Krebs, oligoelemente

INTRODUCTION

Present in small amounts in microorganisms, the trace elements (micronutrients) have the ability to interfere with important biological functions, including enzyme activities of some central metabolic pathways. Although most literature data includes B, Cu, Mn, Mo, Fe, Zn in the microelements category,

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according to the classification to date, Fe is only a the trace element (Şoldea C. and Mocanu M. 2011), while others consider them all invariably microbioelements (Gârban Z., 1999) found in all living organisms. Some scientific hypotheses, supported by the experimental data, offer as explanation a biochemical basis of this fact, the relevance of the metal ions is due to the fact that a large amount of enzymes requires additional components to be able to perform the catalytic roles, for the purpose of being co-opted as so-called enzymatic cofactors, whose function is accomplished by trace elements (Cojocaru D.C., 2007).

Known as the tricarboxylic acid cycle, the Krebs cycle is a major metabolic pathway of primary metabolism found in the fungal cells. The integral enzymatic equipment of the citric cycle catalyzes among the prokaryotic organisms, a cascade of the reactions in the cytosol, although other viewpoints (Griffin D.H., 1996) situate the enzymatic set among some fungal species in the mitochondrial matrix, excepting the succinate dehydrogenase, "captive" in the internal membrane.

Numerous reported in the literature recorded the influence of micronutrients on the enzymes involved in the Krebs cycle in the filamentous fungi. So, the role of Mn^{2+} and Mg^{2+} is mentioned to actuates directly on the isocitrat-dehydrogenase due to the enzyme NADP + dependence's (Punckar N.S. *et al.*, 1984; Yasutake Y. *et al.*, 2003, Bertini I., 2007), of the Fe^{2+} which form a chelated with the citrate, essential for the aconitase's activity (Beinert H. and Kennedy M.C., 1993), influencing implicit throughtout the Krebs cycle progress and that play both structural and functional role in the succinate dehydrogenase (Frey P.A. and Hegeman A.D., 2007), the inhibitory activity that have Fe^{2+} , Zn^{2+} and Cu^{2+} on the malate-dehydrogenase, the Cu^{2+} inhibiting completely at 0.1 mM concentration the activity of this flavoprotein, specifying that the three metal ions competes for the catalytic site of the protein (Jernejc K., Legis M., 2002), the antagonism and the synergism between micronutrients being reported in other papers (Fraústo da Silva J.J.R., Williams R.J.P., 2001). Given that the Krebs cycle is amphibolic, some intermediaries being as the precursors of secondary compounds of the fungi (Olteanu Z. *et al.*, 1988) and also known as the influence of micronutrients on the efficiency of these products (Mn^{2+} , Fe^{2+} , Zn^{2+} reduces for example, the efficacy of the citric acid to *Aspergillus niger* (Soccol C.R. *et al.*, 2006; Hang Y.D. and Woodams E.E., 1998), implicit being affected and the Krebs cycle enzyme's production.

Going on the line to other studies (Manoliu Al. *et al.*, 2004, 2005) this paper aims to study the influence of various micronutrients that have on the Krebs cycle dehydrogenase in *Monilinia laxa*.

MATERIAL AND METHOD

The inoculum of the *Monilinia laxa* has been isolated from mummified fruit that were harvested from the Research and Development Station for Fruit Tree Growing Iasi, Miroslava farm, from varieties of the *Prunus domestica*. The "in vitro" cultivation of the fungus was the Leonian medium (in the changed Bonnar formula), distributed in the Erlenmeyer flasks, which was supplemented with the following trace elements (in the quantities described by Constantinescu, O., 1974). So, we added as H_3BO_3 , $CuSO_4 \times H_2O$, $MnCl_2 \times 4H_2O$, $Na_2MoO_4 \times 2H_2O$, $FeCl_3 \times 6H_2O$, $ZnSO_4 \times 7H_2O$, B -10

mg, Cu - 100 mg, Mn - 20mg, Mo - 20mg, Fe - 20 mg, Zn - 200 mg separately, one nutrient in each flask, as well as all nutrients in a single variant. The control sample consisted of media without the addition of micronutrients. The culture media were seeded with disks 8 mm in diameter, cut-out from a culture of *Monilinia laxa* aged 7 days and incubated under stationary conditions at 28°C, at the thermostat. The experiments, conducted in fungus mycelium were performed at 7 days and 14 days after inoculation of the culture.

The Krebs cycle dehydrogenases activity was determined by the Sisoev and Krasna method, in modifying Arteni, Vl. (Cojocaru, 2009). On the basis of this method of estimation of the total microbial dehydrogenase activity is the ability of these enzymes to transfer hydrogen from various substrates to 2,3,5 – trifeniltetrazoliu chloride, which is reduced, passing in triphenylformazan, colored in red, the intensity of the it's colour is proportional to the dehydrogenases activity.

RESULTS AND DISCUSSIONS

The trace elements influence on the Krebs cycle dehydrogenases activity in *M. laxa* is shown graphically in the figures below. The isocitrate-dehydrogenase activity in fungus mycelium, quantified and statistically analyzed, as shown in figure 1, where the control sample value achieved 1.2375 µg formazan/g. Stimulative effect on the isocitrate-dehydrogenase activity had boron - the most intensively - 2.9226 µg formazan/g, followed by a mixture of trace elements - 2.5744 µg formazan/g, manganese - 2, 1808 µg formazan/g and copper - 1.7201 µg formazan/g. Inhibitory effect in the 7 days old mycelium culture is observed in the molybdenum - 0.3681 µg formazan/g which was found the lowest isocitrate-dehydrogenase activity, followed in ascendingly by zinc - 0.5663 µg formazan/g, respectively, iron - 0.9312 µg formazan/g.

With the aging of the culture mycelia, the activity of this biochemical parameter decreased in the control sample to 0.6054 µg formazan/g, higher levels than it's being observed in the case of copper - 0.7059 µg formazan/g, for molybdenum - 0.6790 µg formazan/g. In the other medium variant, the isocitrate- dehydrogenase it registered decreased levels, the strongest being due to the cumulative effect of the trace elements in the mixture - 0.1630 µg formazan/g, followed by manganese - 0.2474 µg formazan/g, iron - 0.3201 µg formazan/g, zinc - 0.5218 µg formazan/g and boron - 0.5296 µg formazan/g. Rigorously analyzing the dynamics of the isocitrate-dehydrogenase activity in time, it can be concluded that the senescence culture has induced a decrease in the activity of this enzyme, the only exception being a variant V4 with molybdenum, which was increased the level of the enzyme activity in time.

Another studied enzyme was α-ketoglutarate-dehydrogenase, the impact of the trace elements on the activity of this enzyme in *Monilinia laxa* (Aderh.&Ruhl.) Honey specie's being graphically illustrated in figure 2.

The best potentiation of the α-ketoglutarate-dehydrogenase enzyme activity at 7 days was achieved by boron, registering 2.4780 µg formazan/g, compared with control sample value which were noted 0.4414 µg formazan/g. A strong stimulative effect on the α-ketoglutarate-dehydrogenase in 7-day-old mycelium was observed at the zinc - 1.6684 µg formazan/g, iron - 0.9256 µg formazan/g, respectively, molybdenum - 0.8969 µg formazan/g. The inhibition of the α-ketoglutarate-dehydrogenase activity was recovered in the case of medium variants containing manganese - 0.3945 µg

formazan/g, a mixture of micronutrients - 0.0247 μg formazan/g and that containing the copper - 0.1633 μg formazan/g, suggesting that, the α -ketoglutarate -dehydrogenase in *Monilinia laxa* species is inhibited by copper but that its combination with other trace elements enhances this inhibitory effect.

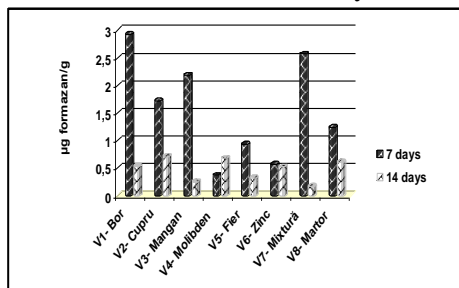


Fig. 1 - The influence of the trace elements on the isocitrate-dehydrogenase in *Monilinia laxa*

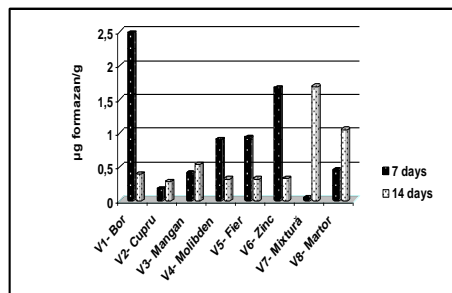


Fig.2 - The influence of the trace elements on the α -ketoglutarate-dehydrogenase in *Monilinia laxa*

After 14 days of incubation, the α -ketoglutarate-dehydrogenase activity value in the control sample was 1.0481 μg formazan/g. The simultaneity of action of the trace elements mixture - induced as α -ketoglutarate dehydrogenase a strong increase in contrast with other medium supplemented with trace elements - 1.6872 μg formazan/g. All other trace elements have caused a significant inhibition of this biochemical parameters compared with the control sample, copper, iron, zinc, boron molybdenum giving relatively uniform values, while manganese, compared with them, was comparatively more tolerant - 0.5292 μg formazan/g.

The results of the time-course monitoring of the succinate-dehydrogenase activity in *Monilinia laxa* mycelium cultivated on medium enriched with the various trace elements are reproduced graphically in figure 3. As a first observation, it appears that, at 7 days after inoculation of the culture, all medium variants have as this enzyme activity the values were lower than the control sample, who had a value of 1.2590 μg formazan/g.

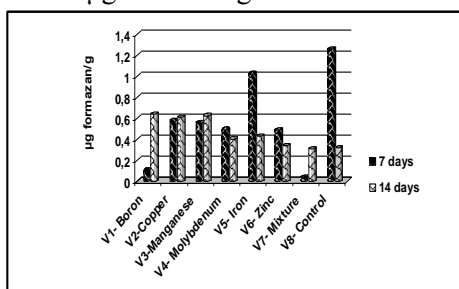


Fig. 3 - The influence of the trace elements on the succinate- dehydrogenase in *Monilinia laxa*

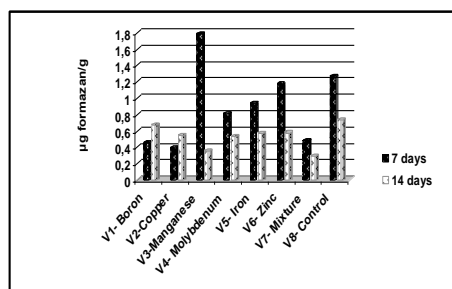


Fig. 4 - The influence of the trace elements on the malate- dehydrogenase in *Monilinia laxa*

The aging of the mycelial culture has induced a decrease of the succinate-dehydrogenase activity in the control sample- 0.3186 μg formazan/g. Has been

noted, however, that in the medium variants containing boron - 0.6384 μg formazan /g, manganese - 0.6266 μg formazan/g, copper - 0.6090 μg formazan /g, iron - 0.4297 μg formazan/g, molybdenum - 0.4064 μg formazan/g, zinc - 0.3387 μg formazan/g, the trace elements have had an stimulating effects on the succinate-dehydrogenase activity. It is noteworthy that the simultaneous effect of the micronutrients in the V7 medium variant-produces on the succinate dehydrogenase an inhibitory effect at 14 days - 0.3093 μg formazan/g.

The chart of the malate dehydrogenase activity, the modulated enzyme “in vitro” of the different trace elements in *M. laxa* fungus mycelium, show that in fungal culture for 7 days, the enzyme activity in the control sample reached a value of 1.2631 μg formazan/g and that the medium variant containing manganese was recorded, a value of 1.7825 μg formazan/g. Other trace elements have determined the inhibition of the malate-dehydrogenase activity, the copper strong hindering most strong the activity of this enzyme - 0.3899 μg formazan/g. The enzymatic activity value in the medium variant supplemented with zinc was approximately equal to the control sample calue activity - 1.1719 μg formazan/g which supports the hypothesis that zinc has a very peached inhibitory effect on the malate dehydrogenase activity in a young culture.

In a secondary series of tests, it has been observed that all variants had lower values of the malate dehydrogenase activity below the control sample, which leads towards the conclusion that in an aging culture, trace elements, either alone or together, inhibit the activity this enzyme in the *M. laxa* mycelium. Thus, it has been observed that the manganese slowed the enzyme activity the most - 0.3586 μg formazan/g compared with the control sample - 0.7358 μg formazan/g and that, in combination with other micronutrients, has increased its inhibitory effect - 0.2932 μg formazan/g.

A careful analysis of the malate-dehydrogenase activity dynamic's shows that, over time, the enzyme activity decreases including the control sample, except for medium variants containing boron and copper.

CONCLUSIONS

1. The studies on the Krebs cycle dehydrogenases activity in *Monilinia laxa* fungus cultivated “in vitro” on the medium supplemented with various micronutrients found that it was influenced in different ways depending on the type of enzyme, on the micronutrient type introduced in the culture medium and the mycelial culture age.

2. In a young culture, at 7 days the isocitrat-dehydrogenase activity was stimulated by boron, the mixture of trace elements, manganese and copper and inhibited by molybdenum, zinc and iron. In 14 days culture the isocitrat-dehydrogenase activity was stimulated by copper and molybdenum.

3. After 7 days of incubation, the α -ketoglutarate-dehydrogenase activity was stimulated by boron, zinc, iron, molybdenum and inhibited by manganese, copper and trace element mixture. After 14 days of incubation, the α -ketoglutarate-dehydrogenase activity was stimulated by the mixture of trace elements.

4. At 7 days after inoculation of the culture, the succinate-dehydrogenase activity was inhibited by all micronutrients, while at 14 days after seeding, the enzyme activity was stimulated in all medium variants.

5. After 7 days, the malate-dehidrogenase activity was stimulated only by manganese and inhibited to 14 days for all trace elements, either separate or combined.

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MORPH-ANATOMIC STUDIES AT SPECIES FROM SPONTANEOUS FLORA WITH ORNAMENTAL VALUE

STUDII MORFO-ANATOMICE LA SPECII DIN FLORA SPONTANĂ CU VALOARE ORNAMENTALĂ

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Abstract. *In the current paper are presented the results of a morph-anatomic study at two species from genus Polygonatum: P. multiflorum L. (All.) and P. odoratum Mill. Druce (syn. P. officinale All.). Species are from the spontaneous flora of Iași County and were cultivated in the experimental field of Floriculture Discipline from USAMV Iași. The effectuated research shown, that at both species the general structure plan of aerial stem and leaf is the one of Liliaceum, with some specific particularities. At specie P. multiflorum the contour of the transversal section is circular-coastal, and at P. odoratum is circular. At P. odoratum the walls of epidermal cells are lignified and the ones of wooden parenchyma cells from the leading fascicles on the inner circles are colenchymatized.*

Key words: *Polygonatum multiflorum, Polygonatum odoratum, morph-anatomy, decorative features.*

Rezumat. *În această lucrare sunt prezentate rezultatele studiului morfo-anatomic la două specii a genului Polygonatum: P. multiflorum L. (All.) și P. odoratum Mill. Druce (syn. P. officinale All.). Speciile provin din flora spontană a județului Iași și au fost cultivate în câmpul experimental al disciplinei Floricultură, din cadrul USAMV Iași. Cercetările efectuate au arătat că la cele două specii planul general de structură al tulpinii aeriene și al frunzei se încadrează în cel al liliaceelor, cu câteva particularități. La specia P. multiflorum conturul secțiunii transversale este circular-costat, iar la P. odoratum circular. La P. odoratum pereții celulelor epidermice sunt lignificați, iar cei ai celulelor de parenchim lemnos din alcătuirea fasciculelor conducătoare de pe cercurile interne ale tulpinii aeriene, sunt colenchimatizați.*

Cuvinte cheie: *Polygonatum multiflorum, Polygonatum odoratum, morfo-anatomie, însușiri decorative.*

INTRODUCTION

The structure of monocotyledons' vegetative organs has been analysed in both special and in some more general studies (Napp-Zinn, 1984, 1988; Kausmann B., Schiewer U., 1989) references being sometimes made to the anatomy on mono-facial leaves. In all these papers, special stress is laid on

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the root types of vascular bundles stem and floral peduncle and especially on the leaf.

From the most recent papers regarding some species of *Polygonatum* L. genus we mention the ones of molecular taxonomy and the various studies of histochemistry and pharmacognosis (M.N. Tamura, 1997; M. Szczecińska et al., 2006; F. Dupont, J.L. Guignard, 2007).

Polygonatum, which is commonly called Solomon's-seal, has been used medicinally for thousands of years. The plant is edible and can be made into a tea which has historically been taken to promote healing and to clean out toxins from a number of different organs. The roots can be mashed into a paste and applied topically to injuries to decrease healing time and to stop bleeding. Though none of these potential medical effects has been scientifically studied, scientists in the early 21st century are examining *Polygonatum* for its potential anti-cancer effects.

Polygonatum belongs to the Liliaceae family and has a total of 57 species. Its major distribution centres are in East Asia, mainly China and Japan, where 40 species are found (M.N. Tamura, 1997). Apart from this area, *Polygonatum* occurs in the moderate climate zone of North America and Europe.

MATERIAL AND METHOD

The research material is represented by two species of *Polygonatum* genus: *P. multiflorum* L. (All.) and *P. odoratum* Mill. Druce (syn. *P. officinale* All.) – from Romanian flora. Species are from the spontaneous flora of Iași County and were cultivated in the experimental field of Floriculture Discipline from USAMV Iași, from where the studied biological material was gathered.

The material was fixed and preserved in 70% ethylic alcohol. Cross-sections of the aerial stem and leaf were performed using a manual microtome, coloured with iodine-green and ruthenium-red and embedded in glycerol-gelatine. The obtained permanent slides were analyzed on a Novex (Holland) microscope and photographed at the Olympus VANOX AHBS3 optical microscope with photo camera included.

RESULTS AND DISCUSSIONS

1. *Polygonatum multiflorum* L. (All.) (Solomon's-seal, David's-harp, Ladder-to-heaven)

Aerial stem (figures 1-4). The contour of the transversal section is circular-coastal (coasts are slightly prominent, in number of 11-13, with unequal distances between them).

Epidermis, unilayer presents cells with the external walls thickened that the others and covered with a very thin cuticle.

Bark, relatively thin is represented by 4-6 layers (up to 8-10 layers at coasts) of rounded cells, which provide between them small meatus.

The central cylinder starts with a multi-layered pericycle (3-5 layers) formed by cells with all the walls uniformed thick and lignified. The leading

fascicles are of a closed collateral type being disposed on around three distinct circles being surrounded by a fundamental parenchyma. On the external circle alternate large and small fascicles (30-32); at the large fascicles, sclerenchyma pericycle it is in contact with the liberian pole of them, while small fascicles are completely integrated in the thickness of this pericycle. The liber of all leading fascicles is formed by riddled tubes and annex cells, and the wood is formed by protoxylem vessels and metaxylem ones (with a V type general design), between them exist cells of wooden parenchyma with the walls lightly thick and lignified at the fascicles on the external circle and only thick but without lignifications at the fascicles on the other two circles.



Fig.1 - Cross-sections through aerial stem (x40)



Fig.2 - Cross-sections through aerial stem (x100)



Fig.3 - Cross-sections through aerial stem (x200)

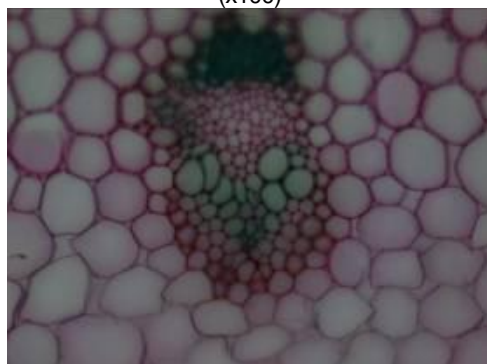


Fig.4 - Cross-sections through aerial stem (x400).

Foliar limb (figures 5 and 6). In transversal section have prominent ribs on the inferior side. Epidermis (superior and inferior) are formed by light elongated tangential cells, with external walls more thick and less cutinized. Most of all, at the inferior side could be observed stomata disposed at the same level with epidermis cells. Mezophile is homogenous, of a lacunars type (7-8 layers), with

cells disposed more compacted at superior side, so the limb have a bifacial ecvifacial centric homogenous structure. Could not be observed the tector hairs neither the secretory ones.

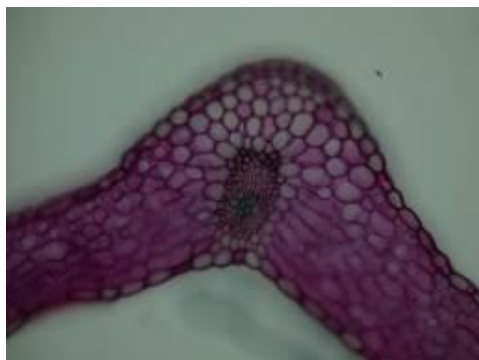


Fig. 5 - Cross-sections through the lamina (x100)



Fig. 6 - Cross-sections through the lamina (x200)

2. *Polygonatum odoratum* Mill. Druce (syn. *P. officinale* All.)

Aerial stem (figures 7-10). The contour of the transversal section is circular. Epidermis, in only one layer, presents cells with all the walls thick and lignified. Hypodermic, could be observed the same characteristics of the cell walls from the first layer of the bark, the rest of the layers (5-6) have cells with thin walls, cellulose-pectin and leaving small auriferous spaces.

Central cylinder starts with a multiple-layered pericycle (5-7 layers) formed by cells with all the walls uniform thick and lignified. Leading fascicles are of a close collateral type being disposed on around three, even four distinct circles being surrounded by a fundamental parenchyma.

On the external circle alternates large and small fascicles (31-35); at the large fascicles sclerenchyma pericycle is in direct contact with their liberian pole, while small fascicles are completely integrated in the thickness of this pericycle.

The liber of all leading fascicles is formed by riddled tubes and annex cells, and the wood is formed by protoxylem vessels and metaxylem ones (with a V type general design), between them exist cells of wooden parenchyma with the walls lightly thick and lignified at the fascicles on the external circle; at fascicles on the inner circles only few, the large ones, have some elements of sclerenchyma light lignified at liberian pole, while at the rest of fascicles the sclerenchyma mechanical elements are missing. Also, the cells of wooden parenchyma on the inner circles present a light collenchymatization of the cellular walls.

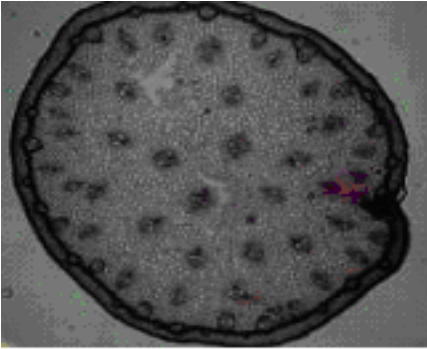


Fig. 7 - Cross-sections through aerial stem (x40)

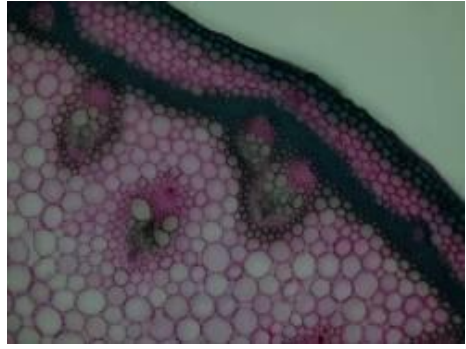


Fig. 8 - Cross-sections through aerial stem (x100)

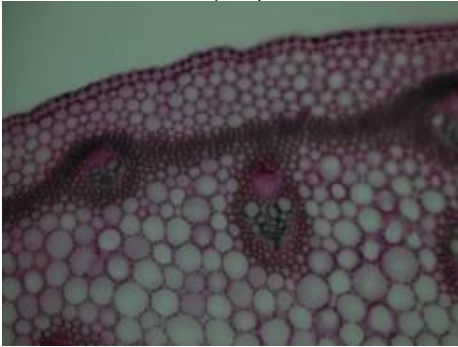


Fig. 9 - Cross-sections through aerial stem (x200)

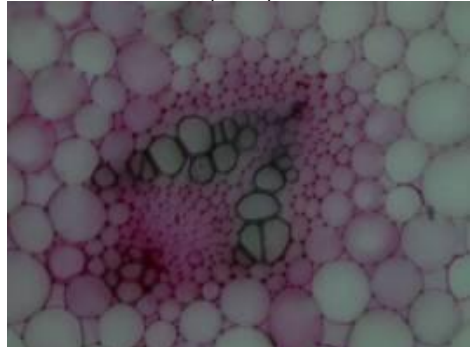


Fig. 10 - Cross-sections through aerial stem (x400)

Foliar limb (fig. 11), in transversal section presents as *Polygonatum multiflorum* a bi-facial ecvifacial centric homogenous structure, being a difference only between the thicknesses of it (only 5 layers of cells, sometimes 6).



Fig. 11 - *Polygonatum odoratum* Mill. Druce
Cross-sections through the lamina (x200)

CONCLUSIONS

1. The general structural plan of aerial stem and leaf at *Polygonatum multiflorum* and *P. odoratum* respects in a great way the one of Liliaceum (the presence of a multiple-layered sclerenchyma and lignified pericycle; a great number of leading fascicles of open collateral type disposed on several circles; V disposal of wooden vessels).

2. Particularities for these two species are: contour of transversal section (circular-coastal at *P. multiflorum* and circular at *P. odoratum*); lignified walls of epidermis cells at *P. odoratum*; collenchymatization of wooden parenchyma cellular walls on the inner circles of aerial stem at *P. odoratum*.

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SOCIAL INTEGRATION AND LSP INTEGRA & TOOL TIPLS PROJECTS

INTEGRARE SOCIALĂ ȘI PREDAREA LIMBILOR STRĂINE PENTRU SCOPURI SPECIFICE PROIECTELE INTEGRA ȘI TOOL TIPLS

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Abstract. It is well known that language learning is best contextualised by cultural information. Teaching and learning languages in school has now long focused on integrating these two components to create a real life-like study background. Globalisation and migration of workforces have lately transferred this into real social inclusion needs: The aim of the *Integra* project (510258-LLP-1-2010-1-LTGRUNDTVIG-GMP) is to work together with social partners such as migrant communities and financial institutes to create a Europe wide network of relevant institutes in order to reach migrants in partner countries to improve their integration into local society by providing them with opportunities to gain language skills on basic financial matters. The aim of the *Tool TIPLS* project (LLP-LdV-TOI-2009-LT-0042) is to develop the tool to improve transparency of professional English language (as lingua franca) skills in the selected target sectors of the Hospitality industry. This will ensure future relevant levels of foreign language competences and their evaluation to people employed or seeking employment in this area.

Key words: social integration, language learning, online platforms

Rezumat. Predarea limbilor străine este perfect încadrată de elemente culturale și se bazează pe combinarea acestor două componente (limbă și cultură) pentru a oferi un cadru de studiu autentic, cât mai aproape de viața reală. Procesul globalizării și migrarea forțelor de muncă a transformat aceste aspecte într-o necesitate de incluziune socială. Scopul proiectului *Integra* este acela de a lucra împreună cu partenerii sociali, cum ar fi comunități de imigranți și instituții financiare, pentru a crea o rețea europeană care să aducă împreună instituții relevante cu scopul de a sprijini imigranții din țările partenere facilitând integrarea acestora în societate. Beneficiarilor le vor fi oferite oportunități de dezvoltare a competențele lingvistice specifice pentru domeniul financiar dar și resurse pentru o mai bună cunoaștere a culturii locale. Scopul proiectului *Tool TIPLS* este acela de a dezvolta un instrument pentru îmbunătățirea transparenței competențelor profesionale de limba engleză (ca lingua franca), în cadrul grupurilor țintă selectate din sectorul industriei serviciilor de turism și alimentație publică. Acest lucru va asigura pe viitor nivele relevante privind competențele de limbi străine, precum și evaluarea acestora, la persoanele angajate sau care caută un loc de muncă în acest domeniu.

Cuvinte cheie: integrare sociala, limbi straine, platforme online

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INTRODUCTION

Never in the history of LSP has there been a more crucial need to integrate daily functionality with the language of communication. It is now that we need to consider the best alternatives to link day-to-day professional activities to the languages targeted by those professions. The high level of mobility requires that we update our society with individuals skilled not only in intercultural collaboration but also in offering concrete support to social integration. INTEGRA and TOOL TIPLS projects focus on developing foreign language skills accompanied by communication skills with regard to the field of hospitality and finances. Similarities between the two projects stand in the practical approach to language teaching and the permanent direct link to the world of work where language „lives” through use and context.

It is vital that we, as a country aiming towards massive tourism development, are made aware of the great importance complementary offers carries. Mountains, picturesque valleys and traditional restaurants may attract tourists but they will certainly not bound them to come back again and again. The exact same way, people living within the boundaries of the „immigrant status” will never become rightful citizens unless they are offered a helping hand and structured support. The above mentioned projects focus on these very aspects: they enhance foreign language learning including cultural elements and specific field information. INTEGRA focuses on integrating immigrants by offering language support related to the financial domain. TOOL TIPLS develops a portfolio to assess language skills in the field of hospitality.

MATERIAL AND METHOD

The main action plan for both projects funded by the European Commission was the implementation of national level research then collated into an international research at the level of the partnership countries. In the case of the INTEGRA project, research was carried in the form of questionnaires distributed to immigrant beneficiaries. Responses were collected by each national partner, interpreted and presented internationally in the form of national reports. Based on this set of national reports the coordinators then elaborated the international overall report presenting the situation of migrant population at the level of the partnership countries. Following the needs analysis stage, the project develops on a set of materials for final beneficiaries which include language teaching and context information related to the field of finances. This is accompanied by the development of a methodology suitable for transfer of information and skills development at the level of the migrant population. Complementary to these activities are the efforts of the international partnership to collect examples of good practices in the project countries which illustrate practical ways to integrate immigrant population and thus enhance intercultural awareness.

The project plans to enhance and support a series of aspects as follows:

- the basic language skills of migrants living in partner countries, specifically relating to financial matters
- migrants' potential for mobility within the EU labour market
- intercultural learning and empathy in migrant communities for international communication in different countries
- self-confidence among migrants

- ability to break personal and cultural frontiers

TOOP TIPLS project started off from the idea that the European Framework of Reference cannot always be successfully applied when it comes to assessing language skills in a more specialised field like that of hospitality. Starting from EFR and adding to it skills and abilities directly related to the above mentioned field, structured on very well delineated professions, the partnership has built on an alternative for the EFR to be applied in restaurants, hotels etc. The prototype has been piloted through international collaboration. Direct beneficiaries were involved in the process and collaboration was both synchronous and asynchronous, via an online platform. Teams were created so as to illustrate collaboration between clients and service providers in various situations thus providing a great number of contexts and opportunities to test the structure of the new portfolio. Each session, online and face-to-face was accompanied by a feedback from the participating students and facilitators. All feedback was collected into a final report, again delivered at national level and suggestions for improvement were made by each member of the partnership.

Activities included in the project workplan focus on the following general aspects:

- to develop vocational skills through professional foreign language knowledge, specifically in relation to the Hospitality industry;
- to enhance young peoples' potential for mobility within the European labour market;
- to encourage intercultural learning and empathy in the Hospitality industry for international communication in different countries;
- to integrate professional language learning in theory with practical application within specific occupational sectors.

RESULTS AND DISCUSSIONS

The project plans to:

- to analyse their needs in terms of basic local language knowledge in relation to financial matters, financial terminology, basic financial documentation as well as specifics of financial systems in partner countries in order to fulfil everyday needs
- to compare good practice used for introducing basic local language on financial matters and basic country specific financial operations in old EU member states (members before 2004) as well as in new EU member states (joined EU in 2004 and later)
- to collect materials for the development of an essential Kit for migrants, which will consist of financial terminology, financial glossary and guide with main information on financial institutes or information sources in partner countries' and migrants' languages corresponding to migrant needs
- to organise and implement trainings together with language professionals and financial experts to representatives of migrant communities in order to cascade that training to ultimate beneficiaries-migrants of the partner countries.
- to collect materials to create and develop an active web portal with the support and direct involvement of social partners

Attracting social partners in the early stages of the project benefitted both the partnership and the end beneficiaries in a number of ways:

1. The partnership had the opportunity to present the objectives of the project from the very beginning and thus select those participants interested in the activities planned for the project
2. It offered the migrant population more time to internalize the new information on the project and thus better understand what their personal gain can be within this project
3. It allowed (migrant) associations the time to plan ahead and possibly come up with new approaches which would benefit the migrant population they represent

The research carried out on the begging of the INTEGRA project clearly illustrated the following findings:

Regarding the age groups which the research has involved: there was a majority of young people, under the age of 20 (47 respondents), a slightly smaller percentage of people aged between 21-30 (36 respondents) and a minority of people aged between 31-40 (3 respondents)

This illustrates on one hand the large number of young people migrating to Romania for educational purposes and their interest in improving their language and cultural knowledge on the country they have migrated to. They could be the ones to benefit the most from this project because their minimum stay in Romania is for the duration of their studies (4-6, 10 years)

On the other hand the fact that there were only a few respondents within a higher age category is illustrative of various aspects:

1. They are not grouped in associations, therefore they are more difficult to reach and involve as individuals
2. They have a tight work schedule
3. They do not have previous experience with this type of collaborations

Our aim was to involve a wide range of nationalities so that we could collect data on the needs and attitudes towards language use of a wider category of future potential beneficiaries. We were able to collect data from people coming from the following country of origin:

- 16 people from Israel;
- 15 people from Tunisia;
- 9 people from France;
- 5 people from each of the following countries Nigeria/China/Morocco;
- 4 people from each of the following countries Portugal/Norway/Greece;
- 2 people from each of the following countries South Africa/India/Palestine;
- one person from each of the following countries Ireland/Somalia/Sweden/UK/Kenya/Pakistan/Mauritius/Albania/Sri Lanka/Madagascar/Canada/Lebanon.

Differences in language proficiency and interest in further cultural development could be traced back (although not as a rule) to levels of education.

We involved people with different levels of education to identify whether there was a clear need for language and cultural education for all these categories starting from basic education to university education.

We addressed:

- 32 people with bachelor degree;
- 24 people with secondary education;
- 15 people with non-university higher education;
- 2 people with basic education/vocational education;
- 6 people haven't answered to this question.

About the level of language barriers the respondents were faced with, as a result of lacking a good command of the new language, the majority stated they encountered medium (29 people, 34% - choice 3) or rather high (25 people, 29%, choice 4) level difficulties.

On the language they use within their families a majority of 74 people (82%) answered that they currently use their mother tongue; 12 people (10%) answered that they currently speak other languages (English, Jordan, Arabic, Norwegian, Urdu, French and Spanish); 10 people (8%) answered that they currently speak the local language (Romanian).

This shows that there is a need of having these people more involved and active within the local community so as to offer them with more opportunities for Romanian language use, outside their family. It is almost certain that, if the majority of the family members do not speak Romanian (not native or not with a very high level of language) the entire family will use another language. To balance this they need to be offered more varied opportunities to use and improve their Romanian within very concrete contexts. It is also very important that they are presented with language and approaches that they can afterwards easily transfer to daily life to ensure continuity.

Feedback on the piloting process in TOOL TIPLS project underlined that:

- levels of language need to be adapted accordingly to the language functionality of the respective profession;
- language use must be alliated to

The specific objectives of the project are:

- to define the levels of skills developed using existing VET curricula in each project partner country;
- to prepare the tool of descriptors of professional English language skills and competences(TOOL) based on CEF and ECVET;
- to implement international piloting in partner countries;
- to consult social partners–potential employers and professional consultants to implement the final improvement of the TOOL;
- to disseminate and valorize the project products via local, regional, national and international networks, via a project conference and other means as opportune.

CONCLUSIONS

1. Evaluator and tutors need to consider the level, contexts, frequency and purpose of communication when assessing foreign language skills in a specific field of activity;
2. Lifelong learning can support integration of migrant communities especially when support is delivered from representatives of those communities;
3. Language learning and assessment of language skills need to be determined firstly by the learners need and practical usage of the language in relation to concrete daily life activities;
4. General linguistic and cultural support – basic knowledge of language and culture should be the starting point to help new comers better integrate themselves and then plan their future development in this direction.
5. Support for specialized contexts – The results of the analysis show that beyond the need of basic cultural info and linguistic abilities, migrants need to be able to deal with daily financial matters and they need to be trained in this direction as well.
6. Relevance - all the information and training need to be contextualize so as to bridge the gap between theory and practice and equip beneficiaries directly with the skills and information they need in daily life.
7. Appropriateness is another key factor referring both to language level/ cultural information and personal learning needs of the beneficiaries.
8. As communication in any language is an extremely complex process, all 4 skills need to be addressed and developed on to equip beneficiaries with a holistic experience which would later on ensure their successful performance in different linguistic circumstances.

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ANALYSIS OF PERFORMANCE IN BUSINESS OF COMPANIES IN WINE MAKING DOMAIN BY THE "BALANCED SCORECARD" MODEL

ANALIZA PERFORMANȚEI ÎN AFACERI LA FIRMELE DIN DOMENIUL VITI-VINICOL PRIN MODELUL „BALANCED SCORECARD”

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Abstract. *In search of success, performance management uses a variety of models, techniques and methods, some taken from other systems and improved and others of their own, more focused on strategy and differentiating elements that provide a competitive advantage. The Balanced Scorecard model applied to the SC Cotnari proposes a series of objectives grouped into four categories: financial, customers, internal processes and development / potential. All collected data, all measurements and tests made relate to each of these four perspectives. After the analysis, the characteristic of SC Cotnari SA is represented by the structural stability of income, by concentrating a large part of income in exploitation. This competitive advantage of the company has led to the reduction of sales uncertainty, currently holding one of the highest shares on the market.*

Key words: performance, management, Balanced Scorecard, Cotnari SA

Rezumat. *În căutarea succesului, managementul performanței utilizează o diversitate de modele, tehnici și metode, unele preluate de la alte sisteme și perfecționate și altele proprii cu accent pe strategie și pe elemente de diferențiere puternice care să ofere un avantaj față de concurență. Modelul Balanced Scorecard aplicat la SC Cotnari SA propune o serie de obiective grupate pe patru categorii: financiar, clienți, procese interne și dezvoltare/potențial. Toate datele strânse, toate măsurătorile și analizele făcute se raportează la fiecare dintre aceste patru perspective. Caracteristica S.C. Cotnari S.A. o reprezintă, în urma analizei, stabilitatea structurală a veniturilor, în sensul concentrării a unei mari părți din venituri în cele de expoatare. Acest avantaj competitiv al firmei a condus la reducerea gradului de incertitudine a vânzărilor, în prezent aceasta deținând una din cele mai mari cote de piață.*

Cuvinte cheie: performanță, management, Balanced Scorecard, Cotnari SA

INTRODUCTION

Now the big companies in the wine making domain are facing an environment where the emphasis is on information, using modern technology and quality in serving the consumer. Thus, in an increasingly competitive wine sector

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firms seek resources and new ways to reassert their own position on the market. There is an increasingly receptivity for new management tools and the method of obtaining profit is as important as profit in itself. By analyzing the economic approach of the concept of business performance, we can mention two specific ideas, namely: a comparison between projects and outputs, the definition of performance through global productivity. Tackling the performance from the management point of view, we can say that this problem is sketched on the following coordinates: economy, efficiency and effectiveness.

MATERIAL AND METHOD

To achieve the paper we used the case study as a major research strategy and in analyzing the performance level of the company we used the Balanced Scorecard model. For data collection and analysis there were used qualitative research techniques and specific tools, analysis of internal documents, published articles and unstructured interviews with employees of the Cotnari S.A. company.

RESULTS AND DISCUSSIONS

Cotnari S.A. is a Romanian legal entity organized as a limited company. The activity is the production of wine grapes for their own farms, production, aging, packaging and bottling wines with designation of controlled origin from Cotnari Vineyard. Cotnari SA is profiled towards producing white wines with denomination of origin (DOC) and the designation of origin and quality levels (DOC-CT, CMD, CIB - late harvest, picking at full maturity, picking the noble grains). Cotnari SA has a national distribution network covering the entire country. Sales are done through Zonal distributors, with a total of 62 companies and has a selling over 96 of the annual wine production.

In search of success, the performance management uses a variety of models, techniques and methods, some taken from other systems and improved and more focused on its strategy of differentiation and elements that provide a strong competitive advantage (Andone I., 2009). A major concern for the managers and specialists from SC Cotnari SA over time was to obtain clarity on organizational and strategic alignment to a direction so as to regain the business vision turns into action. This can be achieved by using a model of excellence in business called the Balanced Scorecard. This model was introduced in modern management science by Robert Kaplan and David Norton (Kaplan R. S., Norton D. P., 1996) as "a concept designed to measure the activities of an organization's vision and strategies against it." Translated into Romanian as the **balanced score sheet** or **balanced scoreboard**, this concept provides managers a comprehensive picture of performance of a business. Balanced Scorecard offers a number of objectives grouped into four categories: financial, customer, internal processes and development / potential. All data collected, all measurements and tests made relates to each of these four perspectives. In other words, this strategic management approach helps companies meet their goals, focusing not only on financial results, but also on employees and customers. The great advantage

offered by BSC to the business of classical concepts is that in addition to recognizing potential problems that may arise in the company, the system allows the identification of possible solutions or action plan covering several non-financial performance indicators.. According to the methodology developed from SC Cotnari SA strategy identified strategic goals for each situation, and degree objectives is measured using selected indicators. To ensure accuracy of the information on achievements in the fields of vital activity Cotnari SA SC indicators are defined as monetary and non-monetary, e.g. concern is customer satisfaction, internal processes, functionality or innovation. From this perspective, the BSC is a management approach, which can be used at SC Cotnari SA after the definition and monitoring of strategic flexible indicators. BSC's objective is to provide for SC Cotnari SA leadership and employees a general picture of the development and main areas of responsibility. The indicators that are at the basis of Balanced Scorecard model can be separated in a first stage in **early indicators** and **late indicators**. Early indicators are used at the beginning or at an early stage of a process. They measure those processes, which today must determine with certainty the profit or cash flow that the company will have over five years. Early indicator signals have been investigated to what extent the client desires and expectations and also how he had known his ways to achieve the desired product or the provision before signing the contract. Thus it can find the direction to follow the appropriate organization services the customer needs, and this gives further market position. Late indicators are calculated at the end of a process and show a retrospective approach in which the process was far better or less well managed. Examples of such indicators are: turnover, cash flow, profit, production cycle, Return on Investment, staff satisfaction.

In the second analysis stage of BSC indicators are delimited according to management priorities SC Cotnari SA in four categories corresponding to the four dimensions of the classic model: **a customer perspective, the perspective of business processes, employee perspective and financial perspective.**

The four perspectives of BSC's classic model applied to the SC Cotnari SA are listed below.

Customer Perspective: What expectations can their customers create if the strategy is implemented successfully?

In the center of customer perspective of SC Cotnari SA is the fulfilment of desires and expectations. Among the major factors affecting the future success of SC Cotnari SA include customer satisfaction, their loyalty and conquest new customers. Even taking into account indicators customer perspective are linked by cause-effect connections. If the image dimension and size reputation, the immaterial factors such as brand name Cotnari play an important role. These factors are particularly important for the company's attractiveness in the eyes of customers. The third category includes delivery, response and delivery time, customer buying experience and quality to be found quickly and easily. In the context of intensifying competition among organizations, the intangible values (image, customer satisfaction, customer loyalty) have become essential for all

companies in the wine sector. Indicators should reflect the client's perspective of the SC Cotnari SA client's point of view. The question is what they use high-quality services and production processes so complicated that they would not be required by customer. Indicators should be chosen that best describe the quantitative factor. Having established exactly what and when it must be measured or calculated. Examples of indicators are late for this perspective: customer satisfaction, customer loyalty, attracting new customers, market share, and early indicators are: product features, customer relations, image etc.

Perspective of processes. From this perspective the question is formulated like this: What processes should be improved to satisfy the customers? Production processes in SC Cotnari SA are considered to begin work in the vineyards technology, and end when obtaining an order and delivery of different types of wine to customers by submitting to the provisions of company strategy.

The production is done either manually or mechanically on surfaces which admit it, using 27 U-650 tractors, 75 vine tractors, together with all due range of agricultural machinery: Sloppy, fertilizing, plowing, cultivation, pest control and diseases etc.. A series of treatments are done with aviation, as on most modern vineyards. The scorecard design requires the identification of those critical processes that influence customer satisfaction and financial targets for SC Cotnari SA. Relevant indicators of this dimension may be: the production cycle, production costs, raw material costs, the number of hierarchical levels every 100 employees, the prevalence of external periodic report of the company.

Perspective of employees is subjected to question: Where must the employee know-how and infrastructure be improved to successfully implement the business strategy? In Cotnari SA there work around 380 permanent employees and about 400 seasonal employees for periods of activity in the vine. Among permanent employees, there are 50 specialists, whose activity and competence increase the fame of the vineyards.

Example of late indicators relevant to the employees' perspectives are: employee satisfaction, employee loyalty, employee productivity, and early indicators are: employee training, proposals for improvement from employees, setting and reaching goals with employees, team effectiveness, informal infrastructure (information and communication flows).

Financial perspective. Can the financial results be presented to shareholders in circumstances in which the strategy is implemented successfully? The financial perspective is the most important perspective of BSC. A feature of the BSC approach (Kaplan R. S., 2005) is taking into account both the current data and the future, to identify problems early. It describes the long-term objectives of SC Cotnari SA in terms of profitability, increased turnover, increased productivity, reduced costs, etc. Financial analysis shows how to achieve financial balance of short-term and long-term as objective analysis based on the balance sheet. Financial balances are calculated based on the financial statement of the company, resulted in three indicators in particular: working capital, working capital requirements and the treasury (Kaplan R.S., 2006).

Table 1

Financial Analysis of S.C. Cotnari S.A. Iasi

Nr. crt.	Indicators	2007 lei	2008 lei	2009 lei
1	Capital Standing	33.099.552	46.544.106	63.423.547
2	Fixed assets	24.025.643	35.187.387	38.665.411
3	Current assets	20.292.249	24.018.696	28.710.384
4	Cash Money	645.205	2.239.893	696.617
5	Non-current assets (-Availability)	19.647.044	21.778.803	28.013.767
6	Current Liabilities	11.218.340	12.661.977	13.952.248
7	Working capital fund (1 – 2)	9.073.909	11.356.719	24.758.136
8	Working capital requirement (6 - 7)	2.144.431	1.305.258	-10.805.888
9	Net treasury	6.929.478	10.051.461	13.952.248

Of the data presented in table 1, the company has working capital and is necessary for carrying out a safety margin of the unit, the daily operation enabling to ensure a minimum level of current assets to operate at optimum strictly necessary parameters. This demonstrates that the unit has a surplus of funding sources in relation to the needs of capital assets and may be regarded as a favorable situation.

There is an increase in net cash, this is positive for the unit under study. This increased liquidity shows that society can afford short-term debt repayment.

Customer Perspective	INDICATORS
C1 The development of mass customers	% Of new customers
C2 Customer loyalty	Turnover from new customers
C3 Image development	Customers lost
Process Perspective	Ha planted with vines, valuable varieties
P1 Developing strategic segments	Market share
P2 Development of innovative processes	Number of new types of wine out on the market
P3 Quality	Turnover related to new types of wine
P4 respect EU legislation in wine production and environment	Litigation
Employee Perspective	increased turnover per employee
A1 Developing skills	knowledge of foreign languages in the sales department, the degree of resolving complaints
A2 Business Stability	
A3 Employee satisfaction	
Financial Perspective	Increased turnover
F1 Increased activity	Change in operating profit
F2 The increase in operating profit	Change in financial expenses
F3 Compliance rates for the recovery of invested capital	Resources / turnover under its own indirect expenses / net turnover
F4 Decrease of financial expenses	
F5 Improving operational performance	

Fig. 1 – The four perspectives of BSC S.C. Cotnari S.A.

Although S.C. Cotnari S.A. gives managers information from four different viewpoints, while minimizing the BSC model laden with information, limiting the number of performance measures used. It forces managers to focus on a set of measures, which prove to be ethical.

From the analysis of figure 1 can be seen that the BSC model brings together in one report, many seemingly disparate elements of a competitive level of a S.C. Cotnari S.A: customer orientation, reducing response time, promoting teamwork, time-reduction for new products, management of long-term development etc. Forcing top managers to simultaneously consider all the important operational measures, TBE allows them to see if the improvements in one area did not somehow damage other areas, protecting against sub-optimization.

CONCLUSIONS

1. S.C. Cotnari S.A. feature represent, upon analysis, the structural stability of income i.e. concentration of a large part of income in exploitation.

2. The company's competitive advantage has led to reduction of uncertainty of sales, currently holding one of the highest market share.

3. Due to the results obtained, the company has proposed a restructuring and modernization program and profit maximization, with several objectives, clearly defined and appropriate strategies.

4. Some of the major benefits that come with a successful implementation of a Strategic Performance Management System based on the Balanced Scorecard are:

- Improve management of S.C. Cotnari S.A. by reducing costs and improving productivity
- Allows alignment of operational activities to the strategic plan
- Balanced Scorecard supports the visibility provided by making better decisions faster and at budget and control processes in the S.C. Cotnari S.A.
- Provides recognition of individual merit and team by facilitating the connection between learning, performance and reward

6. Once the strategic planning process based on the Balanced Scorecard is completed, it must be constantly reviewed and updated. Since the Balanced Scorecard is a flexible model that can be adapted at any time, it must be made constantly reviewed to ensure timeliness and relevance of the strategy in relation to any changes in internal or external environment.

7. Regarding the analyzed unit, S.C. Cotnari S.A., it stands out by a complex activity, which has managed to maintain its fame, vineyard reputation and wine quality. The fame of the products made in this unit is also maintained by the distinctions obtained at various national and international competitions.

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EDUCATIONAL MANAGEMENT – ADAPTATION TO CULTURAL SPECIFICITY

MANAGEMENT EDUCAȚIONAL – ADAPTAREA LA SPECIFICITATEA CULTURALĂ

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Abstract. *We live in constant transition, both economically and socially. In management we are guided by criteria more or less universalist, often copied/borrowed without any effort to cultural appropriateness. This also happens in the educational plan because the programs and methodologies, but also the effective work with human resource, ignore the fact that people from certain cultures have a specific potential, that must be valorised. Some ideas related to this national or regional specificity were raised in a research developed in order to analyse the regional cultural differences, on equivalent samples of students. They may help the integration in class, taking into account the cultural values, in order to increase performance in both sides: teacher and student.*

Key words: educational management, adaptation, cultural specificity, equivalent samples, intercultural management

Rezumat. *Trăim într-o permanentă tranziție, atât în plan economic, cât și social. În management ne ghidăm după criterii mai mult sau mai puțin universaliste, de multe ori copiate/împrumutate fără efortul de adecvare culturală. Acest lucru se întâmplă și în plan educațional, deoarece programele și metodologiile, dar și lucrul efectiv cu resursa umană ignoră faptul că oamenii dintr-o anumită cultură au un potențial specific, care trebuie valorizat. Câteva idei prin care se poate ține cont de această specificitate națională sau regională decurg dintr-o cercetare efectuată în scopul analizei diferențelor culturale regionale, pe eșantioane echivalente de studenți. Ele pot servi efortului de adaptare la clasă, ținând cont de valori culturale, pentru creșterea performanțelor de ambele părți: profesor și student.*

Cuvinte cheie: management educațional, adaptare, specificitate culturală, management intercultural, eșantioane echivalente

INTRODUCTION

Elaborated and developed in the field of social sciences such as anthropology, ethnology, sociology or social psychology, cultural studies take an increasing scale, finding their application in the area of economics, particularly management and marketing. New areas of research are emerging, such as the intercultural management, that aim, among other things, identification, analysis, management and valorisation of cultural differences.

The possibilities of valorisation of cultural specificity elements and / or cultural differences in management have a wide field of expression, but in this article, we limited the area of analysis to the educational management, referring directly to the classroom management of pupils / students. This is because we want to draw a

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warning about the practice of copying and imitation, which are increasing because the European Union requires a common framework, through regulations which refer to specific educational content and methodology. Adherence to regulations on education does not also refer to copying the style of application. Here is the flexible area, where national and / or regional cultural specificity elements find a proper consideration and appreciation.

Culture, understood as "mental programming" affects individuals. Numerous studies have revealed dimensions of cultural specificity with which the national / regional cultural potential level is decoded (Hofstede, 2001; Hall, 1992, Hampden-Turner and Trompenaars, 2004; Schwartz, 1999). Knowledge attitudes, behaviors, attitudes, positions towards action and solutions of the individuals from a particular cultural area can be exploited positively in areas such as management, marketing, communication. Recommendations in this respect are offered by various authors (Prime and Usunier, 2004; Hofstede, 2001; Schneider and Barsoux, 2003; Jandt, 2007). With respect to management, we believe that valorisation of cultural specificity elements finds its application also in the field of educational management, for which, in this paper, we proposed to develop this topic.

MATERIAL AND METHOD

The article is based on an extensive research, which had among its objectives the search and identification of regional cultural specificity.

Table 1

The Structure of Equivalent Samples

FUNCTIONAL VARIABLES	VARIANTS	CLUJ		CRAIOVA		IAȘI	
		No.	Percent	No.	Percent	No.	Percent
Specialization	Marketing	19	24.36	36	24.66	43	24.71
	Management	28	35.90	52	35.62	62	35.63
	ECTS	31	39.74	58	39.73	69	39.66
Years of education	14 years	74	94.87	139	95.21	166	95.40
	15 years	3	3.85	5	3.42	6	3.45
	18 years	1	1.28	2	1.37	2	1.15
Age	20-24	76	97.44	143	97.95	170	97.70
	25-29	2	2.56	3	2.05	4	2.30
Location	Rural	13	16.67	23	15.75	28	16.09
	Urban	65	83.33	123	84.25	146	83.91
Gender	Feminine	58	74.36	109	74.66	130	74.71
	Masculine	20	25.64	37	25.34	44	25.29
Job	Yes	18	23.08	34	23.29	40	22.99
	No	60	76.92	112	76.71	134	77.01
TOTAL SAMPLE		78	100.00	146	100.00	174	100.00
TOTAL SAMPLE		398					

This approach was done in three stages:

1. Exploratory analysis (inventory values, grouping them by size and cultural orientations);
2. Explanatory analysis (explaining the differences);
3. A questionnaire survey (data collection instrument was adapted to the cultural specificity and referred to the inventory values from the first stage; it was administered on equivalent samples of students from the public Faculties of Economics from Iasi, Cluj and Craiova, Management, Marketing and Trade Economics, Tourism and Services specializations, the second year of study (table 1). When entering data in the database (SPSS), there were eliminated the questionnaires of the students who come from another region than the one represented by the corresponding university centre.

RESULTS AND DISCUSSIONS

a) Results of research

After processing the statistical data and the qualitative analysis, there were resulted a series of particularities and regional differences which we summarized in the following lines:

a₁) Students from **Oltenia** like *hierarchy* and *independence* and they perceived the lack of solidarity, registering the highest score in favour of segregation. They give importance to *collective interests* and they appreciate gender equity on a lesser extent than in Transylvania and Moldavia, although the scores are in favour of egalitarianism. The *self-assignment of failure* trend is consistent with the need for independence and voluntarism. They perceive most acutely the need of *wealth*. They appreciate *the least of all the competition*, aspect that is positively correlated with the privileging of collective interests. Another feature is *escape from social isolation*, in harmony with profane hedonism (shopping, entertainment). They have a strong need for *structuring* and *prioritizing* and they perceive time pressure on a greater degree than the Transylvanians. *Formalism, intolerance, past emphasis, privileging the solution of the moment, carelessness, and appreciation of profane hedonism* ("expensive") are other attributes. They have the lowest score at long-term orientation. They value less the religious ceremonies, but they state that religion is very important to them. Although *proactive*, they perceive that *they put into practice their own projects in the slightest degree*, compared with Moldavians and Transylvanians. They are *intuitive, flexible* natures, who appreciate *the concrete*, and they consider themselves less utilitarian than the Transylvanians and Moldavians.

a₂) The **Moldavian** students emphasize the most the *hierarchy* and outsource the utmost the responsibility. They have a higher sense of duty, issued in moral obligations, more powerful than in the other two analyzed regions. They perceive *the lack of solidarity* and they believe in the highest measure that the unpleasant things must be said, which reflects the fact that they are not so preoccupied by harmony. They state in a greater degree than the people from Oltenia and Ardeal that they trust in people and are more *suspicious* than the Transylvanians (but not surpass the people from Oltenia). They appreciate *the egalitarianism between sexes*, they perceive the need for *wealth*, they *self-assign the*

success to an extent far greater than the people from Oltenia and Ardeal, they have the highest *tendency to externalize failure* and feel the strongest *the need for success*. They accept competition, but to a lesser extent than the Transylvanians. They perceive the need for *socialization* and *sympathy* (resonance, empathy). There is a mix between *intuition* and *reasoning*, with a slight privilege of reasoning in comparison with other regions. They feel strongly the time pressure but also the need of *instructions* and the need *to be busy*, that are uncertainty avoidance related items, features that correlate positively with *intolerance*. Concern for the “*good sense*” is more pronounced compared to other regions. Other values are encouraged: *flexibility*, enthusiasm to start a new business, *duplicity*, duality, *creativity*. They appreciate hedonism and they make a balance between the sacred and the profane hedonism. They consider the utmost, that *they put into practice the plans*, being more oriented towards achieving *visible results* and they are rather *pragmatic* than dreamers, aspects that correlate positively with privileging the reasoning. As well, they believe that they are *more oriented towards well done job*, but less serious, in the sense that they tell something and do differently.

a₃) **Transylvanian** students are more egalitarian and less formal than the people from Oltenia and Moldavia. They are more oriented towards *traditional values* (conformity, religious feeling, and harmony). They realize to a greater extent that the individual’s merits are not recognized. Although they consider that they have less trust in people, compared with those from the other two regions, they have less suspicion. They emphasize *gender egalitarianism* and they have the tendency to externalize the failure, they largely support *the competition*, they are *more responsible*, they do not perceive strongly the need for wealth, that correlates with power. They feel the need of *socialization* and they value *benevolence* (support, help). They are characterized by the mixture between *intuition* and *reasoning*, with a slight privilege of intuition, compared to the other regions. They manifest the need for structuring (lower than in Oltenia), the need to be busy and intolerance (lower than in Moldavia). They privilege (to significant differences from people from Oltenia and Moldavia) protestant values such as *perseverance* and *tendency for savings*; they are more consistent and more coherent in statements and facts, inclusive in religious issues. They appreciate the utmost the *spiritual hedonism*, cheaper, which is correlated positively with the fact that they are the most moderate people. They believe that they discourage easily in their work and give things upside down. They see themselves less pragmatic than Moldavians, which is correlated positively with the fact that they perceive to be most insightful. They privilege concrete and utilitarianism.

b) Recommendations for an appropriate educational management

Following the analysis, the obtained data led us to the following recommendations with regard to the manner of adjusting the educational management to the specific cultural profile:

b₁) Regarding the manner of **communication** with students, because of a strong uncertainty avoidance, manifested by structuring needs, instruction, organization and prioritization needs, more pronounced in Oltenia and Moldavia,

we suggest the privileging of formal channels of communication with students from Oltenia and Moldavia and formal and informal channels in the relationships with students from Transylvania (the use of a channel or another, it must take into account the context and purpose of the communication). The content of the tasks must be emphasized by clear, precise instructions, through which they are very well structured. Setting priorities for solving them is greatly appreciated by the students from Oltenia. Specifying the working and organization methods through precise and firm statements is desired especially by the students from Oltenia and Moldavia. In terms of vocabulary, we recommend orientation toward concrete and avoiding the abstract terms.

b₂) As **the approach manner** of the group of students, we consider that the paternalistic attitude is more appropriate in Transylvania, where students are more responsible. In Moldavia and Oltenia, a sharper perception of the hierarchy, fear of mistakes, a weaker assumption of responsibility requires a more direct style, but an empathic and diplomat one.

b₃) On **the level of motivation**, we note the following preferences and value accents (table 2):

Table 2

Motivational Differentiation Recommendations of Educational Practices

Moldavia	Oltenia	Ardeal
diversity of tasks is particularly important – they manifest enthusiasm in receiving a new task	diversity of tasks is important	diversity of tasks is less important – they tolerate well both routine tasks and supplementary ones
providing an opportunity to be creative	giving voice to show creativity	feedback (they are dissatisfied if merits are not recognized)
choosing of tasks based on real competencies to avoid failures	assign tasks that involve internal control, autonomous decision making	distribution of more important tasks that require a lower control and a higher level of delegation
distribution of tasks that involve the elaboration of a work from start to finish, with a visible result (identity task)	distribution of tasks that involve the elaboration of a work from start to finish, with a visible result (identity task)	distribution of tasks that require prolonged effort (they are more tenacious)
providing a competitive environment (quite well tolerated by them), but with structures that favours teamwork	collaborative environment (escaping from social isolation is one of their features, even if they manifest gregar type behaviours)	creating conditions that lead to the creation of a competitive environment (very well tolerated)
allow liberty for emphasise their skills, because they feel the utmost the need for success	allow flexible programs and deadline, to provide them the sense of autonomy (they are proactive natures; attention, they are more uncaring!)	engaging in activities with a prominent social, charity character (values: harmony, benevolence, conformity, religiosity)
individual reward or penalization, stating clearly the performance criteria	individual reward or penalization, stating clearly the performance criteria	collective reward or penalization (traditional values: support and harmony, but also a lower need for wealth)

CONCLUSIONS

1. At regional level there are cultural specificity elements that can be expressed synthetically by the following keywords: antithesis (characteristic to the students from Oltenia, who are able to integrate / assimilate opposing values, apparently in conflict ones), flexibility (specific to the Moldavian students who are able to adapt easily to different situations), consistency (a feature of the Transylvanian students, characterized by emphasizing traditional values, including tolerance, harmony, solidarity, benevolence).

2. The approaching manner of the students must be adapted to the cultural profile.

3. We do not consider that for each region we must come up with fundamental changes, especially about the content, but, at the level of educational practices to achieve aptness (way of communication with the students, how to approach the group of students, the manner of motivation etc.), taking into account the presented regional cultural specificity elements.

4. By adapting to the axiological profile of students, the performance and the efficiency of teaching activities will improve. We consider that the recommendations provided in this article may constitute at least a starting point in this process.

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MANAGERIAL SKILLS NECESSARY FOR MANAGERS OF AGRICULTURAL FARMS FROM VASLUI COUNTY IN ORDER TO ABSORB EUROPEAN FUNDS

COMPETENȚE MANAGERIALE NECESARE MANAGERILOR EXPLOATAȚIILOR AGRICOLE DIN JUDEȚUL VASLUI PENTRU ABSORBȚIA FONDURILOR EUROPENE

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Abstract: *The farm managers must take into account the future development of their business the impact of changes in the environment, the complex issues and situations circumstantial that tend to appear. An important issue related to the development of rural development projects is the professional competence of economic and social agents who initiate, develop and implement such projects, the existence of an effective infrastructure for consultancy of such projects. In order to produce efficiently and competitively, the agricultural farms, irrespective of their type, must enroll in the tendencies that currently exist in the global agriculture, in order to promote qualitative factors among which we mention developing knowledge, managerial training, technical upgrade, application of modern technology, computerization etc.*

Key words: managerial skills, agricultural farms, Vaslui, European funds

Rezumat. *Managerii exploatațiilor agricole trebuie să țină seama în dezvoltarea viitoare a afacerii lor de impactul schimbărilor în mediul din care face parte, de problemele complexe și situațiile conjuncturale care apar. O problemă importantă legată de elaborarea proiectelor de dezvoltare rurală o constituie competența profesională a agenților economici și sociali care inițiază, elaborează și pun în aplicare asemenea proiecte, existența unei infrastructuri eficiente de consultanță pentru asemenea proiecte. Pentru a putea produce eficient și competitiv, exploatațiile agricole indiferent de tipul lor, trebuie să se înscrie în tendințele care se manifestă în prezent la nivelul agriculturii mondiale, spre promovarea factorilor calitativi din rândul cărora fac parte dezvoltarea cunoașterii, pregătirea managerială, înnoirea tehnică, aplicarea tehnologiilor moderne, informatizarea etc.*

Cuvinte cheie: competențe manageriale, exploatații agricole, Vaslui, fonduri europene

INTRODUCTION

The management concept of the businessman in agriculture is at the basis of his action plan which includes, among other things, economic development solutions, optimal technical and strategic identification of skills that exist in the

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team that he leads, establishing responsibilities to subordinates, motivating their actions and last but not least, control of actions taken on responsibilities. In practice, the human factor is decisive. Consequently, training and certification of future specialists is a necessity arising from the economic development strategy.

MATERIAL AND METHOD

The work includes theoretical and practical concepts and principles of production management and a range of methods and techniques which act as tools for improving the farmers' competences. The theoretical foundation is complemented by practical example of the analysis of Vaslui County agriculture. As for the agricultural systems practiced, completed by the evaluation of agricultural activities in 2007-2009, with emphasis on dynamics and structure of the results and indicators of economic efficiency achieved during the period under review. There were also used materials provided by the FEADR. For the processing and interpretation of data, there were used diagnostic analysis method, investigation and correlation.

RESULTS AND DISCUSSIONS

In practical implementation of management precepts, the human factor is decisive. Consequently, the training and certification future specialists is a necessity arising from economic development strategy. In addition, management is foreseen at the branch level, more than an integrating subject. It has, therefore, the role of assembling knowledge from different disciplines, of harmonizing them into a global system of thinking and - especially - to reveal the economic dimension of a certain technology options in the plan. Acquiring thorough theoretical precepts, methods, techniques and management tools, is a sine qua non of competent performance of their duties vested with powers under the management boards, steering committees of the farm or to become a private entrepreneur.

The training also aims at calling attention to the heritage of knowledge of management, but also the formation of modern managerial thinking, emphasizing on the development of personality in the profession, under conditions of risk and uncertainty. In these conditions of risk and uncertainty, the progress of farms and agriculture as a whole depends on the highest level of quality of managerial competence and skills that managers must show when managing- the provision, organization, initiation actions, control and regulation of activity. If the farmer is setting up a vegetable farm he must take account factors relating to: preparation and individual experience, need to choose an optimal structure of crops, assess the possibilities for optimal recovery of production, determination of main competitors, identifying potential customers for products produced on the farm. The manager of a vegetal farm must constantly intervene in the conduct of the entire production process and choose the best solutions for the supply of material and technical resources, administration, staff management and coordination of the farm, carrying out production activities according to objectives, ensuring quality production processes and products, recovery products, promote and sell them on the market, the financial activities of the farm.

After the inventory of cultures it turned out that the agricultural area of Vaslui county is 401,231 ha, of which 291 473 ha of arable land, 86,950 ha of pasture, 7951 ha of grassland, 12,259 ha of vineyards and 2,598 ha of orchards (figure 1).

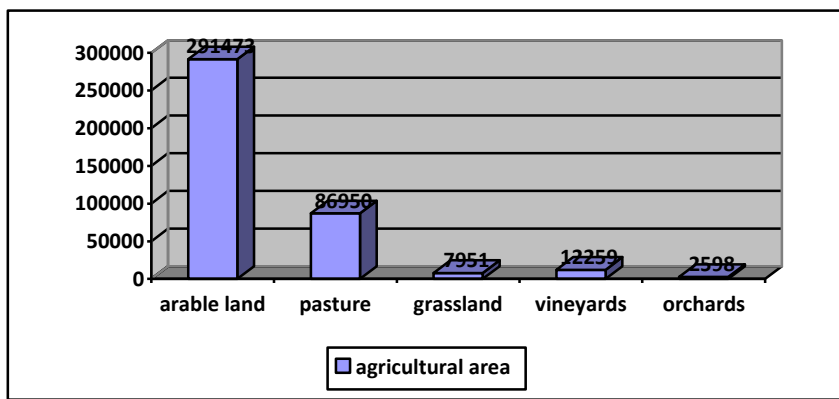


Fig. 1 - The agricultural area of Vaslui county (ha)

Of the total 401,231 ha, the area of 353,100 ha is worked in the private sector and 48,131 hectares in the state sector.

The private area is used by a number of 214 commercial farms in which 13 agricultural companies established according to the Law no.36/1991 on agricultural associations and other forms of association in agriculture with an area of 5442 hectares, 133 limited liability companies, 30 family associations and 38 authorized individuals who exploit agricultural land under Lease Law nr.16/1994, as amended and supplemented with an area of 93,159 ha as well as 239,503 ha of individual producers and other private establishments 2133 ha. The state sector has 48 131 ha, of which 5823 ha is owned by the State Domains Agency and leased to economic operators, 1266 ha belong to research units and 42 487 ha of other owners (local councils, colleges, schools, households annexes of Defence etc.).

From the analysis of surfaces and yields achieved in 2007-2009, at grain crops, there is a decrease in area with 7636 hectares, from 167495 ha in 2007 to 159859 ha in 2009, and the production fluctuated, in 2007 resulting in a yield of 3280 kg / ha due to drought, and in 2009 obtained the highest yield of 4130 kg / ha in the period under review (table 1).

We also believe that a very important role in increasing economic efficiency have the grain producer organizations that can negotiate a good price with employers in the milling and baking areas.

At maize there has been a sharp decrease in the area with 21699 ha from 117063 ha in 2007 to 95364 ha in 2009 and average production per hectare increased from 2075 kg / ha in 2007 to 3417 kg / ha in 2009.

Sunflower area decreased from 40747 ha in 2007 to 34825 ha in 2009, and the average production dropped from 1389 kg / ha in 2007 to 1018 kg / ha in 2009.

Table 1

Areas cultivated in 2007-2009 crop years

Nr. crt.	NAME OF CROPS	Cultivated area (ha)			Deviation registered 2009/2007	
		2007	2008	2009	ha	%
1	Grain cereals	167495	172105	159859	-7636	-4,5
2	Wheat+ rye	42016	43941	55496	13480	24,2
3	Maize-consumption	117063	119983	95364	-21699	-18,5
4	Leguminous plants for grains	1016	1009	1026	10	0,9
5	Total oil plants	54618	55476	58243	3625	6,2
6	Sunflower	40747	55476	34825	-5895	-14,4
7	Rape	7570	7441	22929	15359	66,9
8	Soy	6232	1611	223	-6009	-96,4
10	Total potatoes	2540	2866	2617	77	2,9
11	Vegetables	6324	6664	6723	399	5,9
12	Total forage	28920	30212	33217	4297	12,9
13	Seed lots	695	718	1003	308	30,7
14	Left unseeded	27430	20571	27620	190	0,6
15	Total arable	291 437	291 202	291 340	-79	0,02

In Vaslui County there has greatly increased the area planted with rape from 7570 ha in 2007 to 22929 ha in 2009. As for the average production, it increased from 1398 kg / ha in 2007 to 2413 kg / ha in 2007 (table 2). Given that rape is the main species from which biodiesel is extracted and 2003/30/EC EU requirements, which seek to promote the use bio-fuels and other renewable fuels, particularly in the transport sector as part of EU policy to reduce import dependency energy and lowering greenhouse gas that causes global warming, we believe that the culture should be extended.

Table 2

Total productions in 2007-2009 crop years

Nr.crt	Name of crops	Total productions (tone)			Deviation registered 2009/2007	
		2007	2008	2009	tone	%
1	Wheat+ rye	137813	59834	229209	91369	39,8
2	Maize for grains	242999	41155	230584	-12415	-5,1
3	Sunflower consumption	56638	15389	35472	-21166	-37,3
4	Rape	10583	19755	55339	44756	80,8
5	Soy	7579	8	0	-7579	-100
6	Sugar beet	23856	3554	3661	-20195	-84,6
7	Total potatoes	25579	4270	23122	-2457	-9,6
8	Vegetables	85496	38377	73363	-12133	-14,1

The specifics of the managerial processes is reflected both in higher proportion in which managers must possess a number of qualities, knowledge, skills and behaviours required of all farm components and a range of knowledge and skills in this area. The first category includes: intelligence, memory, sense of observation, concentration capacity, health, character, qualities necessary in any profession, but higher for managers, given the complexity and difficulty of management processes. The results of qualitative knowledge and skills, talent and training managers, regardless of the hierarchical level, gender, age, is represented by the managerial ability or "leadership". In essence, we designate the interpersonal influence which the manager exerts on the subordinates in the process of setting and especially accomplishing the objectives.

The items presented provide sufficient grounds to argue that in the agricultural farms a new profession has outlined - the manager.

The **skills** needed for a farm manager are: *specialized skills* (in basic domain, project management, multidisciplinary, general management knowledge) *methodological skills* (organizational skills, focus on objective, strategic thinking, experience in project activities, teaching skills), *social skills* (management skills, motivation, delegation of powers) *communication skills* (communication and negotiation skills, confidence in talking, conflict resolution); *competences in personality* (self-control, creativity, desire for change, resistance to stress, initiative and accountability, adaptability, discipline, risk management, integrity, positive attitude toward people).

An important question regarding the elaboration of rural development projects is the professional competence of economic and social factors that initiate, develop and implement such projects, the existence of an effective consultancy infrastructure for such projects, availability of institutes or workshops for complicated projects, which require a large specific design proficiency and introduce effective economic and financial mechanism to enable the financial support of the design and implementation of the projects.

Measure 1.4.1.a EAFRD Programme: Support for semi-subsistence farms aims to facilitate the restructuring and transformation of semi-subsistence farms in farms oriented to the market through sustainable use of inputs, improvement of management through diversification of agricultural production and the introduction of technologies adapted to local conditions.

Measure 143 Provision of counselling and consultancy services for farmers. The aim of the scheme is to assist farmers to use counselling and consultancy services for restructuring and improving the overall performance of their duties. This will particularly serve to enrich managerial skills of all categories of farmers through specific advisory and consultancy activities undertaken with the help of specialists from the local consultancy centres.

The consultancy will help to better inform the farmers for modernizing, qualitative reorientation of production, farm diversification, application of production practices compatible with landscape conservation and promotion, environmental protection, hygiene standards and animal welfare and to acquire

management skills necessary to administer a farms economically viable. Consulting aims and standards for occupational safety in the workplace based on Community legislation.

It will follow the dissemination of knowledge in management and administration of land and farms, the application of good agricultural and environmental practices under the Cap. 1 Articles 4 and 5 and Annexes III and IV of Regulation (EC) no. 1782/2003.

The advice will include regular visits to farms, support for additional identification and coordination of specialist advice, support for the credit assistance for drafting, monitoring the implementation business plan, etc.

CONCLUSIONS

1. The rural development programs are based on the objectives of rural development strategies and policies laid down in this area and include all shares and assets intended to be used to achieve rural development goals within a given area.

2. EAFRD is an opportunity of funding for rural areas, amounting to approximately 7.5 billion Euros, from 2007 until 2013. Similar to SAPARD and EAFRD it will be based on the principle of co-financing private investment projects. The consultancy will include regular visits to farms, support for additional identification and coordination of specialist advice (e.g. preparation of the application for agri-environment), support for the credit (e.g., participating in meetings with prospective lenders), assistance for drafting, monitoring the implementation of the business plan etc.

3. In EAFRD program, the measures meant to improve knowledge and consolidate human potential, is more pronounced compared to SAPARD.

4. We recommend a series of measures to improve the managerial skills of farm managers in Vaslui county, namely: improving information for farmers on opportunities of EAFRD financing, promotion among small farmers firstly the measures that do not require co-financing such as Measure 141 "Supporting Semi-subsistence farms" knowing that the vast majority of farms in Vaslui County are in this situation, stimulate formation of producer groups by providing financial assistance for establishing and operating business support groups recognized under national legislation and encourage innovative activities (for example, new solutions to old problems, the introduction and development of new products, new market systems, modernization of traditional activities by applying new technologies).

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EXTRACURRICULAR ACTIVITIES: TRAINING METHODS OF THE ENVIRONMENTAL EDUCATION AT HIGH SCHOOL

ACTIVITĂȚILE EXTRAȘCOLARE - MODALITĂȚI DE FORMARE A EDUCAȚIEI ECOLOGICE LA NIVEL LICEAL

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Abstract. *The extracurricular activities can be carried by pupils guided by teachers outside the classroom, in various forms: excursions, hiking, cleaning actions in some areas, competitions, etc. Some of these activities can be performed to mark certain days dedicated from the environmental calendar. Based on these considerations and taking into account the profile of high school we have designed a set of activities to mark several events from the environmental calendar. Three of these activities are the subject of this paper: „Black Sea needs us”, „Botoșani - City of my childhood” and „The Wetlands and their importance”. All these activities aim to stimulate awareness and motivation for environmental protection, capacity for observation, exploration and understanding of the surrounding reality, developing a positive attitude towards the environment and environmentally appropriate behavior.*

Key words: extracurricular activities, environmental education.

Rezumat. *Activitățile extrașcolare pot fi realizate de către elevi, îndrumați de profesori, în afara orelor de curs, sub diverse forme: excursii, drumeții, acțiuni de igienizare a unor zone, concursuri, etc. O parte din aceste activități pot fi realizate pentru a marca anumite zile consacrate din Calendarul ecologic. Pe baza acestor considerente și ținând cont de profilul liceului am conceput un set de activități care să marcheze mai multe evenimente din Calendarul ecologic. Trei dintre aceste activități „Marea Neagră are nevoie de noi”, „Botoșani – Orașul copilăriei mele” și „Zonele Umede și importanța lor” fac obiectul prezentei lucrări. Toate aceste activități vizează stimularea motivației privind cunoașterea și protejarea mediului înconjurător, dezvoltarea capacității de observare, explorare și înțelegere a realității înconjurătoare, formarea unei atitudini pozitive față de mediu și a unui comportament ecologic adecvat.*

Cuvinte cheie: activități extracurriculare, educație ecologică.

INTRODUCTION

The extracurricular activities can be carried out by pupils guided by their teachers outside the classroom, in various forms: excursions, hiking, visits, cleaning actions of the green areas, debates, competitions, Eco Patrol etc. The extracurricular education has its precise role and place in forming the pupils'

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personalities. The education by means of extracurricular activities focuses on identifying and cultivating the optimal correspondence between the pupils' abilities, talents, research and teamwork abilities development, analysis and data communication abilities, interest in cultivating a healthy life style, as well as the stimulation of the creative behaviour in different fields.

According to Costică Naela et al., (2007), some habits formed by the educational activities involved in the environmental protection can contribute to the general development of the pupil. A part of these activities may be carried out in order to celebrate some special days in the environmental calendar.

Based on these considerations and taking into account the high school focus on natural resources and environmental protection, we conceived a 2010-2011 activity program that mark several events from the ecologic calendar. Three of these activities: "*The Black Sea needs us*", "*Botosani – the city of my childhood*" and "*The Wetlands and their importance*" are the subject of the present paper work. They mark three important days of the environmental calendar, which are "The International Black Sea Day" (October 31st), "World Town Planning Day" (November 8th) and The World Wetlands Day" (February 2nd).

In the continuation, few synthetic information referring to the importance of those three events from the environmental calendar, are presented.

On October 31st 1996 the six Black Sea riparian countries - Bulgaria, Georgia, Romania, Russian Federation, Turkey and Ukraine – signed the Strategic Action Plan for the Rehabilitation and Protection of the Black Sea. This day designated "the International Black Sea Day". The Black Sea is the world's most isolated sea connected to the Oceans via the Mediterranean Sea through the Bosphorus, Dardanelle and Gibraltar straits and linked with the Sea of Azov in the northeast through the Kerch strait (www.mmediu.ro). The coastal areas of the Black Sea include a diversity of habitats, with vegetal and animal species of national and international importance, designated as Ramsar sites, reason for which a project entitled the Ramsar Regional Initiative for Black Sea coastal wetlands (www.ddbra.ro; www.blackseawet.org).

To the initiative of the Professor Carlos Maria della Paolera from the University of Buenos Aires the "World Town Planning Day" has been celebrated since 1949, in over 30 countries. The aim of the activities carried out for celebrating this day is to take into attention the town planning problem and its effects over the sustainable development of the society (www.ecomagazin.ro).

This year, we celebrate the 40th anniversary from the day the Ramsar Convention (Iran, 1971) was signed, which aims the conservation and sustainable use of the wetlands and their resources (www.rowater.ro). "The Convention on Wetlands of International Importance, mostly for the aquatic birds" is the first international environmental convention to which Romania adhered (by means of Law 5 of 1991) (www.apmgr.ro). In the Ramsar Convention list there are over 1600 international importance wetlands; 5 wetlands were designated as Ramsar sites in Romania (www.rowater.ro). In Botosani County, three wetlands (the Stâncă Costești Lake, the ponds on the valley Bașeu-Podrigăi-Ibăneasei and the Lozna peat bog)

were declared Protected Natural Areas of Community Interest because they are biotopes for birds that are protected in the UE. (www.apmbotoșani.ro).

MATERIAL AND METHOD

A series of special activities that resulted attractive and accessible to the high school pupils were organized between October 2010 and February 2011. Pupils from 9th to 11th grades from "Petru Rareș" High School from Botoșani and students from the Faculty of the Biology of Iași University participated to these thematic actions.

By carrying out these activities, we tried to mark the three international events on the above-mentioned environmental calendar.

Objectives: knowing the characteristics and the importance of different types of ecosystems (marine, urban, wetland specific); developing the team working abilities, the environmental documentation, investigation, and research abilities, the data communication abilities; awareness of pupils on: problems of the marine ecosystem, urban areas and wetlands, the role of green spaces; identifying applicable solutions from the perspective of pupils on protecting the marine environment, urban environment and wetlands; the formation of a positive attitude towards the environment.

Didactic strategies: heuristic conversation, Power Point presentations, research papers, posters, on field research displacements, case study; debates, didactic games, teamwork activities, problematisation, brainstorming, photo competition.

Operating place: according to their specific theme, the activities were carried out in the classroom (the ecology laboratory), in various areas of Botosani city.

RESULTS AND DISCUSSIONS

Carried out activities:

1) *"The Black Sea needs us"*. The activities carried out under this title were very diverse. They consisted in Power Point presentations, research papers, posters, publications, booklets, the Children's Encyclopedia and fliers over the Black Sea marine life; debates regarding the Black Sea: general information, the flora, the specific fauna, the coast of the Black Sea, the tourist area, the port cities of the Black Sea, the pollution sources and the anthropic impact over the marine ecosystem as well as the importance of marine environment conservation (figure 1).

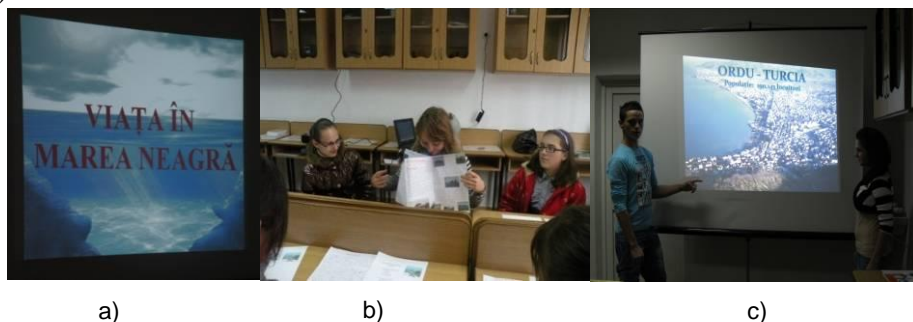


Fig. 1 - Images from these activities

The final part of the activities was represented by an active creational game named “the skilful housemaids” that stimulated the pupils to cook, observe and taste some of the marine fauna alimentary products (fish and fry cans). The figure 2 show images from the final part of these activities.



Fig. 2 - Images from the final part of these activities

2) “Botosani – The city of my childhood”. The activities consisted in:

- Power Point presentations of the city – seen as human settlement, the city of Botosani - past, present and future; the importance of the green areas in the city: case study – green areas in Botosani.

- Debates regarding the urban pollution (urban pollution sources, the effects of the pollution over the environment and the human health) and the measure to be take in order to reduce it; green spaces categories and their importance.

- On field practical activity in downtown area of Botosani city and in various neighborhoods in order to observe the cleanness degree of the city and to get to know the main parks and tourist sites of the city.

- Photo competition: the pupils organized in three groups had as a task to take some photos of Botosani on the following themes: city administrative buildings; cultural sites; historic and cult sites; beautiful versus less beautiful (less clean) areas of the city.

The figures 3 - 5 present images from these activities.

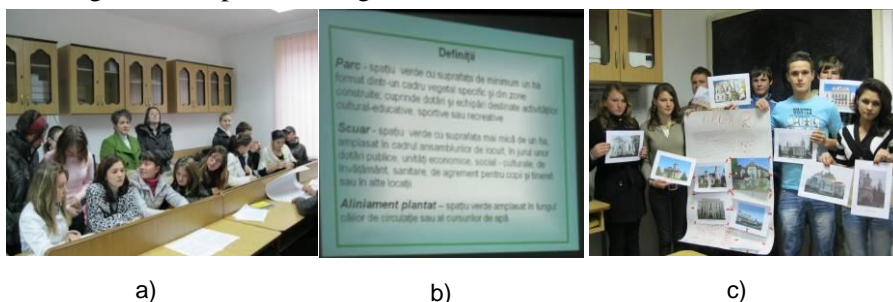


Fig. 3 - Images from these activities - in the ecology laboratory

At the end of the activity the pupils that involved themselves intensely in carrying out the activity, the ones that actively participated on debates and took the most beautiful photos were rewarded.



Fig. 4. - Mihai Eminescu County Library



Fig. 5 - Park Hall

3) *“The wetlands and their importance”*. The theme related activities consisted in:

- a presentation of documentary materials referring to the wetlands: fliers, booklets, magazines, specific field articles, the Children’s Encyclopedia – the wetlands animal life.

- debates over the type of wetlands, their importance, the specific flora and fauna; the wetlands in Romania and more specifically in Botosani County (characteristics, plant species, specific animals), wetlands protection measures.

- Power Point presentations, research papers referring to: Romanian wetlands and more specifically those in Botosani County (characteristics, plant species, specific animals), wetlands protection measures.

- designating and rewarding the most accomplished presentations the pupils made.

The photos from figure 6 show images from these activities.



Fig. 6 - Images from these activities

CONCLUSIONS

The activities carried out by the pupils brought positive changes in the pupils' behaviour and contributed to the improvement of their communication, enriching their vocabulary with terms from biology, ecology and environmental protection fields, as well as assuming some individual and group responsibilities and the development of creativity.

Also, these activities stimulated the curiosity and the interest for knowing the different aspects of the environment (local, national and international environmental problems; measures and initiatives to reduce the environmental pollution to protect the environment factors, the biodiversity and the human health).

The pupils were enthusiastic and showed an eager desire to accomplish more such activities in the future.

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RESEARCH REGARDING MANAGEMENT SYSTEMS FOR PLANTS WITH TWO STEMS, CULTIVATED IN SOLAR

CERCETĂRI PRIVIND CONDUCEREA PLANTELOR DE TOMATE CU DOUĂ TULPINI, CULTIVATE ÎN SOLAR

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Abstract. *The tomato plants were cultivated in solar, in extended cycle, managed with one stem as the classical plant management system for tomato, and with two stems, V shaped. The V shape was obtained by pinching the seedlings while planting them, removing only the growth top, and during the period when the shoots appeared, the first two shoots from the base of the plants were maintained, the rest of them being removed. The two shoots were individually supported on strings, V shaped, in order for the light to better penetrate to the plants. During the vegetation period, specific maintenance works were applied, with the observation that they were applied on agrotexile soil with mulch purpose and five phasal fertilizations, locally with Universol 18-11-18, 200 ml/pl, with a concentration of 1,5 %. The scheme of the experiment: V1- control, managed with one stem, at 80 cm / 40 cm , realizing a density of 31 250 pl/ha; V2 – plants managed with two stems, at 100 cm /40 cm, realizing a density of 25 000 pl/ha. After the interpretation of the results it could be observed that the plants managed with two stems behaved very well both from the point of view of vegetative growth and from the point of view of fructification. The fruit production calculated per plant was 3,8 kg for the plants managed with one stem and 6 kg for the plants with two stems. The production per meter square was 11,9 kg for the one stem variant and 15,1 kg for the two stem variant. From the point of view of the size of the fruit measured by weight, most of them were in the 100 – 150 g category, 35 % respectively 38 %, followed by the under 100 g category.*

Key words: protected areas, tomato plants with two stems, production, quality.

Rezumat. *Tomatele au fost cultivate în solar, în ciclu prelungit, conduse cu o tulpină ca în sistemul clasic de conducere al tomatelor și cu două tulpini, în formă de V. Forma de V a fost obținută prin ciupirea răsadului în momentul plantării, îndepărtând numai vârful de creștere, iar în momentul în care au apărut lăstarii, s-au lăsat primii doi de la baza plantei, restul fiind îndepărtați. Cei doi lăstari au fost palisați individual pe sfori, în V, în scopul pătrunderii cât mai bine a luminii la nivelul plantelor. Pe parcursul perioadei de vegetație s-au aplicat lucrări de întreținere specifice, cu mențiunea că s-a aplicat pe sol agrotexil cu rol de mulci și 5 fertilizări faziale, locale cu Universol 18-11-18, câte 200 ml/pl, în concentrație de 1,5%. Schema experienței: V1- martorul, condus cu o tulpină, la 80 cm/40 cm , realizând o desime de 31 250 pl/ha; V2 – plante conduse cu două tulpini, la 100 cm /40 cm, realizând o desime de 25 000 pl/ha. După interpretarea rezultatelor s-a putut observa că plantele conduse cu două tulpini s-au comportat foarte bine atât*

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din punct de vedere al creșterii vegetative, cât și din punct de vedere al fructificării. Producția calculată de fructe pe plantă, a fost de 3,8 kg la plantele conduse cu o tulpină și 6 kg la plantele conduse cu două tulpini. Producția la mp a fost de 11,9 kg la varianta cu o tulpină și 15,1 kg la varianta cu două tulpini. Din punct de vedere al mărimii fructelor apreciate prin greutate, cele mai multe s-au încadrat în categoria 100 – 150 g, 35 % respectiv 38 %, urmate de categoria sub 100 g.

Cuvinte cheie: spații protejate, tomate cu mai multe tulpini, producție, calitate

INTRODUCTION

Tomato culture in various ways still represents a challenge for those working in this field, being a species that easily adapts and positively reacts to the factors to which it is exposed, without exceeding certain limits. Plant management system with two stems is a challenge, being determined on one side by the rather high cost of hybrid seeds and on the other side by the capitalization as high as possible of the environmental factors that still exist. Plant management system with two stems is possible by maintaining the first offspring from the base of the plant, (Indrea D., 2007) that will play the role of a stem, variant accepted by when inside the culture gaps that cannot be filled appear, by pinching the plants in the seedling phase or by cutting the stems at 30 cm above soil, at the end of the first cycle, in order to pass to the second cycle, anticipating the production (Schutz Maria, 2010). In this last case, usually only one stem is maintained, which comes from a more vigorous shoot that appears on the portion of the stem which is maintained and which will anticipate the obtaining of the harvest in the second cycle.

For a superior capitalization of the environmental factors, especially the light, the plants can be alternatively managed along the row, in V shape (Hoza Gheorghîța, Soare Anca, 2010).

MATERIAL AND METHOD

The research was conducted at the Faculty of Horticulture in Bucharest, using the Romanian hybrid created at the Vegetable Center Buzau, Siriana F1.

Siriana F1 is an early hybrid, with undetermined growth, destined to cultivation in protected areas and open field. The fruit has an average weight of 120–180 g and an uniform red color. It produces 3–3,5 kg/plant/5 level and has a good transportation resistance.

The culture was founded in solar with two variants:

- V1- control, managed with one stem, at 80 cm / 40 cm, realizing a density of 31 250 pl/ha
- V2 – plants managed with two stems, at 100 cm /40 cm, realizing a density of 25 000 pl/ha

The two stems were obtained by pinching the growth top of the seedling during planting, leaving the two shoots appeared at the base of the plant, the rest being removed. Each stem was supported on a string, in V shape, in order to ensure better lighting for the plants. During the vegetation period, the culture was maintained by specific solar works, respectively irrigation, mulching the soil with agrotexile, local fertilization with solution of Universol 18-11-18, five times during the vegetation period, 200 ml/pl, with a concentration of 1,5 %. Observations and measurements were made regarding the height of the plants, distance until the point of insertion of the shoots, recording the production, determination of average fruit weight, calculating the absolute and relative production, measuring the size of the fruit and framing them into weight categories.

RESULTS AND DISCUSSIONS

The research being conducted in solar, on tomato plants regarding the plant management systems, showed that the plants react very well to the management system with two stems, being a vigorous species and with a very good capacity to support a high load of fruit.

Analyzing the fruit from the point of view of the biometric characteristics, it can be observed that Siriana variety behaved very good. Thus, the distance from the parcel to the first inflorescence from the first shoots that after that became stems was very close for the two variants studied, the difference being very small and influenced by the variety and obviously larger, respectively 58 and 59 cm, comparative to the insertion point of the first inflorescence from the main stem which for Siriana is around 30-35 cm. An important aspect recorded was that the distance until the point of shoot insertion was relatively small, 25 and respectively 27 cm. The plants recorded an increase in height of 1.8m, being managed in extended cycle (table 1).

Table 1

Biometric characteristics					
Variant	Average plant height, cm	Distance from the parcel to the first inflorescence from the left shoot, cm	Distance from the parcel to the first inflorescence from the right shoot, cm	Distance until the point of shoot insertion, cm	
				left	right
V1 – control	1.86	-	-	-	-
V2	1.83	59.3	58.4	25.2	27.3

Plant management system influenced the fruit production, both per plant and per unit of area. Regarding the average production obtained per one plant, it was observed that for the plants conducted with one stem it was 3.8 kg. for the plants conducted with two stems, the production was 3.1 kg on one stem and 2.9 kg on the other stem, and 6 kg per plant. The fruit production per meter square was influenced by the number of stems with which the plants were managed, thus for the variant with one stem 11.9 kg were obtained, and for the variant with two stems the production per m² was 15.1 kg, on one stem being obtained 7.8 kg, and on the other 7.3 kg (table 2).

Table 2

The fruit production						
Variant	Stems number	Production, Kg/pl	Difference compared to the control		Significance	Production, kg/m ²
			kg/pl	%		
V1	1	3.8	-1.1	77.55	oo	11.9
V2	2	6.0	1.1	122.44	**	15.1
Average	-	4.9	-	100	control	13.5

DL 5% - 0.24 kg/pl

DL 1% - 0.53 kg/pl

DL 0.1% - 1.82 kg/pl

Regarding the difference in the recorded production for the two stem variant, compared to the variant with one stem, the production was of +2.2 kg/pl, and as a

percentage of + 58 %. The production per m² was of + 3.1 kg for the two stem variant and as a percentage of +27 % (table 2). The obtained data was statistically ensured.

The quality of the tomato fruit, expressed by weight, was an important indicator in the ongoing of the research. Thus, the Siriana variety was noticeable for its fruit of large to medium size, in the over 200 g category, having fruit of 243g and respectively 245 g, 6 % for the control and 10 % for the two stem variant. Most fruit were in the 100-150 g category, 35 % for the control and 38 % for the two stem variant (table 3, 4).

Table 3

Measuring the size of the fruit, g					
Variant	Average fruit weight, g	Average on weight category, g			
		>200	150-200	100-150	<100
V1 control	117	245	166	118	66
V2	118	243	162	124	52

Table 4

Fruit percentage, on size categories %				
Variant	Fruit size categories, g			
	>200	150-200	100-150	<100
V1 control	6	23	35	36
V2	10	24	38	28

CONCLUSIONS

Tomato plant management system with more stems is a technological variant to reduce the number of shoots per unit of area. From the conducted research, it can be concluded that it is a good management system for tomato plants, because:

- The number of seedlings needed for founding the culture was reduced from 31250 pl/ha for the one stem variant to 25 000 pl/ha for the two stem variant, which represents a reduction of 6250 pl/ha, meaning 20 %, according to the chosen planting scheme;
- The plants presented a very vigorous vegetative growth measured by plant height, which was on average 1.83-1.86 m and very rich foliage;
- Very good fructification capacity, measured by production per plant, which was 3.8 kg/pl for the one stem variant and 6 kg/pl, for the two stem variant, but also by production per m², which was 11.9 kg for the one stem variant and 15.1 for the two stem variant;
- The fruit reached an average weight of 117-118 g, most of them being in the 100-150g size category, 35 %, respectively 38 %, followed by the under 100g category.

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DIRECTIONS FOR EFFICIENT USE OF LAND FUND FRUIT GROWING IN THE REPUBLIC OF MOLDOVA

DIRECȚIILE UTILIZĂRII EFICIENTE A FONDULUI FUNCİAR ÎN POMICULTURA REPUBLICII MOLDOVA

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***Abstract.** Results are exposed on land use efficiency in fruit growing. We propose several directions for improving land use through the establishment of productive perennial plantations in the Republic of Moldova.*

Key words: land use efficiency, productivity plantations, profits, establishing plantations of apple trees.

***Rezumat.** Se expun rezultatele referitor la eficiența utilizării fondului funciar în pomicultură. Se propun câteva direcții de ameliorare a utilizării fondului funciar prin înființarea plantațiilor perene productive în Republica Moldova.*

Cuvinte cheie: eficiența utilizării fondului funciar, productivitatea plantațiilor, profitul, înființarea plantațiilor de meri.

INTRODUCTION

Agricultural production is directly linked to the land. Land is the main and indispensable means of production. The land belongs to the natural resources used by man. A prominent American economist Paul Samuelson, in his book "Economics", said: «... the value of land is completely determined by the value of products grown on it...» (Samuelson P., 1992).

The value of land as a means of production has to be quantified, or evaluated. Net income is the criterion for economic evaluation of land, its value as a means of production. In the economic assessment of agricultural land are taken into account the differences between areas of profitability due to differences in soil quality.

The structure of agricultural land includes: arable land, virgin, fallow, natural grasslands, natural pastures, perennial fruit cultural plantings (orchards, berries, grapes etc.). A system of indicators is applied to assess the economic efficiency of land use in agriculture there: yields of major crops, agricultural production per unit land area, value of gross output, gross profit per unit of arable land etc.

Among the main reasons hampering the export of agricultural products, it is necessary to identify three main components: infrastructure, pricing and requirements for the product itself.

The first involves the lack of modern material and technical base of the collection in Moldova, processing and storage of agricultural products, the conditions for its transportation and transit in accordance with international requirements.

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The second component reflects the lack of stable and long-term contracts, failure to provide the necessary product packaging, the neglect of experience managing the prices of foreign markets.

And finally, the third component - is the product itself. With its initially excellent taste Moldovan producers are not yet able to provide a guarantee for the food security of the goods, a common fact to foreign consumers look, compliance with international standards and parameters for all indicators.

MATERIAL AND METHOD

In this work were used scientific methods of research: analysis and synthesis, grouping, economic and statistical research methods.

As material of study was used data from the Ministry of Agriculture and Food Industry of the Republic of Moldova and FAO STAT MOLDOVA.

RESULTS AND DISCUSSIONS

Since 68% of all areas of fruit crops in the country are occupied by apple orchards, were studied summer and winter varieties of apple trees of the northern zone of the Republic of Moldova (table 1).

From the economic efficiency of land use were taken and investigated two measures: the yield and net income derived from the sale of fruits.

Table 1

The dynamics of productivity in apple orchards in the Northern Zone of the Republic of Moldova in 2006-2009

Varieties	Yield, t/ha				Average for 4 years
	2006	2007	2008	2009	
Summer varieties					
PRIMA	2,9	4,9	5,6	18,5	8,0
COREALOR	3,0	12,3	14,7	11,8	10,4
COREMEN	2,9	7,7	7,4	33,4	12,8
CORESTIN	2,7	7,9	8,5	34,6	13,4
Winter varieties					
IDARED	34,7	38,4	37,8	16,5	31,8
CAMPION	38,8	39,1	38,7	17,0	33,4
SUPER CHEIF	35,4	37,5	38,1	16,2	31,8
KING IONAGOLD	7,2	35,9	36,9	16,9	24,1
FIRMGOLD	16,5	5,3	35,3	12,5	17,4
Average for all the varieties across the republic	3,48	4,18	4,53	4,70	4,22

Source: Developed by the authors according to the data from Ministry of Agriculture and Food Industry of the Republic of Moldova and FAO STAT MOLDOVA

Analysis of the data in table 1 showed the following: in studied years, most yields were harvested from winter varieties of apple in specialized farms for breeding of new varieties in all years of study.

The average rate ranged from 17,4 t/ha to 33,4 t/ha in 2006-2009, and was significantly higher than the national average 4.22 t/ha.

However, not all the newly introduced varieties exceeded the recognized varieties of 31,8 t/ha.

Therefore, for the further development of horticulture in the country we suggest to grow orchards with varieties CAMPION, the average yield of which amounted to 33,4 t/ha in studied years and varieties SUPER CHEIF, the average yield of which amounted to 31.8 t/ha.

As for summer apple varieties, the yield of all three promising new introduced varieties: COREALOR, COREMEN, CORESTIN significantly exceeded the control level and ranged from 10.4 t/ha to 13.4 t/ha, and more than twice than the average national average.

Table 2

The dynamics of yield in apple orchards in the Northern zone of the Republic of Moldova in 2006-2009

Varieties	Net profit, thousand lei/ ha				
	2006	2007	2008	2009	Average for 4 years
Summer varieties					
PRIMA	8,7	14,7	16,8	55,5	24,0
COREALOR	9,0	36,9	44,1	35,4	31,2
COREMEN	8,7	23,1	22,2	100,2	38,4
CORESTIN	8,1	23,7	25,5	103,8	40,2
Winter varieties					
IDARED	173,5	192,0	189,0	82,5	159,0
CAMPION	194,0	195,5	193,5	85,0	167,0
SUPER CHEIF	177,0	187,5	190,5	81,0	159,0
KING IONAGOLD	36,0	179,5	184,5	84,5	120,5
FIRMGOLD	82,5	26,5	176,5	62,5	87,0
Average for all the varieties across the republic	7,0	8,36	9,06	9,4	8,44

Source: Developed by the authors according to the data from Ministry of Agriculture and Food Industry of the Republic of Moldova and FAO STAT MOLDOVA

Analysis of the data in table 2 showed the following:

The net income for the winter newly introduced varieties also significantly was higher than its value for the summer varieties.

So it varied for winter varieties from 87.0 thousand lei/ha to 167 thousand lei/ha, and was significantly higher than the national average 8.44 thousand lei/ha. In this case, the variety of apple CAMPION and SUPER CHEIF, also exceeded the benchmark level.

For the summer apple varieties, this indicator ranged from 31.2 thousand lei/ha to 40.2 thousand lei/ha, and also exceeded the benchmark level for the varieties COREALOR, COREMEN, CORESTIN.

It should be noted that the net income for the winter varieties is higher than for summer due to a more rational relationship between the sale price and the cost of production.

Prospective objectives for price management in selected markets in Moldova, in the first place, are:

- more efficient use of production capacities of enterprises;
- promotion the production and sales for the most necessary goods for the republic;
- full development of forms and methods of marketing goods in accordance with the requirements of market economy;
- using the experience of economically developed countries in order to develop pricing policies.

In a changing environment, the role of information services becomes more important.

They are designed, to communicate qualitative information to households in a timely manner.

Farms also require periodic educational programs, where they could learn about new alternatives and possibilities.

Of course, the above conditions do not cover all the necessary conditions for the implementation of effective policies in practical activities at farms of the republic.

Life advances, and will put forward new demands in the future, new conditions.

For effective long-term development of agro-food market in the Republic of Moldova is necessary to stimulate the production and sale of goods in accordance with the requirements of a modern market economy, fully utilizing the experience of economically developed countries.

In addition, the formation of a national agro-food market in Moldova is influenced by persistent macroeconomic instability and lack of the concept of state regulation of markets and the likely understanding of how and what should be regulated.

One of the greatest problems of agricultural economy is maintaining price parity between agricultural and industrial products.

Difficulties in achieving parity in prices faced, perhaps, all of the country.

The reason is the fundamental differences in the economics of agriculture and industry.

They have very strong influence on the ratio of the rate and direction of changes in prices of industrial and agricultural products.

First, because of the seasonality of agricultural production prices for the products of this industry, as it were behind the time of the overall change in prices in the country, including in industry.

Secondly, a high degree of monopolization of industrial firms producing for the village. Farmers themselves sell their products to many buyers.

That price imbalance is one of the main reasons for the weak domestic market supply of foodstuffs and rising prices.

Thus, the objects of state regulation of prices are agricultural products and foodstuffs.

State regulation of prices for certain commodity groups with the greatest value is an important part of macroeconomic regulation.

Using the solutions to economic problems redistributive prices, the state ensures their participation in the redistribution of net income among industries and sectors of national economy, regions, countries, companies, individual groups of the population.

This is particularly important for social protection of disadvantaged groups. The state should participate in pricing directly or indirectly to protect the interests of public enterprises and other forms of property that cannot compete with foreign producers of similar products.

Thus, the necessity of state influence on the price appears as one of the areas of macroeconomic regulation and specifically manifested in the following areas of state regulation:

- maintaining market competitive environment;
- prevent monopolization;
- socio-oriented policies;
- impact on the optimal ratio of foreign trade and domestic prices.

The mechanism of state influence on the price works not only at the macroeconomic, but also the microeconomic levels.

Microeconomic measures of state influence on prices are more specific and include:

- control over natural and other monopolies;
- pricing of goods and services that have an important social significance;
- monitoring firms in a dominant position in the market;
- legal and judicial protection of contractual pricing;
- use of excise taxation of certain goods; subsidies and price subsidies;
- regulation of prices and tariffs in foreign economic activity;
- price indexation;
- organization of price statistics;
- monitoring control over prices.

Thus, in market conditions, efficient use of land resources is a complicated process that is affected by many factors.

Selecting a general orientation at the same time and approaches to pricing new and existing manufactured products, provided services to increase sales volumes, turnover, increase production, maximize profits, and strengthen the market position of the company is part of modern pricing policies.

CONCLUSIONS

1. Studies have shown the economic efficiency of growing new varieties of winter apples CAMPION, and SUPER CHEIF; as well as the feasibility of cultivation summer varieties COREALOR, COREMEN, CORESTIN.

2. Thus, we recommend continuing the introduction of new highly effective long-term plantings of apple varieties listed above. This would potentially raise the level of development of fruit growing in the country to a modern level of quality and ensure food market in the country and abroad in such a necessary and important product.

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GROWTH AND FRUITION OF RASPBERRY PLANTS FOR GETTING IN INTENSIVE CULTURE OF ORGANIC PRODUCTION

CREȘTEREA ȘI FRUCTIFICAREA PLANTELOR DE ZMEUR ÎN CULTURA INTENSIVĂ PENTRU OBȚINEREA PRODUCȚIEI ECOLOGICE

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Abstract. *We studied the basic indicators of growth, photosynthetic activity, biological productivity and usefulness of raspberry plants in intensive culture for organic growing. Experimental data were obtained on plant growth substances content of plastics, crop and fruit quality. We have established the basic parameters of intensive culture Razzie for obtaining organic fruit.*

Key words: raspberry, growth, productivity, culture system, organic fruit.

Rezumat. *S-a studiat indicatorii de bază ai creșterii, activității fotosintetice, productivității biologice și utile ale plantelor de zmeur în cultura intensivă pentru obținerea producției ecologice. S-au obținut date experimentale referitor la creșterea plantelor, conținutul de substanțe plastice, recolta de fructe și calitatea lor. S-au stabilit parametrii de bază ale culturii intensive a zmeurului pentru obținerea fructelor ecologice.*

Cuvinte cheie: zmeur, creștere, productivitate, sistem de cultură, fructe ecologice.

INTRODUCTION

A special role in the structure of berry have fruit tree species, and from these, raspberry fruit have a leading role. Although both the raspberry bush is required and necessary for human body, it is cultivated in Moldova on surfaces with much less to meet market requirements for fruit quality. These circumstances have fostered the need to develop and implement new methods of production and storage of raspberry fruit, maintaining a high level of therapeutic food and their values (Barbaroș M., 2005; Barbaroș M., Cimpoieș Gh., 2007).

In order to reduce environmental pollution and solve tasks of the proposed nominees for obtaining technology-based organic raspberry fruit.

MATERIAL AND METHOD

In the experimental group planted soil sucker raspberry variety unvirused Fertőd Zamalos Mollnasarjai were administered natural fertilizers in quantities of 30 t / ha. In the vicinity of the experimental group, in an area of 10 acres on plants of this

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variety were given mineral fertilizer - 150 kg NPK content of these elements equivalent to 30 tons of manure spread on a similar surface, and on another parcel of 10 acres were taking control without fertilizer plants.

The raspberry plants maintained under the proposed technology during the vegetation has been applied to SBA harmless "Fitostim" slurry concentration of 0.5% and a total consumption of 600 l / ha.

Extraroot treatments with 0.5% suspension of powdered preparation obtained from the roots of germinated seeds of grain have been made to the flowering periods, after tying and harvesting fruit. The plants located in the three variants of the experiment, to determine the influence of natural and organic fertilizers matter applied to the processes of growth and development during the growing season following measurements were made and biochemical analysis: leaf area, length and width of shoots, the content Chlorophyll 'a', 'b', their sum and carotenoids.

RESULTS AND DISCUSSIONS

The results are based on investigations carried out are presented in table 1. The data presented in table 1 found that 0.5% suspension of powdered preparation obtained from the roots of germinated seeds of grain, mineral fertilizers and the natural processes of growth are influenced differently, leaf surface and pigment content in raspberry plants during the growing season. The increased values were recorded in the nominated indicators variant proposed use of technology, significantly their values of the following mineral fertilizer use (known technology) and controls (no fertilizer).

Table 1

Biometric and biochemical indicators of raspberry plants variety Fertőd Zamalos Mollnasarjai depending on the use of fertilizers and various biologically active substance harmless "Fitostim"

Variant experience	Leaf area, dm ²	The increase in length of shoots during the 55 days, cm	The increase the thickness of shoots during the 55 days, mm	The content of chlorophyll pigments, mg/dm ²	Carotenoid content, mg/dm ²
Controls	122,9	60,2	8,0	3,59	5,12
Known technology	138,7	61,7	10,0	3,89	5,41
Technology developed	149,0	63,1	12,0	4,23	5,58
DL 5%	4,3	0,55	0,8	0,12	0,07

So, management of natural fertilizer and 0.5% suspension of biologically active substances occurring naturally led to the intensification of growth and development of raspberry plants in relation to known technology, creating prerequisites for obtaining high quality organic fruit.

At harvest of raspberry fruit was also determined the influence of natural and mineral fertilizers, as well as SBA Fitostim" of food and technological qualities of raspberry fruit (table 2).

Table 2

Food quality and technology of raspberry fruit depending on the use of natural fertilizers and SBA Fitostim"

Variant experience	Volume and the average weight of a fruit		Vitamin C content, mg/%
	cm ³	g	
Technology developed	4,91	3,23	6,28
Known technology	4,09	2,81	5,33
Controls	3,72	2,39	5,08
DL 5%	0,17	0,16	0,16

The results presented in table 2 show that natural fertilizers and SBA Fitostim" technology (proposed) have advantages over the use of mineral fertilizers variant (known technology) and control not only by obtaining non-polluting production, but also by enhancing food quality and technological thereof. In-administration of natural fertilizers and SBA Fitostim" both volume and weight of fruit and vitamin C content exceeded their values-administration of mineral fertilizer and control.

So, use natural fertilizers and SBA Fitostim" raspberry plants contributed to the increase in food technology and quality characteristics of fruit obtained, indicating the importance of the power of the human body.

Organic and mineral fertilizers, and SBA Fitostim" and clearly influenced the productivity of raspberry plants investigated variants (table 3).

Table 3

Raspberry plant productivity according to the use of natural fertilizers and SBA Fitostim "

Variant experience	Raspberry road at a plant in two growing seasons, g / plant	The advantage in weight to a plant cultivated according to the developed technology, known technology to the controls, g	The advantage in fruit from plants grown under 1 ha of developed technology known to the controls, %
Technology developed	156,4	0,00	0,00
Known technology	130,0	20,4	12,98
Controls	115,7	40,7	24,50
DL 5%	7,7		

From the data presented in table 3, it is found that by using natural fertilizers and SBA Fitostim" increased productivity of a plant growing fruit in year 2 to 20.3 g, compared with the technology known as cultivated plant and

40.7 g compared to the control. In determining the advantage in yield of fruit from plants grown under technology developed at the surface of 1 ha, he prevailed with 12.9% known technology, and to witness 24.5% respectively.

CONCLUSIONS

As a result of the above, it may be observed that the administration of natural fertilizers and SBA Fitostim" of natural origin has contributed to increasing the amount of organic raspberries, since two of the plants growing.

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COMPARATIVE EFFICIENCY OF CROWN FORMATION SYSTEMS IN INTENSIVE APPLE PLANTATIONS

EFICIENȚA COMPARATIVĂ A SISTEMELOR DE FORMARE A COROANEI ÎN PLANTAȚIILE INTENSIVE DE MĂR

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Abstract. *One of the directions of further improving of intensive culture the technology of apple trees, is to create and test new systems of crown formation. With this purpose in the Republic of Moldova were tested in a stationary experiment on six systems of formation of a crown on varieties of apple Generos and Florina, grafted on rootstock M9. Studies have shown that the rates of accumulation of vegetative mass during the formation of spindle-shaped crown are more emphasized, particularity at the free growing fusiform of apple trees. In conclusion, for the first 3 years of fruiting highest yield per unit area by the variety Generos obtained for the formation of its type Spindle bush, and at variety Florina – respectively is Solax.*

Key words: apple, variety, types of crowns, growth, fruition, productivity

Rezumat. *Una din direcțiile de îmbunătățire în continuare a tehnologiei de cultură intensivă a mărului o constituie crearea de noi sisteme de formare a coroanei. Cu acest scop, în Republica Moldova au fost studiate într-un experiment staționar 6 forme de coroană și 2 soiuri de mere, Generos și Florina, altoite pe portaltoi M9. Studiile au demonstrat că ratele de acumulare a masei vegetative în timpul formării coroanei sunt mai pronunțate la coroanele fusiforme și, îndeosebi, la pomii de coroană fus zvelt ameliorat. În concluzie, pentru primii 3 ani de fructificare, cel mai înalt randament pe o unitate de suprafață s-a obținut la soiul Generos cu forma de coroană fus zvelt ameliorat, iar la soiul Florina – respectiv Solax.*

Cuvinte cheie: măr, soi, forme de coroane, creștere, fructificare, productivitate

INTRODUCTION

Using rootstocks with a low vigour of growth new systems of their formation and caring for apple trees, it was allowed to enter the new frontiers of productivity and economic efficiency of this culture. However, scientific development of a model of modern horticultural shows that even the most modern design of existing plantations do not ensure a sustainable use, especially those of economic resources such as light, air space, land area (Cimpoieș Gh., 2000; Cimpoieș Gh., 2002; Potel A. et al. 2005).

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In super intensive orchards of special importance has the system formation, trim, tilt, branches and other methods of regulating the growth of trees. At high density of plantation, each of them is given a limited space, which must be completely filled out with the required number of elements of phytomass in the optimal ratio between them. It must be complied strictly with the design features and geometric shape of the crown, and to maintain optimal balance between the processes of growth and fruiting throughout the period of operation of the orchard (Babuc V., 2000). Nowadays high-density plantations of apple trees are formed mainly by the type of spindle crown. This shaping has many differences and modifications depending on the regions and local contexts, where it is used.

In this connection there was a need for a comparative study of some of them in Moldova.

MATERIAL AND METHOD

Experimental orchard for the Study of spindle-shaped forms of the crown for intensive plantation of apple was founded in spring 2004 in the Experimental Station "Criuleni", Agricultural University of Moldova. The object of the research is forming the following:

1. Spindle bush (control variant). Recommended as the primary shaping for the apple on the rootstock M9 in the Republic of Moldova. The distance of plantation 4 x 1,5 m.

2. Slender spindle. Crohn's has a well-developed central conductor, surrounded by evenly placed 15 - 20 branches of fouling at the age of 1 - 4 years, which is constantly updated. The distance of plantation 4 x 1,5 m.

3. Solax. This form of the crown like a spindle-shaped bush, but the height of the tree it is not limited to cropping, and by tilting the center conductor at a height of 2,2 - 2,5 m up to a horizontal position. The distance of plantation 4 x 1,5 m.

4. Tesa. Trees have a trunk height of 1,2 m which is placed in a tier 5 - 7 main branches, tying them in a circle to a horizontal trellis. The distance of plantation 4 x 1,5 m.

5. Palspindel. Combines elements of palmettos and spindle bush. In the lower part of the crown has two skeletal branches, directed along the row, and the others lay on the type of spindle. The distance of plantation 4 x 2,5 m.

6. Solen. Trees shaped into a bilateral horizontal cordon and consist of a trunk height of 1,2 m and the two main branches, tied down the row to the horizontal trellis. The distance of plantation 4 x 2 m.

7. Bush form. The tree is formed as a bush, consisting of 4 - 5 main branches off at a height of 10 - 15 cm of soil. The distance of plantation 4 x 1 m.

The experiment studied two varieties of apple trees with genetic resistance to scab – Generos, Florina and was grafted on the rootstock M9. Repeated experience of 3-fold. The number of sample trees in version is 10 pcs.

RESULTS AND DISCUSSIONS

The intensity of growth processes of the tree as a whole is most clearly characterized by such indicators as: the total length of shoots and the diameter of the trunk. One-year increase in addition is also one of the indicators of potential productivity in the next year so is the base of forming fruit-bearing formations in the coming years (Cimpoieş Gh., 2000).

Analyzing the effect of crown shape on the total length of shoots, it should be noted that at 5 - 7 years after planting, the highest it has been in shaping Solax, surpassing the control by 22-25%. This is due to the fact that the height of the trees is not limited by pruning, but due to angling the upper part of the crown. The minimum values of this index were observed in the formation Solen 10,0-19,8 m/tree.

Table 1

The main growth of apple trees depending on the shape of the crown.
Cultivar Generos

Crown shape	The total length of shoots m / tree			Trunk diameter, mm		
	2008	2009	2010	2008	2009	2010
Spindle bush (control variant)	11,6	21,4	21,2	45,5	51,8	55,0
Slender spindle	10,2	23,0	22,3	46,1	52,0	55,4
Solax	14,8	28,2	26,4	46,0	53,3	57,4
Palspindel	13,9	25,8	25,3	45,2	57,9	64,1
Tesa	13,5	26,6	33,5	44,2	52,8	58,5
Solen	10,0	18,8	19,8	38,6	41,6	53,0
Bush form	16,9	22,5	20,2	44,9	50,8	54,7
DL 5%	0,82	0,92	0,89	0,35	0,38	9,41

It should be noted that the values of this indicator depends on many factors, including the load of wood harvesting. Thus, over the past 3 years for all studied forms of growth vegetative was the highest in 2009, when the variety Generos decreased the yield of fruits.

Increase the diameter of the trunk is an integral indicator of the intensity of growth processes of fruit tree. The highest values in the experiment was achieved by the formation of tree-type palspindel, amounting to 64.1 mm in 2010, surpassing the control by 15%. Features of this form of the crown allowed to increase in this scenario the largest volume of wood that has resulted in the largest diameter of the trunk.

The minimum value of this indicator over the years of research - 38.6 - 53.0 mm were observed in the forming Solen. In general, it should be noted that among the total length of shoots and the diameter of the trunk of apple trees there is a definite correlation.

The most important criterion of a collective evaluation of the formation of a yield and fruit quality. It should contribute to an early entry on fruit formation of trees and the annual holding it at a high level. Analysis of the results shows that the shape of the crown had a significant impact on the yield of apple (table 2).

In a cost-effective fruiting trees of all the studied variants come in 4 years after the plantation. The highest yield in the first two years of fructification registered the variety Generos being on plantations of bush canopy forms. In 2010, the highest yield in the experiment - 37,9 t/ha was obtained when the formation of tree-type low growth spindle-shaped bush. In this embodiment of the variety Generos at was recorded and the highest yield of fruit in the average over

3 years of fruiting, 72.9 t/ha. The lowest yield in all the years of research was reported in shaping Solen and was two times lower than in the control variants.

Table 2

**Yield of apple trees depending on the processing and varieties.
Experimental Station "Criuleni", SAUM**

Crown shape	Generos			Florina		
	2008	2009	2010	2008	2009	2010
Spindle bush (control variant)	18,9	16,1	37,9	17,8	22,9	29,6
Slender spindle	18,6	15,8	26,7	16,9	19,7	25,8
Solax	19,0	16,5	36,3	16,8	24,1	32,7
Palspindel	11,0	14,5	24,7	9,1	21,9	26,1
Tesa	18,6	15,9	20,8	14,9	17,8	23,2
Solen	11,3	12,6	13,4	10,1	15,2	15,7
Bush form	20,8	17,3	20,6	15,9	18,7	30,4

At varieties with strong-growth of growth like Florina indicators yields were higher in the formation of tree-type of Solax. In total, over 3 years of fruiting crops in this variant was 73.6 t / ha and exceeded the control with 5%.

The crown bushy formation for the variety Florina was less effective than for the variety Generos. The low temper of growth occurs during the formation of crop and tree-type Palspindel.

The lowest yield on the variety Florina was observed in the formation of Solen.

CONCLUSIONS

1. The intensity of growth processes during the formation of the above apple trees by Solax crown type, thanks to a minimal degree of pruning during its breeding and growth control by hazing an angle optimum branches. The lowest rates of capacity timber marked the formation of trees on the type of Solen.

2. The highest yield of fruit in the average in the first years of fructification was obtained during the formation of variety Generos type spindle bush. For strong-growing variety Florina most of crop was shaping Solax type crown.

3. Shape crown Solen due to the small amount of productive timber, it showed the lowest values of yield production.

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PRODUCTIVITY OF LONG-TERM CULTIVARS IN THE APPLE TREE SUPERINTENSIVE CULTURE SYSTEM

PRODUCTIVITATEA SOIURILOR DE PERSPECTIVĂ ÎN SISTEMUL SUPERINTENSIV DE CULTURĂ A MĂRULUI

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Abstract. *The investigations were made in a commercial orchard “Codru-ST” Ltd. founded in the spring of 2000 year with bench grafting. Apple trees of the varieties Idared, Golden Reinders, Sir Prise, Florina, Mutsu, Gala Must, Jonagored, Jonagold and Ionica growth on dwarfing M 9 rootstock, the distance of plantation between rows is 4.0 m, and between trees in the row is 1.0 m. The trees were trained by the slender spindle crown formation. From 2003 to 2010 was studied the productivity of the apple orchard and fruit quality. It was established, that the first fruits, was registered in the 2003 year, when the yield of the studied cultivars constituted 13.3-33.8 t/ha. In 2010 year, the yield significantly increased to 26.7-40.6 t/ha. During the study period, the highest averages yield of fruits was obtained at the varieties Ionica – 32.07 t/ha, Gala Must – 32.38 t/ha, Golden Reinders – 32.92 t/ha și Jonagored – 35.06 t/ha. The lowest averages yield was registered at the varieties Jonagold, Florina and Mutsu.*

Key words: variety, apple plantation, slender spindle, productivity.

Rezumat. *Studiul s-a efectuat într-o plantație pomicolă comercială a întreprinderii “Codru - ST” SRL fondată în primăvara anului 2000 cu altoiri la masă. Pomii de măr din soiurile Idared, Golden Reinders, Sir Prise, Florina, Mutsu, Gala Must, Jonagored, Jonagold și Ionica cresc pe portaltoiul cu talie scundă M 9, distanța de plantare dintre rânduri 4,0 m, iar dintre pomi pe rând 1,0 m. Pomii au fost conduși după forma de coroană fus zvelt ameliorat. Între anii 2003-2010 s-a studiat productivitatea plantației de măr și calitatea fructelor pe diverse soiuri. S-a stabilit că primele fructe s-au înregistrat în anul 2003, unde producția la soiurile studiate a constituit 13,3-33,8 t/ha. În anul 2010 producția de fructe s-a majorat semnificativ, până la 26,7-40,6 t/ha. Pe parcursul cercetărilor, cea mai mare productivitate medie s-a înregistrat la soiurile Ionica – 32,07 t/ha, Gala Must – 32,38 t/ha, Golden Reinders – 32,92 t/ha și Jonagored – 35,06 t/ha. Soiurile Jonagold, Florina și Mutsu formează cea mai scăzută producție medie.*

Cuvinte cheie: soi, plantație de măr, fus zvelt ameliorat, productivitate.

INTRODUCTION

Variety is a biological unit with printed characters and qualities of the species that formed the basis of its training and shaping human action. So, not all varieties have created regions, areas or countries, but for certain specific conditions of certain climatic zones of some pedoclimatic zones and have all possible qualities as fresh consumption and various forms of industrialization (Balan V. et al., 2000; Cepoiu N., 2002; Cimpoieș Gh. et al., 2001).

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Replacing the old varieties, that have less relevant requirements, with new ones, that are being more efficient and more productive, is an ongoing process and compulsory. This replacement is done according to the introduction of new varieties from other countries on the creation of new local varieties and selection of the most valuable clones (Cimpoieş Gh. et al., 2001).

In Poland, an attempt is made in variety of commercial plantations during the first four crops and can then be decided to be studied that the variety to be introduced in the State Register (Sadowski A. et al., 2005).

In the Republic of Moldova it was currently registered in 70 varieties and 32 temporarily ones for testing under production conditions and more than 50% of global production is apple varieties Golden Delicious and Idared. Share of world production of apples ripening varieties of winter period is 81.0%, 12.0% winter and summer 7.0% (Peşteanu A., 2008; Rapcea M. et al., 2002).

For the foundation of apple orchards is recommended super quality varieties, to have the higher freight, earlier fructification, stable production, tolerant to diseases and a higher economic returns (Peşteanu A., 1998; Sadowski A. et al., 2005).

Introduced varieties must have a good climatic and edaphic adaptability, modern cultivation technologies.

MATERIAL AND METHOD

The study was conducted during the years 2003-2010 in apple superintensive orchard „Codru–ST”, planted around the village Rassvet, district Straseni. Planting was conducted in spring 2000 with perfected copulation. As bench grafting in biological material were used varieties Idared trees (variant control), Golden Reinders, Sir Prise, Florida, Mutsu, Gala Must, Jonagored, Jonagold and grafted onto rootstock Ionica M9. Planting distance is 4.0x1.0m.

The trees are driven by thin-time system. Training work and cutting trees were carried out as up-to-date recommendations.

Each version includes four repetitions of eight trees that you located on the ground randomized. Number of trees in rehearsal is 8.

Research has been conducted in laboratory and field conditions as the accepted method of achieving the experiments with fruit crops.

RESULTS AND DISCUSSIONS

Quantity fruit bearing formations in the crown of apple trees demonstrates how did was the process of differentiation of shoots and allows to determine the degree of intervention to cutting and prior calculation of the crop for next year

The study shows that the total quantity of fruit-bearing formations in the varieties studied is 228-309 pcs/tree (fig. 1). The amount of fruit it is best formations to achieve yields of 35-40 t/ha of fruit quality.

The largest amount of fruit-bearing formations during the research has formed Gala Must variety - 309 pcs/tree. Sir Prise, Florina, and Jonagold Jonagored varieties formed the smallest amount of 228-260 pieces of fruit formation/tree. Mutsu, Idared, Golden Reinders varieties and quantity of training

Ionica was respectively 274, 280, 290 and 292 pcs/tree

To obtain in the crown of apple trees in the superintensive plantations the respective quantity of fruit it is necessary to make cuttings to optimize the cargo of the tree, in the period when the fruits reach the diameter between 10-12 mm for thinning and to exclude the future interchange of fructification. In addition to have a more rational feathering with fruit-bearing formations it is necessary to make all the agro-technical measures (soil maintenance, fertilization, irrigation, harvesting) in optimal time.

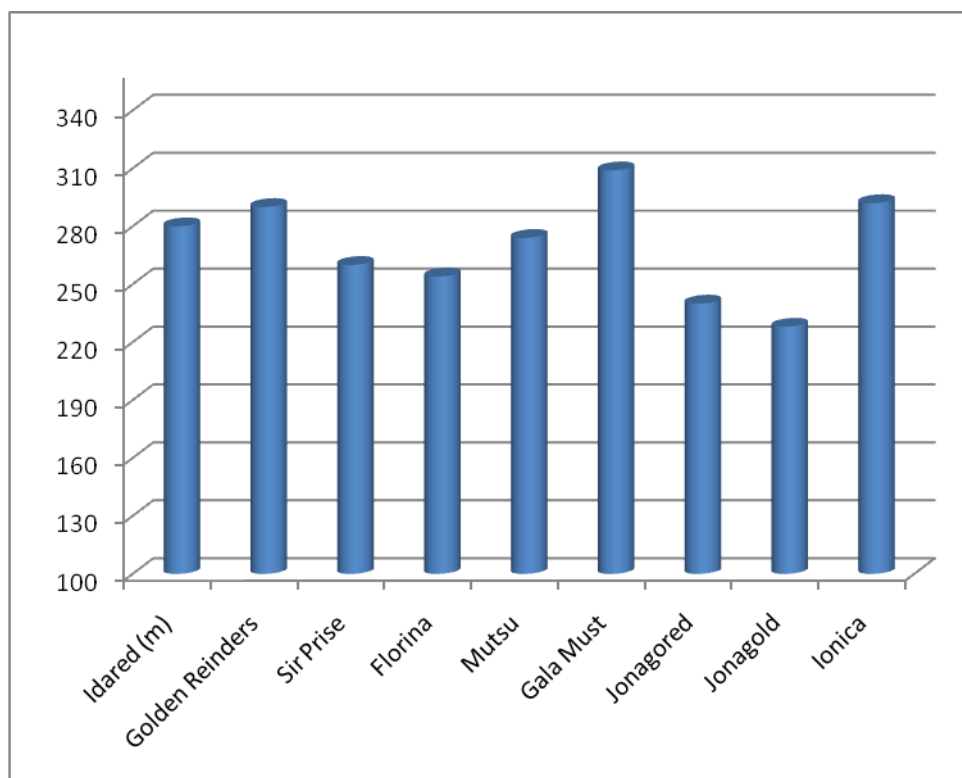


Fig. 1 – Quantity of fruit formations according to biological features of the soil, pcs/tree

Placing the fruit on the branches of different age groups is particularly important to determine the cutting of trees and canopy structure. It improves the lighting and ventilation system of the crown to give a quality production and competitive domestic and foreign.

The study shows that the location of fruit on the branches of different age influences the biological features of the variety (table 1).

The largest number of fruit varieties in the study is placed on the branches of 1-3 years of age from 80.2 to 94.6%, while the older branches are formed from 5.4 to 19.8% fruit. Among the investigated varieties also recorded some difference. If you study the varieties increased fruit weight on younger branches, while their quantity diminishes the older branches. Sir Prise, Idared, Florina and

Golden Reinders varieties on the branches forming the corresponding annual 43.1, 44.4, 44.4, 46.2%. Gala Must and Mutsu varieties the fruit weight is less than the annual branches and constituted 25.8 to 25.9%. Other varieties formed by branches from 36.3 to 38.2% of the total annual fruit. The branches in only two years old Gala Must variety of fruit weight increased and the variety Ionica diminished in comparison to other varieties. If the annual branches Gala Must variety formed 25.8%, then those two years 44.7%, and vice versa variety Ionica a law, the industry 36.3% and 28.8% on the annual age two years.

Table 1

Arrangement of fruit on branches of different size, according to the biological features of the soil, %,

Varieties	Shoots age				
	1 year	2 years	3 years	4 years	5 years
Idared (m)	44,4	40,6	7,0	6,7	1,3
Golden Reinders	46,2	34,4	12,6	5,9	0,9
Sir Prise	43,1	37,1	13,9	5,6	0,1
Florina	44,4	41,3	8,9	4,6	0,8
Mutsu	25,9	38,2	17,1	15,3	3,5
Gala Must	25,8	45,1	14,5	12,1	2,5
Jonagord	38,2	36,1	13,7	8,9	3,1
Jonagold	37,7	36,9	16,4	5,0	4,0
Ionica	36,3	28,8	15,1	16,6	3,2

The branches in only three years old Florina and Idared variety forms a small quantity of fruit from 7.0 to 8.9% as compared to other varieties whose weight was from 12.6 to 17.1%.

The small amount of fruit varieties in the trial branches are formed on 5 years of age where their share was 0.1 to 4.0%. Our results show that the variety branches Idared and rejuvenate Florina made from wood garnish of three years of age, Gala Must and Mutsu varieties from wood aged 4-5 years, and for other wood varieties to age 3-4 years depending on the load of fruit buds

The study demonstrates that biological features of fruit varieties have influenced the location of the branches of different age. These data can be used to recommend the level of cutting trees during fructification.

To obtain consistent production of fruit, it is necessary to use varieties with early fruit setting and a high potential for fruition, allowing restricted in terms of changing the range in accordance with the requirements of wood. To solve these problems is necessary to use new structure planting, cutting progressive types and methods according to ecological features of the area

where these varieties are grown.

The first production of fruit varieties studied was recorded in 2003 (table 2). The largest fruit crop has been the variety Golden Reinders - 33.8 t/ha and lower values for varieties Jonagold - 16.4 t/ha and Ionica - 18.8 t/ha. The productivity of the other varieties ranged from 20.4 t/ha to 29.0 t/ha.

Higher productivity in 2003 was a negative impact on yield reduction in 2004 accounted for the variety Golden Reinders - 8.4 t/ha, the variety Sir prize - 3.0 t/ha, the variety Idared - 2.0 t/ha and the variety Jonagored - 1.8 t/ha. In other varieties of fruit production increased by 1.2 to 4.2 t/ha compared with the previous year.

In the years 2005 - 2006 the varieties with a fruit production in the study showed an increase from 1.5 to 2.3 times compare with the previous year. Jonagored varieties, Ionica and Sir Prize were recorded higher values of 50.0 t/ha.

Table 2

Apple tree productivity according to the biological features of the soils, t/ha

Varieties	2003	2004	2005	2006	2007	2008	2009	2010	average on 8 years
Idared (m)	26,6	24,6	33,1	40,8	30,8	24,6	31,7	33,1	31,2
Golden Reinders	33,8	25,4	40,8	40,9	30,8	22,7	30,6	38,4	34,3
Sir Prize	29,0	26,0	55,3	36,2	29,7	18,4	31,6	26,7	35,2
Florina	13,3	17,7	38,6	39,8	36,4	18,7	34,1	33,2	29,2
Mutsu	20,4	24,0	46,2	35,0	28,3	15,8	27,4	35,7	30,8
Gala Must	26,3	27,7	38,2	40,7	35,4	22,5	33,8	34,5	33,7
Jonagored	23,0	21,2	50,7	47,8	31,3	28,5	37,4	40,6	35,8
Jonagold	16,4	17,6	44,1	36,4	24,0	19,9	29,7	31,2	27,7
Ionica	18,8	23,0	51,5	39,1	33,4	26,0	31,6	33,2	33,2
<i>Media</i>	<i>23,1</i>	<i>23,0</i>	<i>44,3</i>	<i>39,6</i>	<i>31,1</i>	<i>21,9</i>	<i>32,0</i>	<i>34,0</i>	-

High temperatures during the growing season of 2007 and insufficient rainfall have a negative impact on production fruit varieties in the study. Crop varieties in the study decreased by 24.2 to 34.0% compared to the production of fruit harvested in 2006.

In 2008 fruit production in 2004 was reduced due to the formation of fruit with floral buds. Since 2009, production of fruit is set, the values obtained are characteristic super apple plantations, and in 2010 recorded an increase in the index study.

Productions during the research have been enhanced varieties Ionica - 32.07 t/ha, Gala Must - 32.38 t/ha, Golden Reinders - 32.92 t/ha and Jonagored - 35.06 t/ha. Values bellow 30.0 t/ha of fruit varieties have been Jonagold, Mutsu and Florida.

The results obtained during eight years of study we demonstrated that the

varieties introduced in the country, the varieties Golden Reinders, Jonagored, Ionica and Gala Must be suitable for establishing high-density apple orchard to a unit area.

CONCLUSIONS

1. When cutting trees it must be taken into account the biological features of fruit variety and location of the branches of different age. To rejuvenate Florina and Idared variety of industries to be made from wood garnish with 3 years of age, Gala Must and Mutsu varieties from wood aged 4-5 years, and the varieties Golden Reinders, Sir Prise, Jonagored, Jonagold and the Ionica wood aged 3-4 years depending on the load of fruit buds

2. The studied trees varieties started to build since March of crown formation. During the research productivity was the highest recorded for varieties Ionica - 32.07 t/ha, Gala Must - 32.38 t/ha, Golden Reinders - 32.92 t/ha and Jonagored - 35.06 t/ha.

3. The establishment of plantations besides super apple varieties listed in the register of plant varieties planted orchards with varieties Golden Reinders, Jonagored, Ionica and Gala Must temporarily plant varieties for testing under production conditions for a potential higher productivity and higher quality.

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PRELIMINARY STUDIES REGARDING THE OPTIMIZATION OF SOME TECHNOLOGICAL FACTORS FOR VEGETABLES GROWING IN AN ECOLOGICAL SYSTEM

STUDII PRELIMINARE PRIVIND OPTIMIZAREA UNOR FACTORI TEHNOLOGICI DE CULTIVARE A LEGUMELOR ÎN SISTEM ECOLOGIC

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Abstract. *The goal of this paper is a reviewing of the most prominent technological factors and how they can influence the sustainability of crops. The evaluation of these factors is based on a comparative analysis of their influence in conventional and organic vegetable growing systems.*

Key words: technological factors, organic vegetables, sustainability, comparativ analysis.

Rezumat. *Lucrarea de față își propune trecerea în revistă a celor mai de seamă factori tehnologici și a modului în care aceștia pot influența sustenabilitatea culturilor. Evaluarea acestor factori se face pe baza unei analize comparativă a influenței lor în sistemele de legumicultură convențională și legumicultură ecologică.*

Cuvinte cheie: factori tehnologici, legume ecologice, sustenabilitate, analiză comparativă.

INTRODUCTION

Vegetable plants grow, develop and carry out the planned harvest in the local environmental conditions, adjusted by the technological conditions or technological factors. Technological factors vary in quality and / or quantitatively, depending on their nature; their value is determined by the amount of natural conditions, in circumstances which the production process runs, but also the technical possibilities at their disposal (the base material, labor etc.) (Rusti, 2007).

The optimization of technological factors has been a constant concern and appeared early on in chronological cultivation of vegetable plants, reaching its peak in the twentieth century. As a result, new technologies for growing vegetables, more complex and focused on a greater number of technological factors developed (Săulescu and Săulescu, 1967; Davidescu and Davidescu, 1982 cited by Rusti, 2007).

Thus, J. B. Boussignault (1834), studied the effect of fertilizer and crop rotation in France. Liebig (1840), had concerns about the usefulness of using mineral fertilizers based on the theory of plant nutrition in Germany. J.B. Sawes

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and H. Gilbert (1843), at the Rothamsted Experimental Station - England, had performed experiments of fertilization and rotation of the main agricultural crops and crop rotation. They were the pioneers of European agricultural experimental research.

The study of complex technological factors and placing them in the process of technologies optimization has been a constant concern in the second half of the twentieth century. This thing was possible due to progresses made in biometrics and biological and experimental statistic field, accomplished at the beginnings by Fischer, Snedecor, Cochran and Cox (Săulescu and Săulescu, 1967).

The knowledge of the influence of technological factors in agriculture and how they can be directed represents a continuous issue for agricultural science and practice. The promotion of new agricultural systems, such as ecological agriculture, requires the development of new technologies based on the knowledge of the influence of technological factors in production.

As a result, this paper presents a comparative analysis of the main technological factors from both organic and conventional vegetables growing systems.

MATERIAL AND METHOD

This paper was based on the existing factual analysis, registered and managed by different authorities and institutions. To achieve the goal and objectives, there was a case study on the main experimental factors and the way they "make their mark" on the culture of vegetables in both conventional and ecological system.

Working material consisted of documents from numerous sources of public character.

As working methods in the study of case were used notes, comparative analysis, comparative and systematic group based on goal.

RESULTS AND DISCUSSIONS

Technological factors that have proved to be essential in the vegetable growing, ensuring the sustainability of both culture systems (conventional and organic) are: crop rotation, soil tillage, the biological material and cultivar, crop density, sowing time, the provision of irrigation, fertilization, weed, pest and disease control.

Crop rotation represents the rotation of crops in time and space. It involves dividing the whole surface in equal size plots, filled with one or more species which have similar agro-technical and environmental requirements. Usually, a vegetable crop rotation has a duration of 4-5 years. The restrictions regarding weeds, pests and diseases that occur in organic vegetable growing system, makes the crop rotation a main link in achieving sustainability of the system.

The soil tillage aims to create favorable conditions for plant growth and development, improving the physical characteristics and increasing the chemical processes of soil (Stan and Stan, 2010). These tillage are divided into basic (leveling maintenance, basic fertilization, deep plowing, deep soil loosening) and seedbed preparation work (soil modeling, chemical weed control). It is

recommended to avoid deep plowing with furrow return, especially for vegetable crops in ecological farming practice, because it requires deep burial of fertile arable layer, with all living organisms and aerobic bacteria, leading over time to reduce the number of microorganisms, humus and fertility (Stoleru and Imre, 2008).

The cultivar (variety) remains a main factor of production in both culture systems. Due to the great importance of the variety as the main factor of production, a lot of researches on new varieties and hybrids took place since the second half of the nineteenth century till nowadays. The choice of varieties and hybrids resistant to pests and diseases is necessary both in protected and early field crops, due to very high investments, requiring the elimination of all risks and losses. The improvement of varieties and hybrids for ecological vegetable growing is also based on the induction of different resistances considering the restrictiveness to pest and disease control of this vegetable growing system.

Modern technologies for cultivation of vegetable plants, based on the use of advanced cultivars, mechanization, irrigation and chemical administration imposed detailed researches on schemes of crop establishing, distance between plants, plant density and planting dates.

Planting dates are determined by the system of culture, by the biological peculiarities of the vegetable species and the time the yield harvesting (Stan and Stan, 2010).

Standard water quantity represents the amount of irrigation water that is given to crops an entire growing season. Due to restrictions of organic farming in the treatment of fungal diseases favored by high humidity, the provision of irrigation for organic production cycle is recommended to be much lower than the conventional system. However, Stoleru and Imre (2007) show that the removal of intensive irrigation and non-use of synthetic chemical fertilizers and pesticides in ecological system provides water to normal standards and avoid waste, thus achieving water sustainability.

Crop density represents the number of plants per hectare. It varies greatly depending on the scheme of crop establishing. Table 1 presents the distances between plants and the densities achieved in ecological vegetable growing for some important crops which have proved to be sustainable in terms of revenue.

Fertilization is a technological factor with a major impact in increasing the amount of harvest. Stoian (2005) considers that fertilization is the most important technological factor which makes the greater difference between the two cropping systems (conventional and organic). By practicing the ecological agriculture it is avoided the excessive accumulation of mineral salts in the arable layer that can lead to pollution of groundwater and surface water, and also to soil and crop.

In conventional agriculture, the fertilization is based on the careful chemical administration, particularly the use of organic and chemical fertilizers, while the basic link in ecological agriculture is represented by the compost. Also, the methods of fertilization must take into account the actual purpose: maintaining or increasing fertility and improving the nutrition of the growing season (Stan and Stan, 2010).

Table 1

Distances and densities for the establishment of some vegetable crops
(after Stoian, 2005)

Nr. crt.	Species	Number of rows per furrow	Distance between plants in row (cm)	Density thousand plants/ha
1.	Pepper	2	20-22	65-70
2.	Long pepper	2	18-20	70-80
3.	Fiber pepper	2	20-25	57-70
4.	Climbing cucumber	2	20-22	64-72
5.	Mechanically planted onions	4	3-4	700-900
6.	Garden bean	2	7-10	145-210
7.	Climbing beans	2	13-15	70-90
8.	Cantaloupe	1	50-55	13-15
9.	Lettuce	3	25-30	71-86
10.	Early tomatoes	2	30-32	45-47
11.	Summer tomatoes	1	20-25	28-36
12.	Garlic	3	5-6	350-430
13.	Early cabbage	2	25-30	47-57
14.	Autumn cabbage	2	35-40	36-41
15.	Eggplants	2	35-40	36-41

Regarding the *weed control*, the use of the herbicides is an indispensable link in the conventional system technology. The weeds are not considered "bad plants" but "accompanying wild plants" in organic agriculture's theory (Bankels, cited by Petrescu, 1997). However, there are four main factors that must be taken into account when it comes to applying herbicides: choosing the most effective herbicide, establishing the most effective dose of application, timing and technique of application and the factors influencing the implementation (Stan and Stan, 2010).

Concerning the weed control in ecological agriculture, there are two groups of measures: preventive and curative.

Some of the preventive measures are considered: plant quarantine, crop rotation organization, practicing long crop rotations, soil working depth rotation, sowing at optimum time, ensuring the plant density, continuous occupation of land by introducing successive crops, the adjustment of soil reaction and ensuring optimal ratio between nutrients, removal of excess water, using of fermented compost to fertilize in organic system, elimination of weed outbreaks from uncultivated land, cleaning of farm machinery, the use of seeds free irrigation water and timely performance of agricultural works (Munteanu N. et al. 2008).

Curative measures can be: physical-mechanical kind (manual, mechanical or thermal control), biotechnical kind (mulching, soil tillage in the dark, forcing the seed germination), biological kind (allelopathic, parasite and fungal control), genetic kind (based on competition for environmental factors between crop plants and weeds), biochemical and biodynamic kind.

Pests and diseases control. Stan and Stan, 2010, considers that damage caused by the effect of crop diseases and pests are, on average, 18% and can reach

up to 100% when they encounter the best conditions for development. In conventional agriculture there are preventive treatments against diseases (using contact products) and curative treatments (using systemic products). Usually, pests are controlled only by curative treatments when their appearance is seen.

The principles of integrated control are applying in ecological system, with the specification that most chemicals are prohibited. Therefore, rather than the conventional system, the ecological system focuses on preventive measures.

Tables 2 and 3 presents some plants with pathogen and insecticide action successfully used in organic farming.

Table 2

Species of plants acting against pathogens at vegetable crops
(Munteanu N. et al. 2008)

Species	Pathogen	Disease	Partea de plantă folosită
<i>Anethum graveolens</i> (Dill)	<i>Fusarium oxysporum</i> <i>Rhizoctonia solani</i>	fusariosis rhizoctoniasis	Volatile oil
<i>Chelidonium majus</i> (Wormwood)	<i>Botrytis cinerea</i> <i>Fusarium oxisporum</i>	gray rot fusariosis	All plant
<i>Lycopersicon esculentum</i> (Tomatoes)	<i>Fusarium oxisporum</i>	fusariosis	leaves, leafjuice
<i>Mentha piperita</i> (Peppermint)	<i>Cladosparium fulvum</i> <i>Botrytis alii</i>	Brownstaining of leaves garlic rot	Leaves, volatile oil

Table 3

Native plant with insecticide action (Munteanu N. et al., 2008)

Species	Contained pest
<i>Achillea millefolium</i> (Yarrow)	aphids, mites, psilide, thrips
<i>Allium cepa</i> (Onion)	mites, ants, deposit pests
<i>Artemisa absintium</i> (Wormwood)	nematodes, caterpillars, fleas
<i>Conium maculatum</i> (Hemlock)	Beetle larvae
<i>Coriandrum sativum</i> (Coriander)	aphids, spiders, Colorado beetle (repellent effect)
<i>Solanum nigrum</i> (black nightshade)	aphids, mites, cabbage white butterfly

Ecological agriculture system can use a series of entomophagous predators for pest control: *Coccinella septempunctata* against grey lice, *Encarsia formosa* (parasitic wasp) against *Trialeurodes vaporariorum*, *Trichogramma spp* (parasitic wasp) against *Mamestra brassicae* to mention the most known.

CONCLUSIONS

1. Technological factors represent the main element of vegetable growing, regardless of the system of culture, because they provide the quantitative growth (conventional system) and the quality growth (organic systems) of vegetable production.

2. Sustainability of vegetable growing, either conventional or organic, is closely related to ensuring optimized technological factors in accordance with the latest developments in the vegetable growing area and economic efficiency conditions.

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MORPHOLOGICAL AND PHYSIOLOGICAL CHARACTERISTICS OF THE SPECIES *ORIGANUM VULGARE* L. IN ORGANIC GROWING CONDITIONS IN THE COUNTY OF IASSY

CARACTERISTICI MORFOLOGICE ȘI FIZIOLOGICE ALE SPECIEI *ORIGANUM VULGARE* L. ÎN CONDIȚII DE CULTIVARE ECOLOGICE ÎN JUDEȚUL IAȘI

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Abstract. The paper highlights the main morphological and physiological characteristics of the species *Origanum vulgare* L. in organic growing conditions in the county of Iassy. The results show that under these conditions the plant has a typical morphology and physiology with some deviations on the habitus of the plant, vegetative mass, the vegetation, flowering, harvest quality. These results demonstrate the species well adapted to natural conditions of the science and efficient cultivation opportunities.

Key words: *Origanum vulgare*, morphological, physiological.

Rezumat. Lucrarea prezintă principalele caracteristici morfologice și fiziologice ale speciei *Origanum vulgare* L. în condiții de cultivare ecologice în județul Iași. Rezultatele arată că planta prezintă în aceste condiții o morfologie și fiziologie tipică cu unele abateri privind habitusul plantei, masa vegetativă, pornirea în vegetație, înfloritul, calitatea recoltei. Aceste rezultate demonstrează buna adaptare a speciei la condițiile naturale din zona Iași, precum și posibilitățile de cultivare eficientă.

Cuvinte cheie: *Origanum vulgare*, morfologie, fiziologie.

INTRODUCTION

Oregano (*Origanum vulgare* L.) is a native species from the Europe (Mediterranean region), southern and central Asia. The most important species of oregano have the origin from high altitude mountain areas in the Mediterranean region, the plant is common in Greece, Asia Minor, Italy and even in the Balkans (Sarlis G., 1994). This species is known in Romania, both spontaneous and the cultivated. The area planted with oregano is relatively low: in small farms, in private collections, research establishments or in some companies with concerns for the spicy, aromatic and medicinal crop (Fălticeanu Marcela, N. Munteanu, 2003).

Technical knowledge about the culture of oregano are relatively low, and written, for the most part, are takeovers of foreign literature.

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Knowledge of the main agrobiological characteristics related to plant morphology and physiology, agrotechnic and cultivation technology, is essential to promote, on a scientific basis, this culture. Therefore, the purpose of this paper is to highlight some of the morphological and physiological features of this culture in order to optimize the cultivation technology (Stan and Munteanu, 2001).

MATERIAL AND METHOD

The research was conducted at the Faculty of Horticulture organized on the basis of experience in the experimental field of vegetable discipline during 2009-2010, established a culture of oregano in the previous year.

Culture was established by 40-45 days seedling, planted in the last decade of April, with rows spaced 70 cm and a distance between plants in the row of 30 cm (4.8 plants/m²).

Care work are those recommended in the literature. During the vegetation period, observations and measurements were made on the main biometric characteristics morphophysiological with special reference to: the vegetation, plant height, plant diameter, branch and main phenophase. The flowering period were sampled for determination of leaf pigments using spectrophotometry.

The experimental data were processed by statistical and mathematical methods.

RESULTS AND DISCUSSIONS

Results were analysed and compared to the years 2009 and 2010.

In 2009 (table 1), the plants were growing in the second year, entered into between 10-15 March and vegetation began to flourish in the 14-20 June and flowering lasted about three weeks.

Table 1

Results on the dynamics of *Origanum vulgare* L. plants in 2009

Date of measurement	Plant height (cm)	Bush diameter (cm)	Number of tillers/plant	Vegetative mass (g)	Phenophase
8.04. 2009	22	65-70	80	1200	issue sprouts
3.05.2009	40-45	72-75	85	1800	floriferous stems issue
3.06.2009	50-55	77-80	95	2900	flower buds
3.07.2009	55-60	80-85	95	3500	full flowering

The first harvest was made on 12 July. Following harvest was obtained 16.8 t/ha of fresh vegetative mass, after drying were obtained 4.2 t/ha vegetative dry mass. Drying efficiency was 4 kg to 1 kg fresh vegetative dry vegetation.

The second harvest was made on 30 September when the harvest was obtained fresh vegetative weight 1.07 t/ha, respectively 0.3 t/ha of dry vegetative mass, drying the resulting yield was 3.9 kg for 1 kg fresh vegetative dry vegetation.

In 2010 (table 2), plants have entered the vegetation period March 20 to 25 and began to flourish during the period June 20 to 25. The flowering lasted about three weeks. The first harvest was made on July 20.

Following harvest were obtained 22.5 t/ha fresh vegetative mass, obtained after drying were 5.76 t/ha dry vegetative mass. Drying efficiency was 3.9 kg to 1 kg fresh vegetative vegetative dry mass. A second harvest was made on 25 September when fresh harvest was obtained 1.44 t/ha, respectively 0.36 t/ha dry, in which case the yield was the same as the first harvest, 3.9 kg of mass 1kg fresh vegetative mass for dry vegetation.

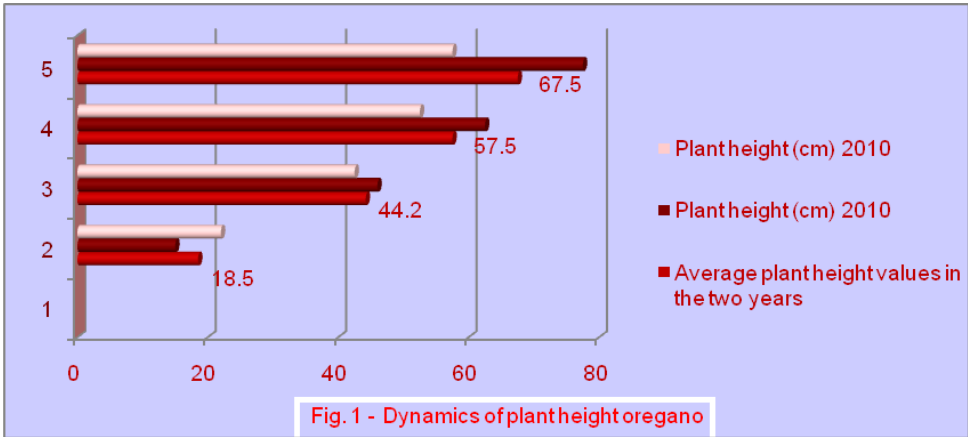
Table2

Results on the dynamics of *Origanum vulgare* L. plants in 2010

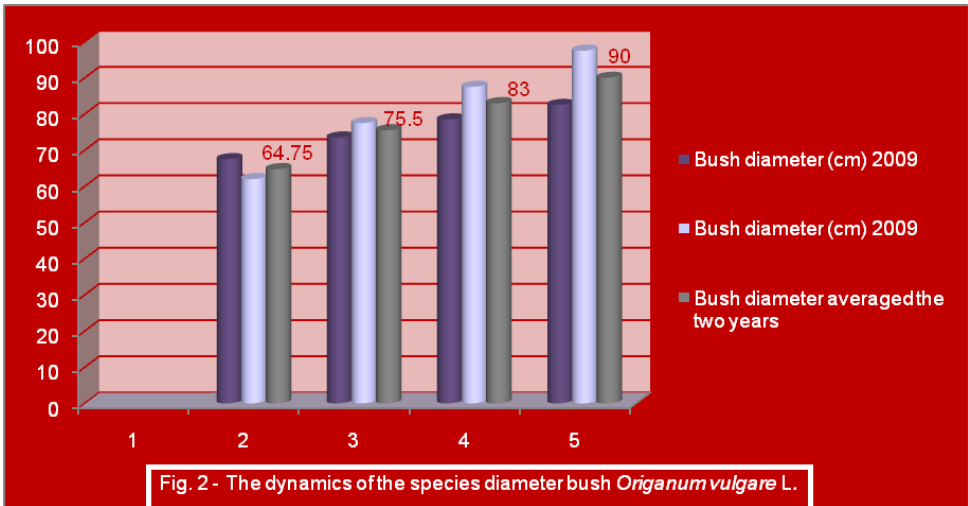
Date of measurement	Plant height (cm)	Bush diameter (cm)	Number of tillers/plant	Vegetative mass (g)	Phenophase
8.04. 2010	15	60-64	96	2300	issue sprouts
3.05. 2010	44-48	75-80	100	3700	floriferous stems issue
3.06.2010	60-65	85-90	110	4300	flower buds
3.07.2010	75-80	95-100	110	4600	full flowering

Mean experimental results obtained in the two years 2009 and 2010, are presented graphically in figures 1, 2 and 3. Regarding plant height, we can say that it shows a significant increase in the last phenophase height compared to the plants phenophase issued shoots.

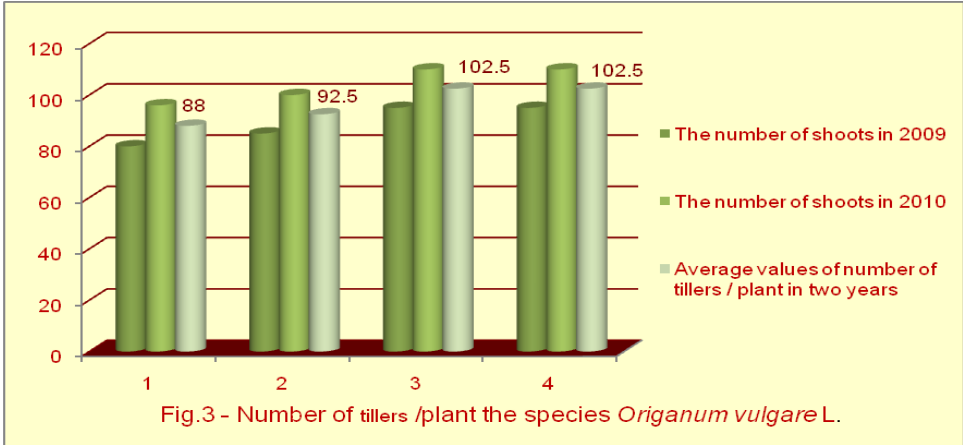
Thus, in 2009, plant height had values ranging from 22 cm, in shoots and 55-60 cm. phenophase issue when the plants were in full bloom period. Assigned range in plant height in 2010 ranged between 15 cm. and 75-80 cm. in the first phenophase at full flowering. Average values for the two years ranged from 18.5 cm., during the period when the plants were given full, flowering shoots and 67.5 cm.



The following graph, the diameter growth of the bush, we have values higher in the third year of crop plants, compared to the second year in most phenophase except phenophase issue of shoots, where you can see a decrease in the diameter of the bush. Average values recorded on the two years is between 64.75 cm. in the plants issued phenophase shoots and flowering phenophase 90 cm.



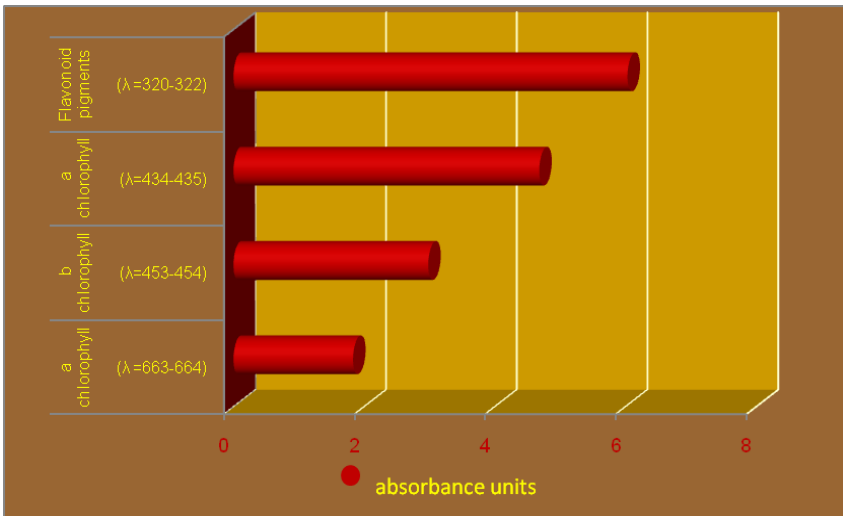
As the number of shoots, it appears that it has made quite different, increasing from one year to another, indicating that in the last two phenophase values stabilized. Average number of shoots recorded values, the two-year period was 88 when the plants emit sprouts, 92.5 in issuing phenophase floriferous stems and 102.5 both during floral bud formation and at full flowering.



Qualitative and quantitative analysis of foliar pigment content, assessed by ability to absorb UV light in the visible spectrum and shows differences between the categories of plant pigments in the oregano.

Chlorophyll a 663-664, had average values of 1.83, considered high value, which shows a good adaptability of the species in experimental conditions. Knowing that a plant is heliofill oregano (fig.4). *453-454 chlorophyll b* has values ranging around 2.98 absorbance units, and *chlorophyll a* 434-435 has an average value of 4.68 absorbance units, demonstrating good light absorption capacity by plants.

Flavonoid pigments have an average of 6.03. Based on these values we can evaluate the strength of plant organs adverse environmental conditions.



CONCLUSIONS

1. The analysis main morphological characteristics (plant height, diameter of the bush and number of tillers/plant), the two years in different phenophase showed a progressive increase from one year to another, the values recorded by them.

2. Yields on these two years, ranged from 16.8 t/ha in 2009 to 22.5t/ha 2010.

3. Content in chlorophyll pigments and flavonoids of plants, is located at a high level, demonstrating the photosynthetic capacity and high adaptation.

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ON THE ORNAMENTAL FEATURES OF SOME VEGETABLE CULTIVATED SPECIES

VALOAREA ORNAMENTALĂ A UNOR SPECII LEGUMICOLE CULTIVATE

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Abstract. *The research was based on documentary research and field-level collections, the value of wild ornamental vegetable cabbage (*Brassica oleracea* L. var. *acephala* DC) and pumpkin (*Cucurbita pepo* L var *ovifera*). The sprouts were detected ornamental shapes by color, shape and appearance of leaves. Ornamental pumpkin shapes differ in plant habitus, size, shape, color and appearance of the fruits.*

Key words: *Brassica* genus, *Cucurbita* genus, biological evolution, variety, ornamental value.

Rezumat. *Cercetările au avut la bază studiul documentar și în teren, la nivel de colecții, privind valoarea ornamentală a speciilor legumicole varza (*Brassica oleracea* L. var *acephala* DC) și dovleacul (*Cucurbita pepo* L var *ovifera*.). La varză au fost depistate forme ornamentale prin culoare, formă și aspectul frunzelor. Formele ornamentale de dovleac diferă prin habitusul plantelor, mărimea, forma, culoare și aspectul fructelor.*

Cuvinte cheie: *genul Brassica, genul Cucurbita, evoluție biologică, varietate, valoare ornamentală*

INTRODUCTION

The art of gardening provides a shining example of the use of vegetable plants in decorative arrangement - Park Villandry in France, the Renaissance manner. Vegetable garden in this park was established since the Middle Ages, being cared for by monks from the nearby monastery. Much later, Dr. Carvallo pragmatist recreated the vegetable garden during the World War II, adding a total of about 250,000 plants that today are only for decoration. In the garden are planted 40 different vegetables. The best time of year to admire the garden is in autumn, when the decorative cabbage matures and the courgettes enchants us with their elliptical shapes, flattened and globular. (<http://www.gradinamea.ro/>).

Vegetable garden consists of nine areas that have different geometric shapes. In these areas, are vegetable plants with contrasting colors (leeks blue, red and white ornamental cabbage, pumpkin orange, green leaves of carrot etc.), giving the impression of a colorful game board. (<http://www.gradinamea.ro/>).

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Vegetable production is marked by a great diversity of species, cultural practices and traditions of use. The great biodiversity of the vegetables species and vast movement all over the world have allowed the evidence of many uses, besides the food, such as phytotherapy, cosmetics, landscaping etc.

Ornamental value of vegetables results from the morphological characteristics of the plant itself: size, general habitus of plants, shape, appearance, size and color of leaves, flowers and fruits.

At some vegetable species and types occurred mainly ornamental value with food value less important or insignificant. Such forms we meet the species like: green pepper, onion, cauliflower, zucchini, beans, parsley, lettuce, cabbage etc.

This study proposes an overview of ornamental shapes of zucchini, *Cucurbita pepo* L. var. *ovifera* and cabbage, *Brassica oleracea* L. var. *acephala* DC. The analysis of ornamental forms is made with special reference to biological characteristics, organical - physiological and ornamental, and how to use landscaping.

MATERIAL AND METHOD

This study was based on analysis of existing information in the literature.

It was analyze a wide variety of forms including ornamental cabbage and ornamental squash. As a working method it was used comparative analysis.

RESULTS AND DISCUSSIONS

a. Results of ornamental cabbage.

Biological features. Ornamental cabbage is a biennial species, cross-fertilized. The root system is developed at lower depths compared with other vegetables.

The stem grows to 120-160 cm height, depending on variety. Leaves (formed at the beginning) at first forming a rosette on a short stalk about 25-30cm. At this stage leaves already have (shows) an ornamental value by form and color. In his evolution, stem grows vertically, and the leaves are arranged alternate and helical on it. In the stem apex is maintained a rosette of leaves similar to the original, which is continuously refreshed with leaves that start from the central bud. Leaves from the rosette are sessile or short petiolate, and those on the stems are long petiole.

Ornamental value is given mainly by the shape, appearance and color of the rosette leaves of the partially stripped.

The leaf shapes are like cabbage leaves used as vegetable plants. The limb is at first elongated oval or lanceolate, and then circle or heart surface more or less corrugated, and the edges full and pursed.

Leaves usually shows two colors, one of which is original and substantive (background), and the second overlaps the first.

The background color is different shades of green. This predominate from outer leaf (fig. 1). The second leaf color should be placed inside the shades of

white or mixed white and pink, pink or red (fig. 2), blue, violet blue and garnet (fig. 3).

Ornamental cabbage can be said (affirm) in landscape architecture in rabat, flats, mosaics, arabesques, borders, but also in pots or containers in various shapes: oval form with lirate leaf, embossed or obovate, spherical, with round leaf, lirate or embossed, round and flat-leaf embossed.



Fig. 1 – Light Green background

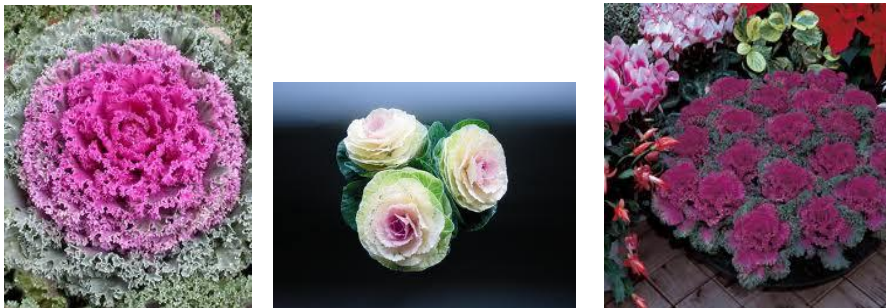


Fig. 2 – Shades of white, pink and red interior leaf



Fig. 3 – Shades of blue, violet-blue and dark red interior leaf

Ecological and physiological characteristics. Ornamental cabbage leaf has lower requirements to the factors of vegetation, compared with other

vegetable sprouts. Optimum growing temperature is 15-17°C, but plants vegetate at 5-10° C too. Mature plants are resistant to low temperatures of minus 8-10°C, so it can remain in the field over winter in areas without strong frosts. Requirements for water are high, due to water loss through embossed leaves. Plant water supplies during dry periods favorably influence the production of leaves and ornamental value.

b. Results of ornamental gourd.

Biological features. Zucchini is an annual species, with lush vigorous growth, forming compact bushes or widely scattered through the haulm, long and clips by enclosures.

Root is pivoting, over 1m L, lateral roots massed emitting layer of arable soil.

The stem is short and strongly branched or long branches, crossed by longitudinal sharp edges, covered with stiff hairs. The leaves are large, dark green, lobed palmate, long petiolate and covered with short stiff hairs. Unisexuate flowers are large, long petiolate, colored in yellow. Male flowers appear earlier than females, and 2-3 are grouped at the base of leaves (Stan and Munteanu, 2003).



Fig. 4 – Globular form



Fig. 5 – Flattened shape



Fig. 6 – Elliptical shape



Fig. 7 – Discoid shape

Ornamental value of the zucchini plant is given by the habitus of plants, shape, size and color of fruit. Fruit shape presents (shows) several forms: globular, flattened, elliptical (fig.4-6), discoid, cordiform or pear-shaped (fig.7-9), turkish turban or crooked neck (fig. 10-11).

Fruit color is formed from mixtures thereof (fig. 12), or shades of one color (fig. 13).

Zucchini is required in landscape particularly through plant habitus, size, shape and fruit color. These important issues are taken into consideration for selection, placement and grouping them across the landscape must also add additional decorative effects of the flowers and leaves.

The housing lots, ornamental gourd value is usually grown in a separate sector, apart from an ornamental garden, including flowers, shrubs, trees, or directly on the lawn. It also can be used in interior design, where is required by color, size and shape of fruit by color, size and shape of fruit.



Fig. 8 - Heart shape



Fig. 9 – Pear shape



Fig. 10 – Turkish turban shaped



Fig. 11 – Crooked neck



Fig.12 – Fruit bicolor



Fig.13 – Unicolor fruit

Ecological and physiological characteristics. Minimum temperature for seed germination is 12-14°C and the optimum during the growing season of 25-28 C. Plants are destroyed at temperatures of -0.5°C. Front light has high demands, requiring a minimum of 40,000 lux. While claiming higher soil moisture, support relatively well the drought thanks (due) to the well-developed root system. Optimum soil moisture during the fructification is 70-75% of field water capacity (Indrea et al., 2009).

CONCLUSIONS

1. Following the study conducted on the basis of existing research literature, there have been results on the value of wild ornamental cabbage and zucchini.

2. The ornamental cabbage forms have been identified characterized by color, shape and appearance of leaves and the pumpkin, ornamental shapes by plant habitus, size, shape, color and appearance of fruit.

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STUDIES ON THE PREFERENCES FOR ECOLOGICAL VEGETABLE PRODUCT OF THE CONSUMERS FROM IASI COUNTY

STUDII ASUPRA PREFERINTELOR PENTRU LEGUMELE ECOLOGICE A CONSUMATORILOR DIN JUDEȚUL IAȘI

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Abstract. *The study aims at highlighting the consumers' preferences as determining factors in the promotion and development of the ecologic vegetable production in Iasi County. The results obtained show us that consumers' preferences varied depending on the income class and number of family members of the persons interviewed. This study was made on a sample made of 500 persons by using a questionnaire elaborated according to the norms provided in the specialized literature.*

Key words: ecological vegetables, preferences, consumers.

Rezumat. *Studiul are drept scop evidențierea preferințelor consumatorilor ca factori determinanți în promovarea și dezvoltarea producției legumicole ecologice în județul Iași. Rezultatele obținute ne relevă faptul că preferințele consumatorilor au variat în funcție de grupa de venit și numărul de membri ai familiei persoanelor intervievate. Studiul de față a fost realizat pe baza unui eșantion format din 500 de persoane, utilizându-se un chestionar elaborat după normele prevăzute în literatura de specialitate.*

Cuvinte cheie: legume ecologice, preferințe, consumatori.

INTRODUCTION

Iasi county has high possibilities to cultivate vegetables and in time there have appeared several traditional micro areas such as those around Tg. Frumos town or those from Lunca Prutului. In these micro areas, the pedoclimatic conditions and the professional knowledge are favorable factors for the practicing of the ecologic vegetable growing (Munteanu N. et al., 2008). If we take into account a sustainable ecologic vegetable production, then there must a demand from the consumer's part for such products, since they are also the final beneficiaries of such a system (Darnhoferlka et al., 2005; Munteanu N., Rominger O., 2001; Teliban G., Munteanu N., 2009).

In this context, the goal of this paper is to highlight the consumers' preferences in terms of yield and consumption of ecologic vegetables, depending on some elements of the social-professional profile of the interviewed people.

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MATERIAL AND METHOD

The carrying out of the study proposed was made through the survey method by using questionnaires specially made for social-professional surveys. Such studies are made at the level of some relatively large samples, so that the answers might represent average values as close as possible to the theoretic average for the entire population participating in the survey.

The interviewing comprised 500 persons by using a questionnaire elaborated according to the norms provided in the specialized literature (Buia Anuța et al., 2003; Oppenheim A.N., 1997).

For the field investigation we chose the towns of Iași and Tg. Frumos, as well as communes Belcești, Bosia, Golăiești and Răducăneni, localities having large surfaces and vegetable yields and a well known tradition.

Respondents' answers were checked, validated and processed by specific methods using the SPSS program (Statistical Package for the Social Sciences), variant 17.

Following the validation of answers, out of the 500 questionnaires only 484 were valid with full answers to all questions, answers considered as acceptable "pertinent answers", with one answer for every question etc. The answers regarding preferences were appreciated on a scale with five levels of answer from „I totally agree to that” up to „I totally disagree to that”.

RESULTS AND DISCUSSIONS

A pertinent analysis of consumers' preferences in terms of the ecologic vegetable production must first of all be studies from the economic viewpoint. At the same time, an important factor in determining consumers' preferences is represented by the number of family members.

From the economic viewpoint, the persons who participated to the interview may be grouped as follows: respondents having an income up to 400 lei – 23.4%, respondents having an income between 400-800 lei – 36.4%, respondents having an income between 800-1200 lei – 14.9%, respondents having an income between 1200-2000 lei – 15.2%, respondents having an income over 2000 lei – 10.1%.

As for the number of family members, we may notice that: 47.8% is the percentage of persons having a 1-3 member family, 46.2% is the percentage of persons having a 4-6 member family, 4.4% is the percentage of persons having a 7-9 member family, 0.6% is the percentage of persons having a 10-12 member family and 0.9% is the percentage of persons having more than 12 family members.

The preferences of the people, who were asked the question “Would I buy ecologically grown vegetables?”, show different groups of answers for the sample under study (table 1).

Thus, out of the 484 interviewed persons, 81.0% said that they would buy ecologically grown vegetables, 15.5% said they were not sure and 3.5% would not buy ecologically grown vegetables. The data obtained for the sample under study shows the respondents' interest and preoccupation first of all or their health.

As for the answers received depending on the income class, the percentage of persons who agreed to the abovementioned issue was the following one: people having an income below 400 lei – 70.7%, people having an income between 400-800 lei – 80.6%, people having an income between 800-1200 lei – 84.3%, people having

an income between 1200-2000 lei – 95.1% and people having an income over 2000 lei – 92.1%.

As for their distribution in terms of the number of family members, the persons having a 1-3 member family agreed or totally agreed in a percentage of 79.9%, the persons having a 4-6 member family agreed in proportion of 83.5%, the persons having a 7-9 member family – 73.7%, the ones having a 10-12 member family – 33.3% and the ones having more than 12 family members agreed in a percentage of 100%.

Table 1

Consumers' preference to buy ecologically grown vegetables depending on the income class and the number of family members

Incomeclass (lei)	Number of members	I would buy ecologically grown vegetables					Total
		I totally agree	I agree	I am not sure	I disagree	I totally disagree	
upto 400	1 – 3	22	30	17	4	0	73
	4 – 6	18	22	12	2	0	54
	7 – 9	4	2	4	0	0	10
	10 – 12	0	0	1	1	0	2
	>12	1	0	0	0	0	1
Total		45	54	34	7	0	140
400 – 800	1 – 3	27	50	21	3	0	101
	4 – 6	24	38	7	3	0	72
	7 – 9	3	2	0	1	0	6
	10 – 12	0	0	0	0	0	0
	> 12	0	1	0	0	0	1
Total		54	91	28	7	0	180
800 – 1200	1 – 3	10	16	1	3	0	30
	4 – 6	13	13	6	0	0	32
	7 – 9	0	2	0	0	0	2
	10 – 12	0	0	0	0	0	0
	> 12	0	0	0	0	0	0
Total		23	31	7	3	0	64
1200 – 2000	1 – 3	16	15	2	0	0	33
	4 – 6	15	11	1	0	0	27
	7 – 9	1	0	0	0	0	1
	10 – 12	0	0	0	0	0	0
	> 12	1	0	0	0	0	1
Total		33	26	3	0	0	62
over 2000	1 – 3	8	13	1	0	0	22
	4 – 6	7	6	2	0	0	15
	7 – 9	0	0	0	0	0	0
	10 – 12	1	0	0	0	0	1
	> 12	0	0	0	0	0	0
Total		16	19	3	0	0	38
TOTAL		171	221	75	17	0	484

Question: “Would you buy ecologic vegetables even if they are more expensive?” shows a certain classification of answers (table 2). Thus, 64.8% of respondents agreed or totally agreed to this question, 25.2% were not sure and 9.9% would not buy ecologic vegetables because they are more expensive.

Table 2

Consumers' preferences to buy ecologic vegetables even if they are more expensive, by income class and number of family members

Incomeclass (lei)	Number of members	Would you buy ecologic vegetables even if they are more expensive ?					Total
		I totally agree	I agree	I am not sure	I disagree	I totally disagree	
upto 400	1 – 3	9	31	19	13	1	73
	4 – 6	12	19	17	3	3	54
	7 – 9	3	2	4	1	0	10
	10 – 12	0	0	1	1	0	2
	> 12	0	1	0	0	0	1
Total		24	53	41	18	4	140
400 – 800	1 – 3	10	44	36	9	2	101
	4 – 6	9	36	20	5	2	72
	7 – 9	3	3	0	0	0	6
	10 – 12	0	0	0	0	0	0
	> 12	0	1	0	0	0	1
Total		22	84	56	14	4	180
800 – 1200	1 – 3	8	14	4	1	3	30
	4 – 6	10	14	6	2	0	32
	7 – 9	0	1	0	1	0	2
	10 – 12	0	0	0	0	0	0
	> 12	0	0	0	0	0	0
Total		18	29	10	4	3	64
1200 – 2000	1 – 3	9	15	9	0	0	33
	4 – 6	10	14	3	0	0	27
	7 – 9	1	0	0	0	0	1
	10 – 12	0	0	0	0	0	0
	> 12	1	0	0	0	0	1
Total		21	29	12	0	0	62
over 2000	1 – 3	8	11	3	0	0	22
	4 – 6	4	10	0	0	1	15
	7 – 9	0	0	0	0	0	0
	10 – 12	1	0	0	0	0	1
	> 12	0	0	0	0	0	0
Total		13	21	3	0	1	38
TOTAL		98	216	122	36	12	484

As for the distribution of answers by income, we may notice that the persons having higher income (1200-2000 lei and over 2000 lei) gave the most affirmative answers – 80.7% and 89.5%, respectively.

The persona having the lowest income up to 400 lei gave the least affirmative answers, namely 55.0%.

As for the distribution of answers by the number of family members, the persons having a 1-3 member family agreed or totally agreed in a percentage of 61.4%, the persons having a 4-6 member family agreed in a percentage of 69.0%, the persons having a 7-9 member family – 68.4%, the persons having a 10-12 member family – 33.0% and the ones having more than 12 members in their family agreed in a percentage of 100%.

The respondents' answers related to the idea that "I do not buy ecologic products because they do not have an attractive aspect, though it is known they are healthier" determined a certain classification of answers (table 3).

Table 3

Consumers' trend not to buy ecological vegetables because they do not have an attractive aspect, by the income class and the number of family members

Income class (lei)	Number of members	I do not buy ecologic products because they do not have an attractive aspect, though it is known they are healthier					Total
		I totally agree	I agree	I am not sure	I disagree	I totally disagree	
upto400	1 – 3	2	6	30	28	7	73
	4 – 6	1	7	19	22	5	54
	7 – 9	0	0	3	7	0	10
	10 – 12	0	0	1	1	0	2
	> 12	0	0	0	1	0	1
Total		3	13	53	59	12	140
400 – 800	1 – 3	3	13	34	42	9	101
	4 – 6	2	8	21	36	5	72
	7 – 9	0	1	2	3	0	6
	10 – 12	0	0	0	0	0	0
	> 12	0	0	0	1	0	1
Total		5	22	57	82	14	180
800 – 1200	1 – 3	0	2	8	17	3	30
	4 – 6	0	4	10	13	5	32
	7 – 9	0	0	1	0	1	2
	10 – 12	0	0	0	0	0	0
	> 12	0	0	0	0	0	0
Total		0	6	19	30	9	64
1200 – 2000	1 – 3	0	6	5	18	4	33
	4 – 6	0	1	3	15	8	27
	7 – 9	0	1	0	0	0	1
	10 – 12	0	0	0	0	0	0
	> 12	0	0	0	0	1	1
Total		0	8	8	33	13	62
over 2000	1 – 3	1	3	3	10	5	22
	4 – 6	0	1	1	10	3	15
	7 – 9	0	0	0	0	0	0
	10 – 12	0	0	0	0	1	1
	> 12	0	0	0	0	0	0
Total		1	4	4	20	9	38
TOTAL		9	53	141	224	57	484

Thus, 12.9% out of the persons interviewed answered they would not buy ecologic vegetables because these do not have an attractive aspect, 29.1% were not sure and 58.1% expressed their wish to buy such products, regardless of their aspect. The relatively low percentage of those who answered positively in relation with the aspect of the ecologic vegetables has a high relevance in the commerce with such products.

As for the answers received by the income class, the percentage of persons who would buy ecological vegetables even if they do not have an attractive aspect is the following: persons having an income below 400 lei – 50.7%, persons having an income between 400-800 lei – 53.4%, persons having an income between 800-1200 lei – 61.0%, persons having an income between 1200-2000 lei – 74.2% and persons having an income over 2000 lei – 76.3%.

As for their distribution by the number of family members, the persons having a 1-3 member family agreed or totally agreed in a percentage of 55.2%, the persons having a 4-6 member family agreed in a percentage of 61.0%, the persons having a 7-9 member family – 57.9%, the persons having a 10-12 member family – 66.6% and the ones having more than 12 members in their family agreed in a percentage of 100%.

CONCLUSIONS

1. Consumer's preferences in relation with the ecologic vegetables depend on the income class and the number of family members.

2. The highest preferences for ecological vegetables belong to the persons having high and very high incomes (1200-2000 lei and over 2000 lei).

3. Depending on the number of family members, consumers' preferences to buy ecological products registered a majority percentage in case of the families having 4-6 family members.

4. When speaking about their orientation towards the ecological product market, consumers prefer first of all high quality products with an attractive aspect whereas price is the second criterion taken into account.

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OPTIMIZATION OF CERTAIN TECHNOLOGICAL MEASURES FOR HYSSOP (*HYSSOPUS OFFICINALIS*) CROPS IN THE ECOLOGICAL CONDITIONS

OPTIMIZAREA UNOR VERIGI TEHNOLOGICE LA CULTURA DE ISOP (*HYSSOPUS OFFICINALIS*) ÎN SISTEM ECOLOGIC

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Abstract. *The main goal of the study was to optimize cultivation technology by variation of the establishment biological material, plant density and fertilization in the ecological conditions from the Biarom farm (Iași County). The highest fresh yield (10.54 t/ha) and dried one (3.45 t/ha) were obtained by seedling establishment, using a density of about 180 thousands plants/ha and two times fertilization with 500 l solution of Cropmax 0.2%.*

Key words: *Hyssopus officinalis*, plant density, fertilization, ecological conditions.

Rezumat. *Studiul a avut ca scop optimizarea tehnologiei culturii de isop (*Hyssopus officinalis*), prin variația factorilor modul de înființare a culturii, densitatea și fertilizarea, în condițiile practicilor ecologice de cultivare, la ferma Biarom, județul Iași. Cea mai mare producție de masă vegetală proaspătă (10,54 t/ha) și uscată (3,45 t/ha) a fost realizată în varianta înființării culturii prin răsad, în condițiile unei densități de circa 180 mii plante/ha și a fertilizării cu produsul ecologic Cropmax 0,2%, aplicat de două ori, în cantitate de 500 l/ha.*

Cuvinte cheie: *Hyssopus officinalis*, densitate, fertilizare, sistem ecologic.

INTRODUCTION

Spice and aromatic plants present a special interest because they are used in the food domain to prepare salads, to spice dishes, in the canned food industry, the refreshment and alcoholic drink industry, in confectionery, cosmetics or medicine (Grădila Marga, 1998; Vărbăniș D. et al., 2005).

This study aimed at evaluating the profitability of hyssop cultivation and optimizing some technological steps for this culture in the circumstances of the ecologic agriculture from Iași County (Stan N., Stan T., 2006).

To attain our proposed goal, we established the following objectives:

- the study of the possibilities to set up the culture by nursery transplant and by direct seeding;
- the study of the influence of culture setting up diagrams (densities) on the yield;
- the study of the fertilization pattern on the harvest quantity.

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MATERIAL AND METHOD

The biological material used consisted in hyssop seeds and nursery transplants from cv. De Ciorani.

Researches were conducted at Biarom farm near Iași, in the interval 2007-2008.

The meteorological data registered at the Copou Meteorological Station, in the period when experiments were effectuated, are presented in table 1.

As for these data, we draw the conclusion that the values fall within the normal limits of the regional climate. The soil is a medium levigated cambic chernozem, well supplied with nutritive elements and a clayish texture.

Commenting on the meteorological and climatic conditions registered in the years when the study was conducted, we may say that these were favorable conditions for the hyssop culture.

Table 1

Data pattern in the interval 2007-2008 for the Copou-Iași meteorological station

Month	Year 2007			Year 2008		
	Average temperature (°C)	UR %	Precipitations (mm)	Average temperature (°C)	UR %	Precipitations (mm)
April	10.4	60	81.6	9.8	81.6	66.8
May	14.8	65	40.9	17.9	40.9	171.4
June	19.0	63	26.0	19.9	26.0	106.8
July	20.8	72	148.8	22.6	148.8	135.0
August	19.6	76	61,4	20.9	61.4	68.4
September	15.0	74	41.6	15.9	41.6	38.4
October	10.7	81	21.4	10.3	21.4	37.2

According to the established objectives, we took into account the following experimental factors with different graduations:

- factor A, manner of culture setting up with graduations: a₁- by direct seeding; a₂- by nursery transplant;

- factor B - setting up diagrams (densities) with graduations: b₁- four rows per 150 cm wide bed (180 thousand plants/ha); b₂- three rows per bed (130 thousand plants/ha); b₃- two rows per bed (90 thousand plants/ha). In all variants, the distance between plants in a row was 15 cm.

- factor C (fertilization pattern): c₁- unfertilized (blank test); c₂- Cropmax 0.2%; c₃ - Bionat 0.2%; c₄ - Bioforce 0.1%.

Treatments were administered by two foliar sprinklings in amount of 500 l/ha solution.

The poly-factorial experiment of the type (2x3x4) was organized in parcels subdivided in three repetitions, the surface of the repetition parcel being 12 m².

The effects of the experimental variances and their factors and graduations respectively, were appreciated by the quantities of fresh and dry harvest. The determinations of vegetal mass were processed by statistic-mathematic methods and the variance analysis (Fischer test) and the least significant differences –LSD (Student test).

RESULTS AND DISCUSSIONS

The results regarding the main elements of yield obtained for the hyssop culture are presented in table 2.

The fresh vegetative mass varied between 7.66 t/ha (a variant set up by seeding, with the lowest density, blank test, unfertilized, a1b3c1) and 10.54 t/ha for the setting up of culture by nursery transplant with the density of 180 thousand plants/ha, fertilized with Cropmax, a2b1c2. We may notice the superiority of the culture variant set up by nursery transplant with high density and fertilized with Cropmax. Very close values (10.46 t/ha) were also registered for the variant set up by nursery transplant with the density of 130 thousand plants/ha fertilized with Cropmax:– a₂b₂c₂.

Researches have proved that the determining factor in terms of yield is the manner of culture setting up, the variants set up by nursery transplant registering significantly higher values due to the fact that they benefited from a larger interval between seeding and harvesting and better growing conditions in the first vegetative state, namely in a protected space.

The influence of the culture setting up diagram on the vegetal mass yield was best highlighted when using the culture diagram with 4 rows /bed what demonstrates the fact that productivity in this case is directly correlated to a higher density.

From the viewpoint of the influence of “c” factor (fertilizer application) on the dry and fresh vegetative mass yield, researches have shown the superiority of Cropmax fertilizer as compared to others fertilizers used, all variants which used this product registering highly significant yield increases as compared to the experimental average. The variant a2b2c4 fertilized with Bioforce also registered distinctly positive values.

The **dry plant** yield was in direct correlation with the mass of fresh plant for the variants from which it was obtained. Thus the maximum yield of dry plant of 3.79 t/ha was obtained for the variant a2b1c2, and the lowest was signaled for the variant a2b3c1 –2.85 t/ha. Very close values to the maximum yield were registered by the variant a2b2c2 – 3.72 t/ha set up by nursery transplant with the density of 130 thousands plants/ha, fertilized with Cropmax.

The culture diagram significantly influenced yield both in case of culture setting up by direct seeding and by nursery transplant. Thus the highest yield of fresh vegetal substances was signaled for the diagram with 4 rows/bed, 8.79 t/ha (a1b1c2) and 10.54 t/ha (a2b1c2), and the lowest for the diagram with rows/bed 7.66 t/ha (a1b3c1) and 9.43 (a2b3c1).

Table 2

Results regarding the fresh and dry hyssop yield obtained by the variant set up by direct seeding and nursery transplant

Variant		Fresh vegetative mass				Dry vegetative mass			
No crt.	Specificatio n	Yield		Difference as comp. to average	Difference significatio n	Yield		Difference as comp. to average	Difference significatio n
		t/ha	% as compared to \bar{x}			t/ha	% as compared to \bar{x}		
1	a ₁ b ₁ c ₁	8.37	90	-0.93	oo	2.99	93.73	-0.20	
2	a ₁ b ₁ c ₂	8.79	94.51	-0.51		3.13	98.11	-0.06	
3	a ₁ b ₁ c ₃	8.53	91.72	-0.77	o	3.03	94.98	-0.16	
4	a ₁ b ₁ c ₄	8.65	93.01	-0.65		3.07	96.23	-0.12	
x	b ₁ average	8.58	92.95	-0.72	o	3.05	95.61	-0.14	
5	a ₁ b ₂ c ₁	8.18	87.95	-1.13	oo	2.89	65.76	-0.30	o
6	a ₁ b ₂ c ₂	8.42	90.53	-0.88	o	2.91	91.22	-0.28	
7	a ₁ b ₂ c ₃	8.36	89	-0.94	oo	2.93	19.84	-0.26	
8	a ₁ b ₂ c ₄	8.39	90.21	-0.91	oo	2.94	92.16	-0.25	
x	b ₂ average	8.33	89.56	-0.97		2.91	91.22	-0.28	
9	a ₁ b ₃ c ₁	7.66	82.36	-1.64	ooo	2.39	74.92	-0.80	ooo
10	a ₁ b ₃ c ₂	8.77	94.30	-0.53		3.14	98.43	-0.05	
11	a ₁ b ₃ c ₃	8.51	91.50	-0.73	o	3.00	94.04	-0.19	
12	a ₁ b ₃ c ₄	8.58	92.25	-0.72	o	3.03	94.98	-0.16	
x	b ₃ average	8.37	90	-0.93		2.89	90.59	-0.30	
x	a ₁ average	8.42	90.66	-0.88		2.95	86.12	-0.24	

1	$a_2 b_1 c_1$	9.79	105.26	0.49		3.45	108.15	0.26	
2	$a_2 b_1 c_2$	10.54	113.33	1.24	xxx	3.79	118.80	0.60	xxx
3	$a_2 b_1 c_3$	10.49	112.79	1.19	xxx	3.76	117.86	0.57	xxx
4	$a_2 b_1 c_4$	10.39	111.72	1.09	xx	3.58	112.22	0.39	xx
x	b_1 average	10.30	110.75	1.00		3.64	114.10	0.45	
5	$a_2 b_2 c_1$	9.53	102.47	0.23		3.36	105.32	0.17	
6	$a_2 b_2 c_2$	10.46	112.47	1.16	xx	3.72	116.61	0.53	xxx
7	$a_2 b_2 c_3$	10.33	111.07	1.03	xx	3.62	113.47	0.43	xx
8	$a_2 b_2 c_4$	10.43	112.15	1.13	xx	3.65	114.42	0.46	xx
x	b_2 average	10.18	109.46	0.88		3.58	112.22	0.39	xx
9	$a_2 b_3 c_1$	9.43	101.32	0.13		2.85	89.34	-0.34	o
10	$a_2 b_3 c_2$	10.35	111.29	1.05	xx	3.01	94.35	-0.10	
11	$a_2 b_3 c_3$	10.28	110.53	0.98	xx	3.20	100.31	0.01	
12	$a_2 b_3 c_4$	10.31	111.72	1.08	xx	3.23	101.25	0.04	
x	b_3 average	10.09	108.49	0.79		3.07	96.23	-0.12	
x	a_2 average	10.19	109.65	0.89		3.43	107.64	0.24	
x	$a_1 + a_2$ average	9.30				3.19			

DL 5%=0.67 DL 1%=0.89 DL 0.1%=1.17 DL 5%=0.30 DL 1%=0.38 DL 0.1%=0.52

CONCLUSIONS

1. The meteorological-pedological conditions in which the experiments were effectuated at Biarom farm from county Iași were favorable to the hyssop culture, in the circumstances of ecologic agriculture.

2. In the first years of culture, the variants set up by nursery transplant register superior net yield as compared to those set up by direct seeding.

3. Due to the fact that the values of fresh and dry vegetal mass yield of the variants set up by nursery transplant with the density 180 thousands plants/ha and fertilized with Cropmax were close, we recommend the variant with 130 thousands plants/ha both for economic reasons (less quantity of material to be planted/ha) and a less disease frequency (due to the less plant density).

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RESULTS ON THE SUSTAINABILITY EVALUATION OF VEGETABLE CULTIVATED SOIL IN THE TÂRGU FRUMOS CONDITIONS

REZULTATE PRIVIND EVALUAREA SUSTENABILITĂȚII SOLULUI CULTIVAT CU LEGUME ÎN CONDIȚIILE DE LA TÂRGU FRUMOS

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Abstract. *The research was carried out in the vegetable ecosystem of Târgu Frumos microregion in 2009 and 2010. The sustainability was assessed according to soil fertility based on the main physical, mechanical and chemical characteristics, expressed by the global agrochemical index (IAGF). Values of IAGF varied between + 31.06 and +41.91 and classified the soil in the +1 group of potential global fertility. The results reveal a high fertility, soils having a pronounced anthropogenic character, wich provides a high sustainability.*

Key words: sustainability, assessment, soil fertility

Rezumat. *Cercetările au fost efectuate în cadrul ecosistemului legumicol al microzonei Târgu Frumos, în anii 2009 și 2010. Sustenabilitatea a fost evaluată în funcție de fertilitatea solului, exprimată prin indicele agrochimic global al fertilității potențiale (IAGF), valorile IAGF au variat între +31,06 și +41,91 solul fiind încadrat în grupa +1 de fertilitate potențială globală ridicată. Rezultatele demonstrează un grad mare de fertilitate, pentru culturile sustenabile a legumelor în microzona Târgu Frumos, ceea ce asigură o mare pretabilitate privind sustenabilitatea.*

Cuvinte cheie: sustenabilitate, evaluare, fertilitatea solului

INTRODUCTION

First of all, the sustainable agriculture involves the development of soil systems to meet the growing quantity and quality of people's current needs without compromising requirements or options for future generations and also without causing irreversible damage to wildlife (Puia, 2000).

Around Târgu Frumos city is known a traditional microregion growing vegetables for over 100 years, in a system that can be considered intensive or very intensive.

In these circumstances the question arises whether this mode of operation will be efficiently, without affecting the soil fertility potential, a vegetable crops as long as possible, that they ensure the sustainability of vegetable production.

Therefore, the goal of the research was to determine scientifically the extent to which vegetable farms in the area are sustainable or not.

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MATERIAL AND METHOD

The research was conducted in 2009-2010 in the microregion vegetable ecosystem of Târgu Frumos.

Physico-chemical study of the main characteristics of the soil were made by observations and measurements related to some physical, mechanical, chemical and biological properties of soil resources.

The soil samplings was done with the drill, according to the systematic collection of agrochemicals applied in Romania. The weight of the samples collected depended on the purpose (the number and type of analysis performed) and the minimum weight provided its representativeness.

The samples were taken from a stationary well-established for research, from the microfarm Maxim up to two times, March and July.

In March, the plastic tunnels were planted with onions, lettuce, orach, and spinach salad, and in July, the same land was cultivated with tomato (Granadero F1) cultivar, tomato (Caliope F1) cultivar, pepper (Maradona F1) cultivar and cucumbers (Merengue F1) cultivar.

The results obtained from the soil analyses were interpreted using the global agrochemical potential fertility index (IAGF) determined on the basis of eight indicators agrochemical namely: pH - the soil, Nt (total nitrogen), PAL (phosphorus), KAL (potassium), C / N (ratio of carbon to nitrogen), T (cation exchange capacity), V (base saturation level) and H (humus) (Avarvarei et al., 1997).

Following the recommendations of the literature (Stanley et al., 1997) values are coded according to the agro-chemical indicators of size, coding into five groups namely: -2, -1, 0, +1 and +2, where the value 0 (zero) is the normal state of fertility.

Coded values are calculated using the global agrochemical potential fertility index, according to the formula:

$$IAGF = \frac{(pH + Nt + P + K + \frac{C}{N} + T + V + H)}{n}$$

where the significance of the indicators is previously mentioned and n = number of agrochemical indicators used.

By summing the algebraic values of the coded values are obtained IAGF agrochemical indicators that have the following meanings valori între -100 și -120 = fertilitate potențială globală scăzută;

-values between -26 and 10 = middle total fertility potential;

-values between 25 and 25 = overall normal fertility potential (satisfactory);

-values between 26 and + 100 = high overall fertility potential;

-values between + 100 + 200 = very high overall fertility potential

RESULTS AND DISCUSSIONS

The results of analysis of the soil samples, respectively the assessment of main physical-mechanical and chemical characteristics of the soil samples from vegetable ecosystem in terms of Târgu Frumos are shown in table 1.

Table 1

The main physical and chemical properties of soil resources - Târgu Frumos 2009-2010

Ecope-dotop	Specifi-cation	Poro-sity %	pH in H ₂ O	Hu-mus %	Nt %	PAL ppm	KAL ppm	SB me	T me	V %
Tg-Frumos 18.03.10 Maxim microfarm, plastic tunels hortical antrosol 0-20 cm	Plastic tunel I onion	18	6,43	3,113	0,14	22	151	20,1	22,6	79
	Plastic tunel II lettuce row	15	6,37	3,042	0,15	28	168	22.3	24,4	78
	Plastic tunel III orach row	16	6.31	3.021	0.16	18	138	21.5	23.1	76
	Plastic tunel IV spinach salad row	13	6,27	3,117	0,15	35	143	24,8	26,8	75
Tg-Frumos 20.07.10 Maxim microfarm, plastic tunels hortical antrosol 0-20 cm	Tomato Granadero F1 row	12	6.43	3.226	0.13	18	135	13.5	18.2	78
	Tomato Granadero F1 between rows	16	6.85	3.282	0.16	31	178	16.2	19.6	85
	Tomato Caliope F1 row	18	6.64	3.174	0.17	24	142	20.1	23.1	77
	Tomato Caliope F1 between rows	11	6.89	3.201	0.19	30	176	24.5	26.7	82
	Peppers Maradona F1 row	16	6.35	3.004	0.15	23	167	21.4	25.3	85
	Peppers Maradona F1 between rows	10	6.43	3.215	0.18	31	181	26.8	30.6	88
	Cucumbers Merengue F1 row	16	6.73	3.156	0.18	18	148	24.1	31.4	86
	Cucumbers Merengue F1 between rows	8	6.96	3.212	0.21	27	168	30.5	35.8	88

In the stationary microfarm Maxim on 03/10/2010 to the plastic tunnel crop, the aeration porosity values environmental determinant of 0-20cm soil depth in the plastic tunnel are lower on the row of plants being between 11-18% at samples collected in March. The soil samples collected during the summer values among young vegetables are also being included in the range 12-18% and decrease by up to half (6-12%) due to fine soil texture and soil compaction due to the irrigation time.

The soil reaction values decrease slightly lower limit of weak acid, correlated with high levels of vegetable crops intensification stress and at risk due to technological factors.

Thus, soil reaction values indicates a weak acidic domain, ranging from 6.27 to 6.43 pH unit values in samples collected in March, and the values ranging from 6.35 to 6.96 pH units, at the samples collected in July. The content of humus in plastic tunnels is generally medium to low so the samples collected in March in humus content values range from 3.021 to 3.117% and from those collected in July the soil organic matter content values ranged from 3.004 to 3.282%.

Total Nitrogen generally has medium values, in turn, somewhat higher than the interval between the lines, so the samples collected in March, soil total nitrogen content values range from 0.141 to 0.163% and the samples collected in July contained values between 0.130 to 0.212%.

Assimilable potassium content generally has medium values in samples collected in March, ranging from 138-168 ppm, and from those collected in July, resulting in values between 135-181 ppm. As regards exchange bases sum, the values of samples collected in March ranged from 20.1 to 24.8 me, while in July ranged from 13.5 to 30.5 me.

Total cation exchange capacity indicator has ranged between 22.6 to 26.8 me at the samples collected in March and ranged between 18.2 to 35.8 me at the samples collected in July. The degree of base saturation has values between 75-79% in samples collected in March, and values between 77-88% in samples collected in July 2010.

Following the calculation made for IAGF (global agrochemical potential fertility index) in order to highlight, the degree of fertility of soils and how they ensure a high suitability for sustainability, the results highlight the different values depending on their location.

Thus, in the pedological condition of microfarm Maxim in March 2010 the results are as follows:

- In the plastic tunnel I onion the IAGF result obtained by calculating the values was 35.82 which falls within the class of high potential overall fertility;
- In the plastic tunnel II lettuce resulted a value of 38.36 also fits within the class of 26 and 100 representing high overall fertility potential;
- In the plastic tunnel III orach salad on row achieved a 36.34 value falling within the class of high potential overall fertility;
- In the plastic tunnel IV spinach on row a value of 32.79 was obtained fits to the class of high fertility potential in overall.

Graphical representation of the values obtained in the ecopedotop farm on Maxim at 03/18/2010 is shown in figure 1.

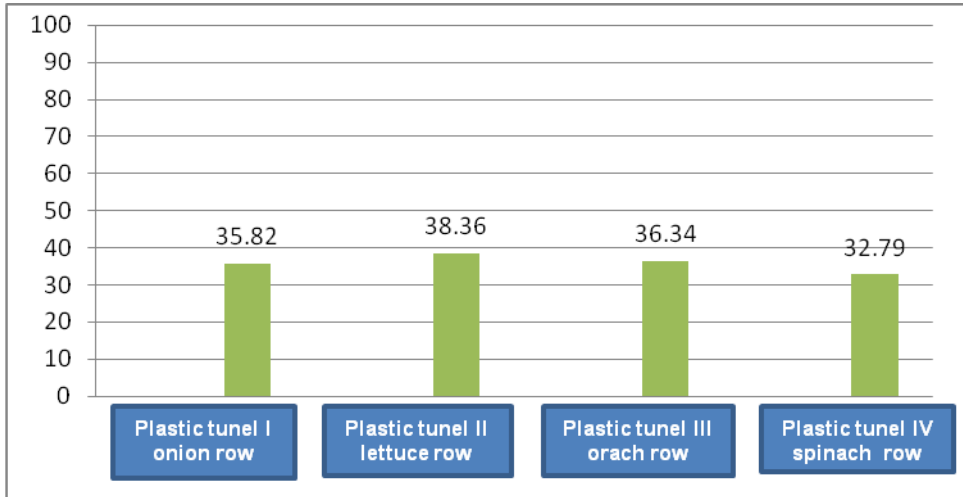


Fig. 1 - Framing class fertility values obtained in high overall potential between 26 and 100 for the Maxim farm ecopedotop 03/18/2010

At the same ecopedotop in July 2010 the results show that:

- culture of tomato (Granadero F1 cultivar) at a time of 31.60 was obtained assigning value to high potential overall fertility class;
- at the same hybrid tomato (Granadero F1 cultivar), but the range was obtained by calculating the value of 39.56 also fits to the class of high fertility potential in overall;
- for the soil cultivated with tomato hybrid (Caliopé F1 cultivar) the value of all global agrochemical fertility potential index was 34.90 and was within the same class of high overall fertility potential;
- the value obtained from the calculation of tomato (Caliopé F1 cultivar) the interval was 40.05 indicating a high overall fertility potential;
- the culture of peppers for the hybrid (F1 Maradona cultivar) turn the value obtained was 38.57 giving the class of high fertility potential overall;
- the same culture sample taken from the interval between rows of plants representing the result class was 41.91 potential overall fertility rate;
- for the soil cultivated with cucumber (Merengue F1 cultivar) value of 37.06 was achieved on all classified as high class fertility potential overall;
- the value obtained from the same culture but samples from the interval between rows of plants is 40.85, ranging also fits class high fertility potential overall.

Graphical representation of the values obtained in the farm Maxim on 18/03/2010 is shown in figure 2.

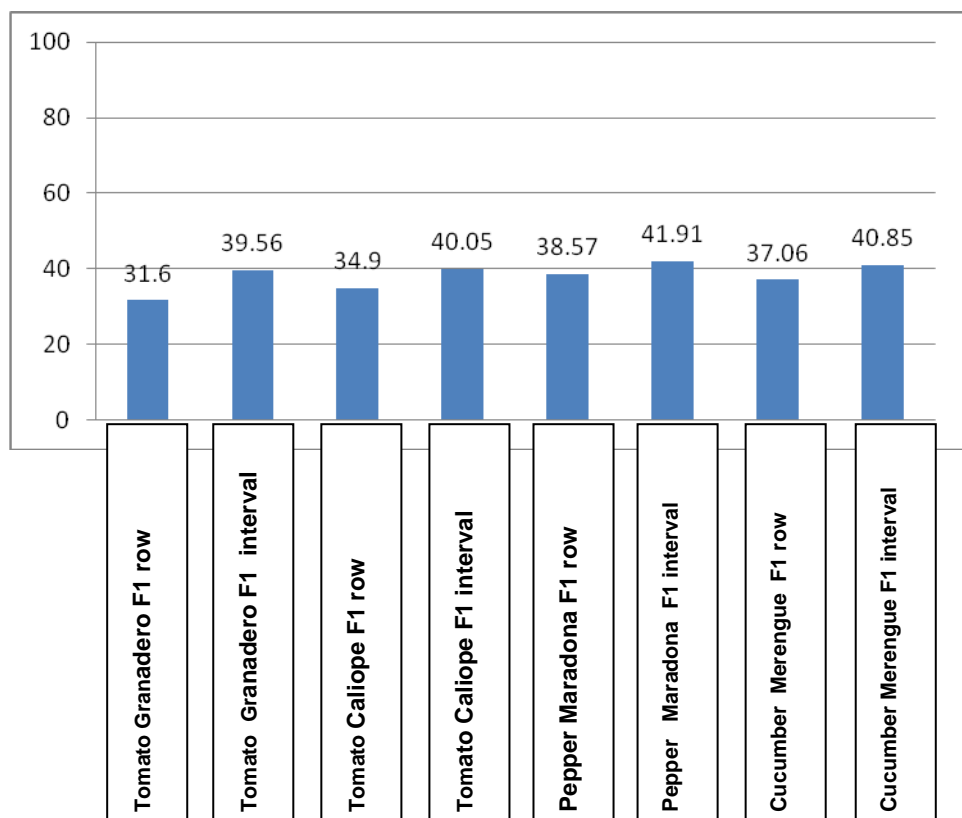


Fig. 2 - Framing class fertility values obtained in high overall potential between 26 and 100 for the farm Maxim ecopedotop 07/20/2010

CONCLUSIONS

1. The research conducted within March and July at Maxim farm highlight classification in the range of values obtained 26 and 100, while indicating high fertility potential overall;

2. The high fertility of soils and their assertive nature anthropogenic ensure the successful practice of sustainable agriculture in terms of Târgu Frumos.

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NEW MELON COLLECTION (*CUCUMIS MELO* L.) OBTAINED AT V.R.D.S. BUZĂU

UN NOU SORTIMENT DE PEPENE GALBEN (*CUCUMIS MELO* L.) OBȚINUT LA S.C.D.L. BUZĂU

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Abstract. *The Plant Breeding Laboratory from Vegetable Research and Development Station Buzău, started since 1998 an intensive breeding program for these species, whichever put across until now 10 valuable genotypes with distinctive phenotypical characteristics. The main objective followed in the breeding process was the yield quality especially obtaining genotypes with a particular taste and flavor.*

Key words: melon, genotype, germplasm collection, plant breeding

Rezumat. *Laboratorul de Ameliorare din cadrul Stațiunii de Cercetare și Dezvoltare pentru Legumicultură (S.C.D.L.) Buzău a demarat, începând cu anul 1998, un intens program de ameliorare la această specie, concretizat până în prezent cu obținerea a 10 genotipuri valoroase caracterizate prin însușiri fenotipice distincte. Obiectivul principal urmărit în procesul de ameliorare a fost calitatea producției, în special, obținerea de genotipuri cu gust și aromă deosebite.*

Cuvinte cheie: pepene galben, genotipuri, colecție de germoplasmă, ameliorarea plantelor

INTRODUCTION

In Romania, the melon breeding (*Cucumis melo* L.) faced out with some indigence, especially after 1990. The lack of a national coherent research program in order to improve this species, made to disappear the Romanian creations for this species almost totally.

The interruption of the breeding work and of the specific conservative selection works for the inland creations leded in the one hand to the lost of a great biological material, and one the other hand to the genetic depreciation of some valuable genotypes.

The Plant Breeding Laboratory from our institution started an intensive breeding program for this species since 1998, having as a main objective obtaining new competitive creations.

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MATERIAL AND METHOD

The breeding works started since the procurement of valuable biological material. First, there were procured from the University of Agronomical Sciences and Veterinary Medicine from Bucharest, the Vegetable Department, 24 valuable families observed and selected by Professor PhD. eng. Corneliu Petrescu.

To these added another 8 lines detained by V.R.D.S. Buzău, which were used in the breeding works in order to obtain the variety called Fondant. The genetic material collected was a subject for the intensive breeding and evaluation works (Leonte, 1996).

The main breeding objectives proposed were: productivity, quality, earliness, genetic resistance to the pathogen agents attack, ecological plasticity etc. (Drăcea I., 1972).

The breeding works were difficult because of the fact that this species is entomophila, preferred by insects, especially by bees (Crăciun, 1981).

In order to solve this problem and to avoid the biological impurity of the lines, there was used 2 isolation methods (Vînătoru C., 2008):

- genotypes isolation by respecting the distances between the cultivars;
- genotypes isolation by separate cultivation in special arranged compartments.

The culture technology applied was the classical one used for this species in protected spaces without technological warming (Dumitrescu et al., 1998).

During the vegetation period, there were supervised and noted the, main phenophases of the vegetation and there were made measurements and biometrical observations.

The 10 genotypes presented in this paper manifested genetic stability and valuable phenotypical characteristics.

The variety called Fondant created at V.R.D.S. Buzău was used as an appreciation etalon for the comparative cultures (control variant).

RESULTS AND DISCUSSIONS

The breeding works specific to this species finalized now obtaining 10 new genotypes.

Some of these genotypes had remarkable results in what it concerns total yield obtained (table 1). Thus, L₁ realized the greatest yield, over 25840 kg/ha, superior to the control variant Fondant with 1020kg/ha.

Great yields were obtained as well at the family L₄, which registered a 24510 kg/ha yield, 310 kg/ha less than the control variant, but with 4080 kg/ha over the mean yield. L₈ registered a total yield of 22230 kg/ha, with 2590 kg less than the control variant, but with 1800 kg over the mean yield.

The lowest yield was obtained by L₅ which realized 15510 kg/ha, registering 75% yield percentage than the mean yield. Even if this genotype obtained low yields during the researches, it presents a great interest because of its performances in what it concerns the quality of yield.

Table 1

The yields of the melon families obtained at V.R.D.S. Buzău in 2010

Experimental variant	Yield		Difference from mean (kg/ha)	Signification
	kg/ha	%		
L ₁	25840	126,4	+5410	xxx
L ₁₀ Mt	24820	121,4	+4390	xxx
L ₄	24510	119,9	+4080	xxx
L ₈	22230	108,8	+1800	xx
Mean	20430	100	–	–
L ₃	19510	95,4	-920	–
L ₆	19510	95,4	-920	–
L ₇	19330	94,6	-1100	o
L ₉	16920	82,8	-3510	ooo
L ₂	16140	79,0	-4290	ooo
L ₅	15510	75,9	-4920	ooo

DL 5% = 1080 kg/ha
DL 1% = 1450 kg/ha
DL 0,1% = 1930 kg/ha

In what it concerns the mean weight of the fruit, there was remarked the family L₁, which realized a fruit mean weight over 2,6 kg, followed by L₄ with 2,1 kg, and the control variant registered 2kg fruit mean weight (table 2).

The breeding works had not as a main purpose to obtain new genotypes with very big fruits. A special attention was paid to the fruits quality. There was followed the increment of the commercial quality and of the economic efficiency.

The supervised characteristics were: exterior and interior aspect of the fruit, color, pulp thickness and consistence, dry substance, taste and flavor.

L₅ is situated on the first place in what it concerns the pulp consistency. It has a dense pulp, almost crunchy, surpassing all the families studied. The dry substance is over 13% and the vanilla flavor and the sweet taste are remarkable.

L₈ is remarkable by the yield quality which presents fruits with a light green pulp, with pineapple flavor and sweet taste.

L₆ has as well a special taste and flavor. It has the thickest pulp, over 5,2 cm, white color, taste and flavor like pear.

All the genotypes obtained presents phenotypical expressive diversity (fig. 1), stability and genetic homogeneity, being remarkable by its subtlety taste and flavor.

Table 2

**The main characteristics of the fruit for the melon families
obtained at V.R.D.S. Buzău in 2010**

No.	Followed character	Experimental variant										
		L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₇	L ₈	L ₉	L _{10Mt}	
1	Fruits mean weight (kg)	2,6	0,75	1,5	2,1	0,65	1,2	0,85	1,4	0,82	2,0	
2	Fruits dimensions (cm)	h	16	12,5	18	20	16	16,2	11,5	17	11,5	14,8
		ø	19	12	14	15	10	12,5	11,5	13,5	10,2	12,6
3	Pulp thickness (cm)	5	2,5	3,5	4,5	3,5	5,2	3,5	3,3	3,2	3,5	
4	Rind thickness (cm)	0,5	0,5	0,5	1,0	0,5	0,5	0,5	0,5	1,0	1,0	
5	Pulp color	yellow	orange	Light orange	yellow	yellow	white	orange	Light green	orange	Light orange	
6	Fruits exterior color	hoary	hoary	Green with rids	Light green	Light yellow	yellow	green	Light green	green	hoary	
7	Fruits exterior surface	ribbed	ribbed	Slightly ribbed	Slightly ribbed	Slightly ribbed	sleek	Slightly ribbed	sleek	sleek	Slightly ribbed	
8	Dry substance (%)	12,0	11,2	10,5	10,8	13,0	12,2	10,0	11,0	11,6	10,8	



L₅



L₁



L₆



L₂



L₃



L₄



L₇



L₈



L₉



L₁₀ Mt

Fig. 1 - The selection of the melon fruits obtained at V.R.D.S. Buzău

CONCLUSIONS

1. Thereafter the researches made on the melon germplasm base during 12 years, there were obtained 10 new melon selections.

2. The selections dignified by productivity (L₁), comparing to the control variant Fondant (1020 kg/ha).

3. The quality characteristics which give value to the new collection are the following: consistency (L₅), vanilla flavor and taste (L₅), pineapple (L₈) or pear (L₆).

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STUDY ON THE BEHAVIOR OF NEW VARIETIES OF SWEET CHERRY IN CLIMATIC CONDITIONS OF NE ROMANIA

STUDIUL PRIVIND COMPORTAREA SOIURILOR NOI DE CIREȘ ÎN CONDIȚIILE PEDOCLIMATICE DIN NE ROMÂNIEI

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Abstract. *Cherry, representative species for Iasi district, has experienced in last years a progressive improvement of assortment, enriching it with new varieties, valuable, well adapted for NE Romanian country. New varieties are characterized by large-fruited and precocity, high quality, which, by default, determines and increased productivity. The experience has been realized over the years 2008–2010, studying the behaviour of four cherry varieties, grafted on mahaleb and planted on the 5/4 m. System maintenance of the soil was worked field, and the crown shape was free, flattened by pruning on the direction of the row. Following the application of foliar fertilization there were achieved increased productions with 7.4 to 12.4 t/ha, depending on the variant of fertilization. Vigor of trees has been expressed by the trunk area surface, this indicator was 258,6 cm² at Bucium variety, 272.2 cm² at variety Iașirom, 129,9 cm² to variety Ștefan and 230,5 cm² at variety Teresa. The average production of fruit varieties analyzed oscilated between 20,8 and 33.0 kg/tree, with slight variations depending on the climatic conditions in the experimental years .*

Key words: intensive culture system, sweet cherry, new varieties, climatic conditions, North East of Romania

Rezumat. *Cireșul, specie reprezentativă pentru județul Iași, a cunoscut în ultimii ani o înnoire progresivă a sortimentului, acesta îmbogățindu-se cu soiuri noi, valoroase, bine adaptate în regiunea de NE a Moldovei. Noile soiuri se caracterizează prin precocitate, fructe mari și de calitate superioară, ceea ce, implicit, determină și o productivitate sporită. Pentru realizarea experienței s-a urmărit, pe parcursul anilor 2008 – 2010, comportarea a patru soiuri de cireș, altoite pe mahaleb și plantate la 5/4m. Sistemul de întreținere a solului a fost ogorul lucrat, iar forma de coroană a fost liberă, aplatizată prin tăieri pe direcția rândului. Vigoarea de creștere a pomilor a fost exprimată prin indicele suprafeței secțiunii transversale a trunchiului, acest indicator fiind de 258,6 cm² la soiul Bucium, 272,2 cm² la soiul Iașirom, 129,9 cm² la soiul Ștefan și 230,5 cm² la soiul Tereza. Producția medie de fructe a oscilat la soiurile analizate între 20,8 și 33,0 kg/pom, înregistrându-se mici variații în funcție de condițiile climatice din anii experimentali.*

Cuvinte cheie: sistem intensiv, cireș, soiuri noi, condiții pedoclimatice, Nord Estul României

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INTRODUCTION

Increasing demand for fruit on the market in combination with good prices obtained by farmers have as result a significant increase of surfaces cultivated with sweet cherry orchards in Iasi district. Whereas in international assortment have imposed new fruit varieties (Istrate M., Ludovic P, 2003; Petre L., 2003), whose weight exceeds 8 g/pcs, researchers have tried to come in farmers greeting, and as a result, in Iasi, through sustained efforts of specialists of the SCDP were obtained, in last years, an entire series of new varieties of sweet cherry varieties (Elena Iurea, Ludovic P., Sarbu Sorina, 2009).

MATERIAL AND METHOD

The experience was realized in a sweet cherry orchard founded in 1991 at the distance of planting by 5/4 m, where the maintenance of the soil was worked field, and the technological links were specific for sweet cherry culture.

Experimental variants were represented by Bucium (V1), Iasirom (V2), Stefan (Mt-V3), Teresa (V4), grafted on rootstock mahaleb and leded in a free crown shape flattened by pruning.

Observations were made on the fruit trees vigour, fruit production quantities, as well as physical and chemical characteristics.

RESULTS AND DISCUSSIONS

Probing table 1 it can be seen that in the experience, the most vigorous was the variety Bucium with 285,6 cm² surface section of the trunk. Also, Iasirom variety, with 272,2 cm² recorded a high vigor too. Stefan and Theresa varieties realized values for the surface of the trunk 230,5 and respectively 192,9 cm².

Production of fruit realized by Bucium variety was in around 32.0-33,5 kg fruit on the tree, that corresponding for a productions nearly 16 t/ha. In descending order, the varieties Iasirom and Tereza received productions ranging between 23 to 24.5 kg/tree, respectively an estimated productions between 11.5 - 13, 1t/ha.

Table 1

Varieties growth vigor (trunk section area cm ²)					
Variety	2008	2009	2010	Average 2008 - 2010	Difference to control
V1 - Bucium	259,2	286,9	310,6	285,6	+92,7
V2 - Iasirom	268,5	272,3	275,9	272,2	+82,3
V3 – Stefan (mt)	181,2	192,1	205,4	192,9	0
V4 - Tereza	200,5	229,8	261,1	230,5	-37,6

Productions ranging between 20.3-21,7 kg/tree were recorded at variety Stefan. That variety obtaining an estimated production by 10,1-10,8 tonnes/hectare (table 2).

Table 2

Fruit production (kg/tree)					
Variety	2008	2009	2010	Average 2008 - 2010	Difference to control
V1 - Bucium	32,8	33,5	32,7	33,0	+12,2
V2 - Iasirom	23,0	26,2	24,6	24,6	+3,8
V3 – Stefan (mt)	20,4	20,3	21,7	20,8	0
V4 - Tereza	23,5	25,3	24,7	24,5	+3,7

The average fruit weight (table 3) was 8.1 g in Bucium, 7.5 g variety in the variety Iasirom, 7.9 g at Teresa and variety in the variety Stefan 8,0 g.

Average diameter fruits studied was settled between 21-26 mm and dry substance ranged from 17.2 percent in Teresa and variety in the variety Stefan 20.4%.

Table 3

Main physical and chemical fruit characteristics					
Variety	Fruits medium weight (g)	Fruit diameter (mm)	Skin colour	S.U.	Total acidity H ₂ SO ₄ /100g
V1 - Bucium	8,1	26	Dark red	17,8	0,245
V2 - Iasirom	7,5	21	Red	17,6	0,294
V3 – Stefan (mt)	8,0	25	Dark red	20,4	0,238
V4 - Tereza	7,9	25	Dark red	17,2	0,343

CONCLUSIONS

1. Trees vigour, expressed through the trunk section area was between 285,6 and 192,9 cm². With all the varieties studied fit into the medium to large group, the vigor of new varieties has diminished considerably in comparison with of the old varieties (Germersdorf, Hedelfinger, Boambe de Cotnari).

2. Production of fruit had values between 33.5-20.3 kg/tree, superior in quantity and productions that can be compared with the varieties obtained by foreign productions equivalent.

3. The average individual fruit weight between 7.5 and 8.1 g/pcs demonstrate as new romanian varieties can valorify climate conditions of experimentation area, being superior to the oldest varieties witch had the average fruit weight between 5-7 g/pcs.

4. All four varieties are suitable for intensive culture of sweet cherry in the NE part of Romania.

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STUDY ON IMPROVING THE TECHNOLOGY OF INTENSIVE CULTURE OF APPLE PLANTATIONS IN THE CLIMATIC CONDITIONS OF NE ROMANIA

STUDIUL PRIVIND ÎMBUNĂTĂȚIREA TEHNOLOGIEI DE CULTURĂ A MĂRULUI ÎN PLANTAȚII INTENSIVE ÎN CONDIȚIILE PEDOCLIMATICE DIN N-E ROMÂNIEI

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Abstract. For proper application of apple intensive culture technology it is necessary a better knowing of the physiological laws underlying trees growth and fructification, and also their reaction to environmental conditions. Pruning must be applied differently, taking into account trees age, vigor, density and spatial arrangement of the branches, their position, the nature and function of each bearing element. Following the application of foliar fertilization there were achieved increased productions with 7.4 to 12.4 t / ha, depending on the variant of fertilization. The results we obtained concerning the soil system maintenance in intensive apple plantations revealed higher yields when black field was used and also superior quality of fruits and lower maintenance costs for grassed soil variant.

Key words: intensive technology, apple, climatic conditions in north eastern Romania

Rezumat. Pentru aplicarea corectă a tehnologiei de cultură a mărului în plantații intensive este necesar să se cunoască în amănunt legile fiziologice care stau la baza creșterii și rodirii pomilor, precum și comportarea acestora față de condițiile ecologice. Tăierile de rodire trebuie să se aplice diferențiat, ținând seama de vârsta pomilor, vigoarea, desimea și modul de dispunere în spațiu a ramurilor, poziția acestora, natura și funcția fiecărei formațiuni. În urma aplicării fertilizării foliare s-au obținut sporuri de producție de 7,4-12,4 t/ha, în funcție de varianta de fertilizare. Rezultatele obținute privind sistemul de întreținere a solului în plantațiile intensive de măr au scos în evidență producțiile mai mari în cazul ogorului negru și calitatea superioară a fructelor și cheltuieli de întreținere mai reduse la varianta de întreținere interbată a solului.

Cuvinte cheie: tehnologie, sistem intensiv, măr, condiții pedoclimatice, Nord Estul României.

INTRODUCTION

Apple specific growth and fruition conditions, especially in high density culture system, different environmental conditions in which plants develop, higher production levels to be achieved, fruit quality at a low cost price, in terms

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of reduced energy consumption, have imposed more and more the improvement crop technology (Istrate M., Rominger E., 1992; Cârdei E. et al, 2007).

To highlight the influence of soil maintenance system between the rows and row of trees, foliage fertilization and pruning system, during 2006-2008 some researches were carried out in SCDP Iasi at an apple intensive plantation (Istrate M. et al., 2006).

MATERIAL AND METHOD

Experiences were held during 2006 - 2008, at Sârca research and development base of SCDP Iași, and involved five apple varieties: Florina, Generos, Sir Prize, Idared and Jonagold.

Trees were grafted on M 106, planted in 1992 and 2001, at 4 x 3 m, leaded as oblique palmeta.

The experience was conducted on a levigated chernozem, with 2.34% humus content and pH = 6.5 - 7.0, the ground is slightly inclined and soil maintenance system is mixed: one interval between rows with grass and one row remained as black field.

During the experimental period there were performed observations and determinations concerning:

- a. trees growth vigor;
- b. fruit production and quality according to the soil maintenance system in apple plantation.

V1 *black field soil maintenance system;*

V2 *grassing the soil between the rows and working the soil on the row of trees.*

- a. fertilization influence upon the fruit production (**Fertifol 2-2-1**);
- b. pruning influence upon the production.

V1 – thinning and pruning by reducing 1/4 of annual growth

V2 – thinning and pruning by reducing 1/2 of annual growth

V3 – reduction of the annual growth to 3-4 buds and ¼ of structural branches extension

In the three years of experiment there were applied 9-11 phitosanitary treatments to control apple diseases and pests. The annual programs have been introduced the most effective and efficient plant protection products to the extent of aviability of those with a low degree of pollution.

RESULTS AND DISCUSSIONS

Data concerning trees growth vigor at all five studied varieties during 2006-2008, are presented in table 1.

Experimental data highlight Jonagold variety, which proved to be the most vigorous, with a trunk section area average of 9.3 cm² comparing to 7.5 cm² registered at Jonathan variety - considered the control. Sir Prize and Florina varieties follows very close. The least vigorous was Generos variety with an average of trunk section area of 6.3 cm². In the three years of study the highest annual growth in the trunk section occurred VIIth year after planting (2007) at Sir Prize variety - 11.4 cm², and the smallest of only 5.4 cm² at Generos variety in the VIIIth year after planting (2008).

Table 1

**Trees growth vigor (trunk section area cm²)
at studied varieties – 2006 – 2008**

Variety	Growth – cm ²			Growth average 2007-2009	Difference to the control
	2006	2007	2008		
Jonagold	7.2	9.4	11.0	9.3	+1.8
Sir Prize	6.9	11.4	9.4	9.2	+1.7
Florina	7.1	8.4	10.5	8.7	+1.2
Idared	6.8	10.9	7.6	8.4	+0.9
Jonathan (the control)	6.6	7.4	8.6	7.5	0
Generos	6.5	7.1	5.4	6.3	-1.2

Idared variety registered a growth vigor little over the control - 8.4 cm², but achieved the highest average production for the three experimental years - 30.9 kg/tree or 25.7 t/ha comparing to the control Jonathan variety – 21.6 t/ha (table 1).

Varieties that had the largest increases in thickness, and therefore more vigorous, recorded also the lowest average yields per ha, eg Jonagold 21.3 t/ha and Sir Prize 19.2 t/ha, which shows that the vigor of growth is detrimental to the fruit production per hectare.

Productivity and crop quality represent the main objective followed in a tree plantation and which ultimately depends on the economic efficiency of culture.

Studies show that fruit production is influenced by several factors as: variety, age, degree of fruit buds differentiation, fruit binding, crown volume and climatic conditions of the previous year and the harvest year (table 2).

Table 2

Fruit production at studied apple varieties (years VI-VIII after planting)

Variety	Production kg/tree			Years average kg/tree	Years average t/ha	Difference to the control kg/tree
	2006	2007	2008			
Idared	24.3	31.8	36.6	30.9	25.7	+ 5.0
Generos	27.8	29.7	23.5	27.0	22.5	+ 1.1
Florina	19.5	24.7	32.1	26.2	21.8	+ 0.3
Jonathan (the control)	20.4	26.7	30.7	25.9	21.6	0
Jonagold	17.1	30.4	29.6	25.6	21.3	- 0.3
Sir Prize	14.4	26.3	28.3	23.0	19.2	- 2.9

Yields obtained in 2007 and 2008 at all studied varieties ranged from 23.5 to 36.6 t/ha. Very high temperatures and low rainfall in 2006, had huge repercussions on production.

In terms of productivity to be noticed Idared variety, with a three-year average production of 25.7 t/ha followed by Generos variety with 22.5 t/ha.

The results obtained for apples production in the two variants of maintaining soil highlight the superiority of black field system alternative to grassing the intervals (table 3).

Table 3

Soil maintenance system influence upon fruit production and quality

Variety/ variant	Variant 1			Variant 2		
	t/ha average 2006-2008	d.c. quality extra and 1 st		t/ha average 2006-2008	d.c. quality extra and 1 st	
		t/ha	%		t/ha	%
Idared	35.4	31.9	90.1	31.2	25.3	81.0
Florina	31.3	28.9	92.4	27.5	23.4	85.1
Jonagold	29.7	28.3	95.2	23.4	18.8	80.2

Thus the average production for the three experimental years in all three varieties was higher (31.3 to 35.4 t/ha) in the black field variant than the other variant (27.5 to 31.2 t/ha). The most productive variety in both variants was Idared with 31.2 - 35.4 t/ha, followed by Florina with 27.5 - 31.3 to t/ha and Jonagold with 23.4 - 29.7 to t/ha. The same situation is observed in the case of apple quality ratio, in black field variant there is 90.1 to 95.2% extra and 1st quality fruits compared to 80.2 to 85.1 % in grassing variant.

If we are talking about superior production quantity and quality of black field system variant it is not the same for the maintenance costs per hectare of the orchard (table 4). Financial effort in black field variant is higher with 36.5%. Maintenance costs for 1 ha orchard black field system are worth 1549 lei, to 984 lei at grassing intervals system.

Table 4

The expenses for soil maintenance – lei

Works/ Variant	Lei/ha	
	Variant 1	Variant 2
- fall plowing	290	-
- disc harrow on trees interval	155	-
- working the soil with the grower on the intervals (3 times)	540	-
- disc harrow VELOX – (2 times)	280	280
- chopping branches	200	200
- chopping herbs (3 times)	-	420
- manual herbicide	50	50
- herbicide – Roundup 1 l/ha	34	34
TOTAL	1549	984

Obtaining quality fruit, according to trading standards and uniformity of their size is achieved by applying foliar fertilization, technological sequence that must be integrated part of fruit production technology.

Foliar fertilization is a complementary measure, having the advantage that the fertilizing products, more quickly enter the metabolic cycle of the

plant comparing with the radicular fertilization but can not replace it. Foliar fertilizers are applied in the same time with phito sanitary treatments avoiding the interference with copper-based products.

Observations on fertilization considered the influence upon fruit average weight and size and also on their storage capacity.

Analyzing the data in table 5, we can see that after fertilization with Fertifol in different concentrations, treated variants recorded higher values than the control samples both in terms of production and average fruit weight.

Table 5

The influence of fertilization with Fertifol upon the production and fruit quality

Variety		V 1 Fertifol 0,2%			V 2 Fertifol 0,3%		
		t/ha	difference + -	Fruit average weight -g-	t/ha	difference + -	Fruit average weight -g-
Generos	treated	41.9	+5.7	179	44.6	+7.4	182
	untreated	36.2	0	162	37.2	0	160
Florina	treated	30.4	+6.9	150	31.1	+12.4	152
	untreated	23.5	0	142	18.7	0	139
Idared	treated	40.7	+8.9	168	42.3	+8.6	174
	untreated	31.8	0	157	33.7	0	161

Following the observations and measurements that have been made results that Fertifol fertilizations of 0.2 and 0.3% concentration have positive influence on increasing fruit production in all three varieties.

Thus, in V1 - 0.2% variant production increase is from 5.7 to 8.9 t/ha, and at V2 - 0.3% increase is from 7.4 to 12.4 t/ha. Generos variety stands up by the highest yields per hectare in both variants: 41.9 and 44.6 t/ha, but the biggest difference between treated and untreated variety has registered Florina variety - 12.4 t/ha, which also proves that it reacted most favorably to fertilizer factor.

There are also noted the differences, although not significant, for fruit weight, the average weight for each variety in fertilized variant was higher than in the controls. In conclusion we can say that Fertifol fertilizer has positive influences on vegetative increases, production quantity and quality if it is applied during shoots and fruits intense growth. No phytotoxic effects were found on leaves or fruits.

The results concerning the influence of the pruning system on fruit production level in three varieties are shown in table 6.

Fruit quantity per tree and also per hectare highlighted the superiority of variant V1 (reducing $\frac{1}{4}$ of annual growth).

At Idared variety there were registered 49.3 t/ha to the 42.9 t/ha at V3 (thinning and reducing annual growth to 3-4 buds) and 40.1 t/ha in V2. The biggest difference between the variants of (12.9 t/ha) has been registered at Sir Prize, where in V1 was obtained 43.7 t/ha, and at V3 - 30.8 t/ha.

Table 6

Pruning influence on apple production (average for 2006 – 2008)

Variant	Variety /	Idared		Jonagold		Sir Prize	
		kg/tree	t/ha	kg/tree	t/ha	kg/tree	t/ha
V1-	fruit thinning and pruning by reducing 1/4 of annual growth	59.2	49.3	41.3	34,4	43.7	36.4
V2-	fruit thinning and pruning by reducing 1/2 of annual growth	48.1	40.1	35.8	29,8	36.9	30.8
V3-	reduction of the annual growth to 3-4 buds and ¼ of structural branches extension	51.5	42.9	31.4	26.2	30.8	25.7

In an overview is found that all three pruning variants ensures good and very good productions (between 26.2 and 59.2 t/ha), but particularly outlined in variant V1 - thinning and reducing ¼ of annual branches length.

CONCLUSIONS

1. Black field soil maintenance system variant provides higher average yields of 4-6 t/ha to grassing the interval between the rows variant. Maintenance expenses for grassing the intervals is smaller with 36.5% than black field variant (984 lei/ha grassing; 1549 lei/ha - black field).

2. Effect of Fertifol foliar fertilizer was materialized in an increased production between 5.7 and 8.9 t/ha in 0.2% concentration variant and 7.4 -12.4 t/ha 0.3% concentration variant.

3. All three types of production pruning provides significant increases compared to the control, but noted in particular variant V1 – reducing ¼ of branches length where there were registered productions of 41.3 to 59.2 t/ha.

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THE INFLUENCE OF THE CLIMATIC FACTORS ON THE SWEET CHERRY TREE GROWTH AND FRUIT-BEARING IN IAȘI'S CONDITIONS

INFLUENȚA FACTORILOR CLIMATICI ASUPRA CREȘTERII ȘI RODIRII CIREȘULUI ÎN CONDIȚIILE DE LA IAȘI

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Abstract. *This paper presents some aspects concerning the influence of the environmental factors from 2008-2010 on the both sweet cherry tree growth and fructification. The agricultural years 2008 (a rainy one) and 2009 (a droughty one) can be described as years with special climatic characteristics which influenced negatively the vegetative growing and the tree production in this area. The meteorological factors (during 3 years) were analyzed, the fruit's production (kg/tree) on cultivars was calculated, were made measurements and determinations concerning the trunk's cross-sectional area and the length of the annual increases. In terms of 2008 which was an unusual year with an excess of 338,4 l/m² rainfall compared to the multiannual average and of 2009 which was very droughty with a deficiency of 198,6 l/m² compared to the multiannual average, 'Cociu' and 'Ludovic' were noted as the most resistant to drought.*

Key words: sweet cherry tree, cultivars, young shoots, trunk, production.

Rezumat. *Această lucrare prezintă unele aspecte privind influența factorilor de mediu din anii 2008 – 2010, asupra creșterii și fructificării pomilor la specia cireș. Anii agricoli 2008 (an ploios) și 2009 (an secetos) se pot caracteriza ca ani cu particularități climatice deosebite care au influențat negativ în această zonă creșterile vegetative și producția pomilor. S-au analizat factorii meteorologici (pe perioada celor trei ani), s-a determinat producția de fructe (kg/pom) pe soiuri, s-au efectuat măsurători și determinări privind suprafața secțiunii trunchiului și lungimea creșterilor anuale. În condițiile anului 2008 care a fost un an anormal, cu un excedent pluviometric de 338,4 l/m² față de media multianuală și a anului 2009 care a fost foarte secetos, cu un deficit de 198,6 l/m² față de media multianuală s-au remarcat soiurile Cociu și Ludovic ca fiind cele mai rezistente la secetă.*

Cuvinte cheie: cireș, soiuri, lăstari, trunchi, producție.

INTRODUCTION

The sweet cherry tree is a fruit-growing species with great economic importance, because of the nutritional, technological and commercial characteristics of the fruits (Grădinaru G. & Istrate M., 2003; Petre L., 2006). For a good growth and development (having moderate claims to water), the sweet cherry tree grafted on

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mahaleb succeeds in the NE of Romania area, where the multiannual average value of the rainfall is 524 mm (Dumitrescu Gh. et al., 1981; Grădinariu G., 2002).

During the vegetation period, the water consumption of fruit-growing plants is variable. The phases when the water consumption is maximum are called critical phases (shoots growing, the flowering and the fruit's growing) (Milică C.I. et al., 1982).

The crop years 2008 (a rainy year) and 2009 (a droughty year) can be characterized as years with great climatic particularities which negatively influenced in this area the biometrical increases and the fruit-growing trees production (Iurea Elena et al., 2008).

This paper presents some aspects concerning the influence of the environmental factors from 2008-2010, registered in Iași on growth and fructification of the sweet cherry tree species.

MATERIAL AND METHOD

The researches were realized in 2008, 2009, 2010, using as research material five new sweet cherry cultivars (Alex, Anda, Cociu, Margo and Ludovic) grafted on mahaleb. The fruit-growing trees are planted at 4 x 5 m free crown flattered shape and they are in the 10th year since plantation. The land where the plantation was set up is situated in the depression Jijia-Bahlui, where the annual average temperature was 9,4oC in 2008, 10,8oC in 2009 and 10,2oC in 2010.

Meteorological factors, behaviour of the cultivars compared to the limiting factors of production, namely the behaviour of the cultivars in the conditions of 2008, a very rainy year, with a rainfall surplus of 338,4 l/m² and of 2009 which was very droughty, with a deficit of 198,6 l/m² compared to the multiannual average were analyzed. Observations and performed measurements followed the vegetative growth of the trees (the annual branches and the trunk's thickness) and the fruits production (kg/tree).

The fruits production was determined by weighing, the length of the annual increases was determined by measuring, the trunk's section area was determined by measuring the trunk's thickness with the calliper and the drown data was converted in cm². The experimental data was statistically expressed by analysis of the variance.

RESULTS AND DISCUSSIONS

For the sweet cherry tree, the critical stages when the water consumption is maximum are: the shoots growth, the flowering and the fruits growth.

The climatic conditions from 2008, 2009 and 2010 influenced differently the vegetative growth of the trees and the fruits production.

In 2008 and 2010, in the period April, May and June when it takes place intensive growth of the shoots, flowering and fruits growth, there was registered an amount of rainfall of 306,2 mm (2009) and 259 mm (2010) compared to 172,4 mm as the multiannual average, the surplus being one of 133,8 mm (2009), respectively 86,6 mm (2010). In 2009, in the same period, there were registered 106,6 mm compared to 172,4 mm as it represents the multiannual average, the deficit being of -65,8 mm.

As a result of the observations and determinations taken in three years of study, the largest annual length increases were registered for Cociu (79,4 cm) and

Ludovic (78,6 cm), being distinct positively significant compared to the control cultivar Boambe de Cotnari (67,0 cm). At the other cultivars (Alex, Anda and Margo) the length of the annual increases was near as value to the control cultivars (tab. 1).

Table 1

Data concerning the average length of the shoots registered between 2008-2010

Crt. nr.	Cultivar	The average length of the shoots			
		The average length of the shoots(cm)	Calculated compared to the control cultivar		
			%	Difference	Signification
1.	Cociu	79,4	118,5	12,4	++
2.	Ludovic	78,6	117,3	11,6	++
3.	Margo	67,3	100,4	0,3	
4.	Boambe de Cotnari (Control)	67,0	100	0	-
5.	Anda	64,0	95,5	-3,0	
6.	Alex	62,1	92,6	-4,9	

LSD 5% = 7,1 cm

LSD 1% = 10,3 cm

LSD 0,1% = 15,5 cm

Concerning to the trunk's section area, all the cultivars registered a continuous increase (the annual average rate being between 16-38 cm²). By interpreting statistically the data, Cociu (221 cm²) and Anda (213 cm²) was the most vigorous compared to the control cultivar Boambe de Cotnari, registering distinct positively significant values (tab. 2).

Table 2

Data concerning the trunk's section area registered between 2008-2010

Crt. nr.	Cultivar	The trunk's section area			
		The trunk's section area (cm ²)	Calculated compared to the witness		
			%	Difference	Signification
1.	Cociu	221	130,0	51	++
2.	Anda	213	125,3	43	++
3.	Margo	185	108,8	15	
4.	Alex	182	107,1	12	
5.	Ludovic	179	105,3	9	
6.	Boambe de Cotnari (Control)	170	100	0	-

LSD 5% = 28,6 cm²

LSD 1% = 41,6 cm²

LSD 0,1% = 62,4 cm²

Because the absence of the water determined disorders of production regularity and of crop's size, the production from the three years had to suffer. The drought from 2007 affected the fruit's production and the size of the 2008's harvest.

In 2009, the fruit's production was significantly reduced due to the drought during March-September, the water deficit being one of 166,6 mm/m².

Yield of 2010 was partially affected by the heavy rainfall from June (22-29.06), when during some days there was registered an excess of 78,7 mm/m² (the fruits being

in the maturation stadium, have cracked and have been affected by *Monilinia fructigena*).

As a result of the determinations made in those three years, Cociu and Ludovic registered the largest yields (17,5 kg/tree and 15,7 kg/tree respectively) (tab.3).

Table 3

Data concerning the fruits production obtained between 2008-2010

Cultivar	Yield (kg/tree) in the years:			Yield		
	2008	2009	2010	Calculated compared to the control cultivar (2010)		
				%	Difference (kg/tree)	Significati on
Cociu	14,8	13,0	17,5	132,6	4,5	++
Ludovic	13,5	12,3	15,7	118,9	2,5	+
Margo	13,6	9,9	14,0	106,1	0,8	
Anda	11,2	9,0	13,9	105,3	0,7	
Alex	12,2	8,9	13,4	101,5	0,2	
Boambe de Cotnati (control)	12,0	10,3	13,2	100	0	

LSD 5% = 2,31 kg

LSD 1% = 3,3 kg

LSD 0,1% = 5,0 kg

CONCLUSIONS

1. Under hydric aspect, the crop year 2007-2008 can be characterized as a very rainy year, with a surplus of 338,4 mm rainfall and the crop year 2008-2009 was a very droughty year, the deficit being of 198,6 mm compared to the multiannual average of 524,6 mm.

2. The best length increase of the annual shoots (79,4 – 78,6 cm) and the largest yield (17,5 – 15,7 kg/tree) were obtained at Cociu and Ludovic.

3. In 2008, 2009 and 2010 climate conditions, Cociu and Ludovic have the most rezistence to both drought and excess rainfall.

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ASPECTS CONCERNING THE QUALITY OF SOME CHERRY TREE FRUITS RIPPED IN THE CLIMATIC CONDITIONS OF 2010 FROM NORTH-EASTERN ROMANIA

INVESTIGAREA CALITĂȚII FRUCTELOR UNOR SOIURI DE CIREȘ ÎN CONDIȚIILE CLIMATICE ALE ANULUI 2010 DIN ZONA DE NORD-EST A ROMÂNIEI

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Abstract. *Cherry fruit quality is given by several indicators (color, firmness, sugars etc.). In this paper we determined the dry weight, acidity and soluble carbohydrates of 16 varieties of sweet cherry fruits with different maturity periods which are destined for fresh consumption and for industrialization in the food industry. Our results may indicate the suitability of the area (North-East Romania) for a large-scale cultivation of these varieties, since some are new varieties approved in the last 5-6 years and others imported varieties, which are not found in big tree orchards in this region. The soluble carbohydrates quantity has been determined to be between 12,69 - 19,58 % and the acidity of the fruits was in the interval 4,8 - 8,64 g/L (expressed in citric acid).*

Key words: *Prunus avium*, soluble carbohydrates, acidity

Rezumat. *Calitatea fructelor de cireș este dată de mai mulți indicatori (culoare, fermitate, cantitatea de zaharuri, etc.). În aceasta lucrare am analizat conținutul de substanța uscată solubilă, cantitatea de glucide solubile și aciditatea fructelor la 16 soiuri de cireș cu perioade diferite de maturitate care sunt destinate atât consumului în stare proaspătă, cât și în industria alimentară. Determinările efectuate ne pot indica propicietatea zonei (Nord-Estul României) în vederea cultivării la scară mare a acestor soiuri, având în vedere că unele sunt soiuri noi, omologate în ultimii 5-6 ani, iar altele sunt soiuri importate care nu sunt extinse în cultură în această zonă. În ceea ce privește cantitatea de glucide solubile, aceasta a fost cuprinsă între 12,69 și 19,58 %, iar aciditatea a avut valori între 4,8 și 8,64 g/L (exprimat în acid citric).*

Cuvinte cheie: *Prunus avium*, glucide solubile, aciditate

INTRODUCTION

The cherry tree is one of the most important fruit bearing trees from the temperate area. Its fruit are appreciated mainly based on their weight and sugar content, and also due to the fact that in some areas, they are the first fresh fruit of the year. The colour of the fruit is the most important quality and maturity indicator the cherries, and depends on the anthocyanine content (Esti et al., 2002), this is why we have selected varieties with fruit of different colours. Another characteristic we have taken into consideration for our study has been the total acidity of the fruit. Cherries are the fruit with the highest average total sugar content (glucose, levurose, sucrose), while

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its acidity covers an intermediary position. The fruits were harvested at commercial maturity based on color and organoleptic characteristics

MATERIAL AND METHOD

In our study, we have included the fruit of 16 cherry tree varieties. Of these 11 varieties have fruit with red epidermis (Tereza, Lucia, Izverna, Grosse Schwarze, Cătălina, Cetățuia, Radu, Windsor, Lambert, Oana, Ștefan), 2 have bicolour epidermis (Marina and Vega – figure 3) and one is yellow with a colourless juice (Big Drogan). At the same time we have analyzed two types of sour cherry trees: Amar de Galata and Amar de Maxut (figure 2).

In order to determine the soluble carbohydrates quantity in the fruit, we have employed the *School Method* as modified by Vlad Artenie. The soluble dry substance has been determined using the refractory-metric method for the fruit juice.

The total acidity of the analyzed samples has been established using the *potentiometric method*. The juice samples and diluted macerated product have been mixed with a sodium hydroxide solution until they reached 7p.H. The carbon dioxide from the sample had been removed beforehand.

The fruit have been picked as they reached commercial maturity, depending on the color and characteristic organoleptic quality.



Fig. 1 - Lucia



Fig. 2. Amar de Maxut



Fig. 3 - Vega



Fig. 4 - Cetățuia

RESULTS AND DISCUSSIONS

The early fructification of the species *Prunus avium* suggests that a substantial part of the carbohydrates used in the early development phase of the cultures comes from reserves (Roper, Kennedy, 1986).

Even if most carbohydrates are synthesized in the leaves through photosynthesis, some are also produced in other green tissues from cotyledons,

buds, branches, stems, flowers, fruit and cones (Kozłowski, Keller, 1966). Wood plants create carbohydrates reserves when these are excessively produced and use these reserves when the use rate exceeds the synthesis. The deposited carbohydrates play an important role in metabolism, growing, defence, prevention and delay of plant mortality (Kramer, Kozłowski, 1979).

The results of the analysis carried out for the cherry tree varieties have shown differences in the quality of soluble dried substance (S.U.S. %) present in fruit, as well as significant differences of soluble carbohydrates from fruit.

From table 1 we can see that the soluble carbohydrates in fruit varies between 12,69% for Big Drogan, whose fruit epidermis is yellow, and 19,58% for the Lucia variety (figure 1). Higher values have been registered for other varieties such as Grosse Schwarze, Cătălina, Cetățuia (figure 4), and Amar de Maxut, the latter, despite the fact that has sour fruit, has a high level of carbohydrates. Lower values have been registered for Radu, Izverna and Oana.

Table 1

Soluble dry substance content and soluble carbohydrates for the fruit of several cherry tree varieties

Variety	S.U.S. (%)	Soluble carbohydrates (%)
<i>Amar de Galata</i>	17.20	15.48
<i>Amar de Maxut</i>	19.26	17.33
<i>Marina</i>	17.75	15.98
<i>Tereza</i>	15.75	14.18
<i>Lucia</i>	21.75	19.58
<i>Izverna</i>	14.40	12.96
<i>Grosse Schwarze</i>	21.10	18.99
<i>Big Drogan</i>	14.10	12.69
<i>Catalina</i>	20.70	18.63
<i>Cetățuia</i>	20.10	18.09
<i>Radu</i>	14.30	12.87
<i>Windsor</i>	16.50	14.85
<i>Lambert</i>	17.10	15.39
<i>Oana</i>	15.30	13.77
<i>Stefan</i>	18.25	16.43
<i>Vega</i>	17.80	16.02

According to some authors (Serrano et al., 2005; Usenik, Štampar, Šturm and Fajt, 2005) the cherry tree's predominant sugars is glucose.

Regarding the cherry tree, not only the carbohydrates quantity produced and deposited by the cherry tree in different organs and tissues is taken into consideration, but also the sugar quantity stored in the cherries, that represent the main component of the plantation production for this tree species.

The titrable acidity of the fruit juice, the leaves mash etc. measures the titrable hydrogen ions concentration that are contained in the analyzed samples, by neutralizing them with a strong basis solution at a fix pH. Its value contains all substance of an acid nature such as: free hydrogen ions, organic acids, acid salts and cations. Since the organic acid is the main component of the sample that

reacts with the basic solution, the titrable acidity is expressed as g/L or g/100 mL of the main acid. In fruit, citrus cid or malic acid or both predominate.

The total acidity of the fruit variety has been expressed in $g \cdot L^{-1}$ citric acid ($C_4H_8O_7$). The fruit have shown acidities between $4.8g \cdot L^{-1} C_4H_8O_7$ for the Big Drogan variety and $8.64g \cdot L^{-1} C_4H_8O_7$ for Lucia variety.

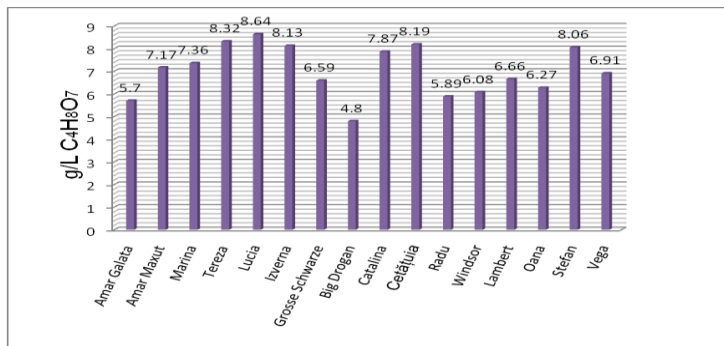


Fig. 5 - Fruit acidity

All the obtained results are presented in figure 5. Low values have been registered for the Amar de Galata and Radu varieties, while higher values have been obtained for Marina, Cetățuia and Izverna.

CONCLUSIONS

1. The values obtained for cherries in 2010 vary significantly among varieties, the lowest values being registered for the Big Drogan variety, while the highest have been registered for the Lucia variety.

2. The value of the total carbohydrates / acidity can be an indicator to evaluate the taste quality of horticultural products, according to this report the studied varieties were evaluated.

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STUDY ON THE BEHAVIOR OF CERTAIN APPLE VARIETIES WITH GENETIC RESISTENCE TO DISEASES LOCATED IN THE HUSI FRUIT BASIN

STUDIUL PRIVIND COMPORTAREA UNOR SOIURI DE MĂR CU REZISTENȚĂ GENETICĂ LA BOLI ÎN BAZINUL POMICOL HUȘI

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Abstract. A study was conducted during 2010-2011 on the apple disease resistance varieties in the environmental conditions of the east-northern part of the Romania. During the experimentation period, observations and determinations were made regarding the following aspects: tree growth vigour (trunk section area, crown volume of trees); phenophases of the fruiting organs, the fructification specific, the amount of biomass removed by the fructification pruning, fruit production obtained and the productivity index. Data regarding the growth vigour of the trees (expressed as trunk sectional area) highlights the highest growth vigour of Florina and Romus 1 varieties (10.32 cm² and 9.39 cm² respectively), Romus 2 (7.11 cm²) having the lowest vigour of all the varieties. Early flowering for apple varieties which were included in the study was registered between 21 and 25 IV and during the flowering period was between 9 and 12 days. In terms of productivity, the varieties Florina (43.4 t/ha), Romus 1 (37.6 t/ha) and Pionier (34.1 t/ha) were remarkable, being are recommendable for the soil and climatic conditions in the Husi area.

Key words: apple, varieties with genetic resistance to diseases, stem, crown, shoots, fruit branches, production.

Rezumat. În perioada 2010-2011 s-a efectuat un studiu privind comportarea soiurilor de măr cu rezistență la boli în condițiile ecologice din NE României. În perioada de experimentare s-au făcut observații și determinări privind: vigoarea de creștere a pomilor (suprafața secțiunii trunchiului, volumul coroanei pomilor); fenofazele organelor de fructificare, specificul de fructificare; cantitatea de biomasă eliminată la tăierile de fructificare; producția de fructe obținută și indicele de productivitate. Datele privind vigoarea de creștere a pomilor (exprimată prin suprafața secțiunii trunchiului) scot în evidență vigoarea mare de creștere a soiurilor Florina și Romus 1 (10.32 cm², respectiv 9.39 cm²) iar vigoarea cea mai scăzută la soiul Romus 2 (cm²). Începutul înfloritului la soiurile luate în studiu s-a înregistrat între 21 și 25 IV, iar durata înfloritului a fost de 9-12 zile. Sub aspectul productivității s-au remarcat soiurile Florina (43,4 t/ha), Romus 1 (37,6 t/ha) și Pionier (34,1 t/ha), care sunt recomandate pentru condițiile pedoclimatice din zona Huși.

Cuvinte cheie: măr, soiuri rezistență genetică la boli, trunchi, coroană, lăstari, ramuri de rod, producție.

INTRODUCTION

Given the damages due to apple scab and powdery mildew to the main apple varieties grown in the north-eastern part of the country (Bođi I., Cârdei E., 1998), it was necessary to introduce apple varieties with genetic resistance to scab

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and mildew vulnerability, obtained either in the country and abroad (Branışte N. et al., 1989; Istrate M., Rominger E., 1992). The assortment's improvement is even more stringent as it is known that the pest control substances are energy consuming, which makes them very expensive and usually imported. Studying and then introducing the resistant varieties in the culture are leading, ultimately, to a considerable reduction in the number of treatments and respectively to the reduction of the environmental pollution. The research objectives aim at introducing in the culture the apple varieties resistant to scab and mildew, which meet the requirements for productivity and fruit quality and which have the proper suitability for intensive and super-intensive cultivation.

MATERIAL AND METHOD

The research was conducted during 2010-2011 in the pomological collection of the D. Cantemir Agricultural College Husi. The biological material used included four apple varieties with resistance to disease: Romus 1, Romus 2, Pionier and Florina. The experimental plantation was established in 2002, with trees grafted on MM106 rootstock, planted at a distance of 4 x 3 m and led under a layered palmeta shape with oblique branches. The soil maintenance system was through the worked field. The phytosanitary treatments were applied only for pest control. During the experimentation period observations and determinations were made for the following parameters: the tree growth vigour (trunk section area, crown volume of trees); phenophases of fruiting organs, the specific of fructification, the amount of biomass removed in the process of fructification pruning, fruit production obtained and the productivity index.

RESULTS AND DISCUSSIONS

The phenophases of the fruiting organs are specific to the biology of each species of fruit and the onset time and duration are closely related to the climatic conditions of each year (table 1).

Table 1

Conducting phenophases for the fructification of 4 apple varieties with resistance to diseases in 2010-2011 period

Varieties	Unbudding	Flowering		Duration of flowering days	Date of the harvest	No. days from bloom to harvest
		Beginning	End			
Romus 1	05.04-12.04	25.04-21.04	05.05-30.04	10-9	20.07-14.07	75-75
Romus 2	05.04-12.04	25.04-21.04	05.05-30.04	10-9	20.07-14.07	75-75
Pionier	08.04-14.04	26.04-22.04	06.05-01.05	11-10	22.09-16.09	138-138
Florina	10.04-15.04	27.04-22.04	07.05-01.05	12-10	14.10-07.10	160-160

The onset of flowering to the apple varieties taken into the study was registered between 21 and 25 IV and the flowering duration was between 9 and 12 days. There is a gap in flowering between the years of study, with 4-5 days earlier in 2010, but between the varieties, differences were insignificant, respectively 1-2 days. The flowering period overlapped for all varieties, ensuring favourable conditions for cross pollination. The number of days from the end of the flowering period to harvest consisted of 75 days for Romus 1 and Romus 2 varieties, 138 days for Pionier and 160 days for Florina varieties. In the climatic conditions specific to Husi fruit growing basin, fruits

ripening begins with the Romus 1 and 2 (during the second decade of July), which are summer varieties; Pionier (the second decade of September) – autumn varieties and Florina (the first decade of October)- autumn-winter varieties. Knowledge of the biological features of apple varieties allows the application of differentiated technologies of culture, depending on climatic zone, soil type, the vigour and type of fructification, the crown shape and the planting distances.

Data on the growth vigour of the trees (expressed as trunk sectional area) highlight the highest vigour of growth of Florina and Romus 1 varieties (10.32 cm² and 9.39 cm², respectively) and, the vigour of the Romus 2 variety (7.11 cm²) being the lowest one (table 2).

Table 2

Biometric data of trees, number and average length of annual increase before the trees fruition pruning

Varieties	Tree height (H) m	Trunk sectional area (cm ²)	Crown diameter		Crown volume		Number of annual branches	Average length of annual increases (cm)
			D (m)	d (m)	m ³ /tree	m ³ /ha		
Romus 1	3,17	9,39	2,54	1,55	5,28	4400	130	56
Romus 2	2,36	7,11	2,22	1,05	2,36	1971	68	43
Pionier	3,11	8,72	3,05	1,43	6,00	5002	166	56
Florina	3,17	10,32	3,15	1,49	7,11	5927	180	53

In the IX year after planting, the Pionier and Florina varieties realized the highest crown volume values (6.0 and 7.11 m³/ tree). The lowest crown volume values were obtained by the Romus 2 variety (2.36 m³/ tree). For some varieties (Pionier and Florina) the distance between trees in the case of using the layered, oblique arms palmetta was maximum in order to ensure an optimum space for nutrition; the interference area of neighbouring trees was of only 0.15 to 1.20 mm. The average length of annual increases ranged between 43 and 56 cm and highlights the existence of a favourable balance between growth and fruiting, which ensures a constant fructification every year.

Table 3

The amount of biomass removed during the pruning and garnish degree of the crown after the completion of pruning

Varieties	of branches eliminated at the cutting	frame of the branches	Number of fruit formation				Annual number of branches			
			Spur buds	Spur with flower buds	Shoots with vegetative buds	Vegetative shoots with flower bud on top	remaining uncut branches left on trees	shortened to 1 / 3 of the length	shortened to 1 / 2 of the length	shortened to 2 / 3 of the length
Romus 1	3,0	1,3	44	9	55	66	47,5	8,25	12	11,75
Romus 2	1,2	0,7	19	5	16	30	13,75	3,5	7,25	3,75
Pionier	4,0	1,4	46	14	20	49	22,75	3,75	16,25	13,75
Florina	4,7	1,5	18	21	17	74	43,75	4,75	12,5	10,75

Analyzing data on the amount of biomass removed once with the pruning highlights the high values obtained by the Pionier and Florina varieties (4.03 and 4.7 kg / tree), the lowest value being the one for the Romus 2 variety (0.72 kg / tree) (table 3). Data on the length of three-five years branches, number and type of fruit formations, the shortening intensity of the annual branches, highlight the fructification specific of the varieties included in the study. The Romus 1, Romus 2 and Pioneer varieties have the characteristics type III of fructification (standard), while the Florina variety presents the type IV fructification.

The average yield obtained in 2010-2011 (the eighth and ninth years after planting) ranged from 21.1 t / ha (Romus 2) and 43.4 t / ha (Florina). The Romus 1 variety also stands out through its productivity (37.6 t / ha) (table 4). The productivity index scored the highest values for Pionier (0.47 kg/cm² trunk section area) and Florina (0.55 kg/cm²) varieties and the lowest values for the Romus 2 variety (0.35 kg/cm²).

Table 4

Fruit production obtained and the productivity index for 4 apple varieties				
Varieties	Trunk sectional area (cm ²)	Productivity index (kg/ cm ²)	The fruit production	
			kg/tree	t/ha
Romus 1	9,39	0.43	4,5	37,6
Romus 2	7,11	0.35	2,5	21,1
Pionier	8,72	0.47	4,1	34,1
Florina	10,32	0.55	5,2	43,4

CONCLUSIONS

1. The soil and climatic conditions in Husi fruit growing basin are particularly favourable for the apple culture.

2. Data on the trees growth vigour (expressed as trunk sectional area) highlights the high vigour of growth for Florina and Romus varieties 1 (10.32 cm² 9.39 cm², respectively) and the lowest vigour for Romus 2 variety (7.11cm²).

3. The onset of flowering for the apple varieties taken into the study was registered between 21 and 25 IV and the flowering duration was between 9 and 12 days.

4. In terms of productivity, the Florina (43.4 t / ha), Romus 1 (37.6 t / ha) and Pioneer (34.1 t / ha) varieties were notable, which are also suitable for the soil and climatic conditions of the Husi area.

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STUDY REGARDING THE INFLUENCE OF GROWING AND IRRIGATION CONDITIONS OVER DIFFERENT ORNAMENTAL FEATURES OF SOME TAXA OF WILD PLANTS AT VEGETABLE RESEARCH-DEVELOPMENT STATION BACAU

STUDIUL INFLUENȚEI UNOR CONDIȚII DE CREȘTERE ȘI IRIGARE ASUPRA UNOR CARACTERE ORNAMENTALE ALE UNOR TAXONI SPONTANI LA STAȚIUNEA DE CERCETARE-DEZVOLTARE PENTRU LEGUMICULTURĂ BACĂU

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Abstract. The researches and experimentations were accomplished at VRDS Bacau during 2011 year. The results obtained at *Allium ursinum* demonstrate that the plant can be cultivated both in open field and in shadow, but when is cultivated in open field different morphological modifications may appear: the plants are smaller, the color of leaves is lighter and the decorative effect is smaller. At *Artemisia annua*, the variant cultivated in not-irrigation conditions, due to its smaller port and the lighter color of leaves is more decorative, framing better in the flower species associations from parks and gardens. At *Anthemis tinctoria*, the variant cultivated in irrigation conditions, due to its larger bush and richness in branches, was more decorative than the other one. At *Malva sylvestris*, the variant cultivated in irrigation conditions, the leaves are darker colored, the flowers are larger and more numerous, thus being more decorative.

Key words: culture, field, effect, decorative, flowers, leaves

Rezumat. Cercetările și experimentările s-au efectuat la SCDL Bacău în anul 2011. Rezultatele obținute la *Allium ursinum* arată că planta se poate cultiva atât în plin câmp cât și la umbră, dar în plin câmp apar modificări morfologice, plantele sunt mai mici, culoarea frunzelor este mai deschisă, iar efectul decorativ este mai mic. La *Artemisia annua*, varianta cultivată în condiții de neirigare datorită portului mai mic și culorii frunzelor mai deschise este mult mai decorativă, încadrându-se mai bine în asociații de specii florifere din parcuri și grădini. La *Anthemis tinctoria*, varianta cultivată în condiții de irigare, datorită tufei mai mari și mai bogate în ramificații a fost mai decorativă. La varianta de *Malva sylvestris* cultivată în condiții de irigare, frunzele sunt de culoare mai închisă, florile mai multe și mai mari, fiind mai decorativă.

Cuvinte cheie: cultură, câmp, efect decorativ, flori, frunze

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INTRODUCTION

Numerous scientists are preoccupied with finding the way and means through which the biodiversity of spontaneous flora can be conserved and utilized as source of new plants for horticultural sector, especially the ornamental one (Rowley and Edwards, 1997, Skinner and Stebbins, 1997, Tibor, 1997, Wolberg, and Reinard, 1997). Primack R. și Drayton B. (1997) recommends, in “The experimental ecology of reintroduction“, some practical methods for the re-introduction of different plant species. Other studies demonstrate that the populations of spontaneous species, with decorative effect can be adapted to live in different geographic areas (Primack, 1996). The native plants with decorative effect are preferable because they have a larger adaptability to local and regional conditions. Thus, the durability of regional genetic resources with decorative effect can be increased, the species being easy to cultivate and maintained during a larger period of time.

Regarding the potential of cultivation of spontaneous ornamental species from the Romanian flora different studies in various geographic areas were accomplished. Floristic researches were developed in Moldavia area: districts Vrancea, Vaslui, Neamt, Bacau, Botosani (Creola Brezeanu et al., 2010; Brezeanu et al., 2010). At all these studies on add the present paper that deals with the influence of different cultivation methods over the decorative effect of some spontaneous species.

MATERIAL AND METHOD

The experimentations accomplished in the field aimed toward the determination of influence of cultivation conditions as well as of irrigation over the ornamental characters of taxons cultivated at V.R.D.S. Bacau. The researches and experimentations were accomplished at VRDS Bacau during 2011 year.

The following species were studied: *Anthemis tinctoria*, *Antemis annua*, *Malva sylvestris* and *Allium ursinum*.

Thus, for the identification of morphological modifications of studied species, with influence over the decorative value and adaptability to environment, the following cultivation variants were investigated (table 1).

Table 1

Variants studied at VRDS Bacău during 2011 year

Nr.	Variant/specie	Specification
1.	V1 - <i>Allium ursinum</i>	Stationary 1 – in research field
2.	V2 - <i>Allium ursinum</i>	Stationary 2 – in dendrology sector, in shadow
3.	V1 - <i>Anthemis annua</i>	Stationary 1 – in irrigation conditions
4.	V2 - <i>Anthemis annua</i>	Stationary 2 – without irrigation
5.	V1 - <i>Anthemis tinctoria</i>	Stationary 1 – in irrigation conditions
6.	V2 - <i>Anthemis tinctoria</i>	Stationary 2 – without irrigation
7.	V1 - <i>Malva sylvestris</i>	Stationary 1 – in irrigation conditions
8.	V2 - <i>Malva sylvestris</i>	Stationary 2 – without irrigation

The main decorative characters were determined: plant's height (cm), plant's diameter (cm), height/diameter, no. of main ramifications and no of secondary ramifications.

RESULTS AND DISCUSSIONS

The studies regarding the quantitative and qualitative characteristics of the biological material are presented in table 2, representing the main criteria in judging the decorative effect of plants.

Table 2

Quantitative and qualitative determinations of taxons introduced in culture

Variant	Plant's height (cm)	Plant's diameter (cm)	Height/diameter	Main ramifications	Secondary ramifications
V1 - <i>Allium ursinum</i>	17 -18	15 - 17	1,1 - 1	5 – 11 flowering stem	x
V2 - <i>Allium ursinum</i>	21 -24	19 - 21	1,1 – 1,1	7 – 12 flowering stem	x
V1 - <i>Arthemisia annua</i>	95 - 112	49- 63	1,9 – 1,8	12 - 14	23 - 27
V2 - <i>Arthemisia annua</i>	36-40	19-20	1,9 - 2	6 - 7	14 – 16
V1 - <i>Anthemis tinctoria</i>	33	26	1,3	19	18
V2 - <i>Anthemis tinctoria</i>	24	19	1,3	4	10
V1 - <i>Malva sylvestris</i>	51	35	1,2	19	22
V2 - <i>Malva sylvestris</i>	34	15	2,3	4	10

The accomplished biometrical determinations demonstrate that:

- *Allium ursinum*, at the variant cultivated in shadow, the plant's height and bush diameter is larger. Also the number of flowering stems increases from 5-11 to 7-12. The color of leaves is lighter at variant cultivated in the field and darker at variant cultivated in the shadow, under trees or shrubs (fig. 1 and 2). The results obtained demonstrate that the plant can be cultivated both in open field and in shadow, but in open field appears different morphologic modifications, the plants are smaller, the leaves color is lighter and the decorative effect is smaller.



Fig. 1 - *Allium ursinum* (V1)



Fig. 2 - *Allium ursinum* (V2)

- *Arthemisia annua*, cultivated in conditions of irrigation has a larger height, 95 - 112 cm, the bush diameter is higher, 49 - 63 cm, the number of main ramification is 12 - 14 and the secondary ones is 23 - 27, comparing with the variant cultivated in non-irrigated conditions, with the height 49 - 63 cm, bush diameter 19 - 20 cm, number of main ramification 6 - 7 and the secondary ones 14 - 16. The variant V2 due to its smaller height and lighter colored leaves is much more decorative, framing very well in the flower species associations from parks and gardens (fig. 4).



Fig. 3 - *Arthemisia annua* (V1)



Fig. 4 - *Arthemisia annua* (V2)

- *Anthemis tinctoria* cultivated in irrigation conditions has a higher height - 33 cm, the bush diameter is larger- 26 cm, the number of main ramifications - 19 and secondary ones - 18, comparatively with the variant cultivated in not-irrigated conditions with a height of 24 cm, bush diameter 19 cm, the number of main ramifications 4 and secondary ones 10.



Fig. 5 – *Anthemis tinctoria* (V1)



Fig. 6 - *Anthemis tinctoria* (V2)

The variant V1 due to its larger and richer in ramifications bush is more decorative than variant V2 (fig. 5 and 6).



Fig. 7 - *Malva sylvestris* (V1)



Fig. 8 - *Malva sylvestris* (V2)

- *Malva sylvestris* cultivated in irrigation conditions has a higher height - 51 cm, the bush diameter is larger - 35 cm, the number of main ramifications 19 and secondary ones 22, comparatively with the variant cultivated in not-irrigated conditions with a height of 34 cm, bush diameter 15 cm, the number of main ramifications 4 and secondary ones 10.

In this case also at variant V1 the leaves are darker colored, the flowers are more numerous and larger in size (fig. 7).

CONCLUSIONS

1. *Allium ursinum* at the variant cultivated in shadow, the plant's height and bush diameter is larger. Also the number of flowering stems increases from 5-11 to 7-12. The color of leaves is lighter at variant cultivated in the field and darker at variant cultivated in the shadow, under trees or shrubs. The results obtained demonstrate that the plant can be cultivated both in open field and in shadow, but in open field appears different morphologic modifications, the plants are smaller, the leaves color is lighter and the decorative effect is smaller.

2. *Artemisia annua*, cultivated in conditions of irrigation has a larger height, 95 - 112 cm, the bush diameter is higher, 49 - 63 cm, the number of main ramification is 12 - 14 and the secondary ones is 23 - 27, comparing with the variant cultivated in non-irrigated conditions, with the height 49 - 63 cm, bush diameter 19 - 20 cm, number of main ramification 6 - 7 and the secondary ones 14 - 16. The variant V2 due to its smaller height and lighter colored leaves is

much more decorative, framing very well in the flower species associations from parks and gardens.

3. *Anthemis tinctoria* cultivated in irrigation conditions has a higher height - 33 cm, the bush diameter is larger- 26 cm, the number of main ramifications - 19 and secondary ones - 18, comparatively with the variant cultivated in not-irrigated conditions with a height of 24 cm, bush diameter 19 cm, the number of main ramifications 4 and secondary ones 10. The variant cultivated in irrigated conditions is more decorative due to its larger and more branched bush.

4. *Malva sylvestris* cultivated in irrigation conditions has a higher height - 51 cm, the bush diameter is larger - 35 cm, the number of main ramifications 19 and secondary ones 22, comparatively with the variant cultivated in not-irrigated conditions with a height of 34 cm, bush diameter 15 cm, the number of main ramifications 4 and secondary ones 10. Also, in irrigation conditions the leaves are darker colored, the flowers are more numerous and are larger in size, thus being more decorative.

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SPECIES FROM SPONTANEOUS FLORA OF TULCEA COUNTY, WITH ORNAMENTAL VALUE

SPECII CU VALOARE ORNAMENTALĂ DIN FLORA SPONTANĂ A JUDEȚULUI TULCEA

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Abstract. *The current paper present five species with ornamental value identified in the spontaneous flora of Tulcea County, as follows Allium flavum, Allium saxatile, Echinops ruthenicus, Silene compacta, Silene supina. Identification and gathering of the species was effectuated in the vegetation period of 2010 (May-October), from Turcoaia and Babadag localities, Tulcea County. To study these taxons in crop conditions were established experimental plots and the biologic material was represented by seeds, bulbs, function of specie. Taxonomic nomenclature and botanic description was in according with the one proposed by Ciocârlan V. and Flora Europaea.*

Key words: spontaneous flora, ornamental value, biodiversity, Tulcea County.

Rezumat. *În lucrarea de față sunt prezentate cinci specii cu valoare ornamentală identificate în flora spontană a județului Tulcea și anume: Allium flavum, Allium saxatile, Echinops ruthenicus, Silene compacta, Silene supina. Identificarea și colectarea acestor specii s-a făcut în perioada de vegetație a anului 2010 (mai-octombrie), din locațiile Turcoaia și Babadag, județul Tulcea. Pentru studierea acestor taxoni în condiții de cultură s-au înființat câmpurile experimentale, iar materialul biologic utilizat a fost reprezentat, în funcție de specie, de semințe, bulbi. Nomenclatura taxonomică și descrierea botanică utilizată a fost după Ciocârlan V. și Flora Europaea.*

Cuvinte cheie: flora spontană, Allium, Echinops, Silene, valoare ornamentală, județul Tulcea.

INTRODUCTION

The spontaneous flora of Romania has over 3000 species (Ciocârlan V., 2000) and constitutes a valuable source of plants with decorative potential.

Dobrogea represent a Romanian area with a mild climate, a characteristic geo-morphology (Burcea Nela, 2008) and a specific spontaneous flora (Dihoru, G., Doniță, N., 1970; Doniță N. et al., 2007; Făgăraș M., 2010). Meadows and forests from Dobrogea have species with a remarkable botanic value (Sârbu Anca et al., 2009). Some of them presents decorative features and could be a germplasm source to enrich the ornamental assortments, which could be used both in the south-east part of Romania and also in other areas.

Research regarding morphological characterisation of the plants and cultivation possibilities of species from spontaneous flora, with ornamental

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potential, were realised both on national level (Manda Manuela et al., 2009; Chelariu Elena Liliana et al., 2010; Draghia Lucia et al., 2010) and international one (Uysal I., 1992; Fritsch R. M. et al., 2002; Heywood V., 2003; Fritsch R. M. et al., 2008; Ouzoundou Georgia, 1994, 1995).

The current paper aimed on the characterisation of five spontaneous species with ornamental features (*Allium flavum*, *Allium saxatile*, *Echinops ruthenicus*, *Silene compacta*, *Silene supina*), identified in Tulcea County and which could contribute to the enrichment of ornamental plants assortment.

MATERIAL AND METHOD

Research was carried out in year 2010, during vegetation period (May – October). To elaborate the current paper were studied, gathered and recorded five taxons from spontaneous flora of Tulcea County, Turcoaia and Babadag areas (fig. 1).

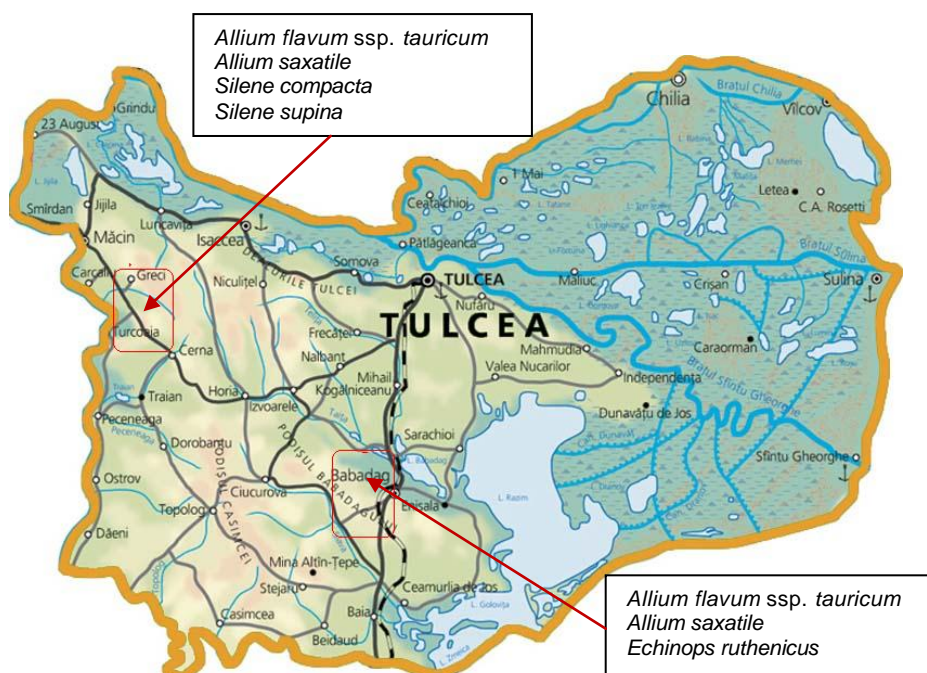


Fig. 1 – Map of Tulcea County – the natural habitat of the studied species

Having in view the biological particularities of plants (life time cycle, phenol-phase) or zoological category in which are placed some taxons for establishing the experimental field we gathered different biological materials such as: seeds and bulbs (table 1).

Table 1

Species identified and gathered from the spontaneous flora of Tulcea County

Nr. crt.	Specie	Biologic gathered material	Natural habitat
1	<i>Allium flavum</i> ssp. <i>tauricum</i> (Besser ex Rchb.) Stearn	seeds bulbs, bulblet	Turcoaia Babadag
2	<i>Allium saxatile</i> Bieb.	seeds	Turcoaia Babadag
3	<i>Echinops ruthenicus</i> (Fischer) Bieb	seeds	Babadag
4	<i>Silene compacta</i> Fischer.	seeds	Turcoaia
5	<i>Silene supina</i> Bieb.	seeds	Turcoaia

Also at some species, at which were identified populations in different areas, were gathered material from each population to be able to compare morphologic characters, multiplication and adaptability capacities.

The taxonomic nomenclature is the one adopted by Ciocârlian V. and *Flora Europaea* (Tutin T.G., colab., (eds.) 1964-1980 & 1993).

Study method consists in observations on the main morphological and ecological characteristics of the species, specifying areas within the spread of taxa in Romania (Oprea A., 2005).

RESULTS AND DISCUSSIONS

Research regarding cultivation potential in ornamental purposes of some spontaneous species from Romanian flora was carried out in the South-East part of the country, respectively in Tulcea.

The studied taxons are presented below, underlining the main biological, morphological and ecological features, spreading area, the place from where the material was gathered and characters of ornamental interest.

***Allium flavum* ssp. *tauricum* (Besser ex Rchb.) Stearn** (yellow onion, ornamental onion, small yellow onion), **Alliaceae** family (fig. 1), is a geophytes perennial specie with bulbs. It is rarely met in Romania, in arid and rocky places, on meadows and bushes from silvo-steppe area till beech level. Specie blooms in summer (July – August) and decorates through small and yellow flowers, grouped in umbelliform inflorescences.

Biological material (bulbs, bulblets, seeds), used to settled up the crops are from Turcoaia and Babadag localities, Tulcea County.

Specie prefers sunny places, sandy soils, well drained, with a neutral pH. Requires moderate water quantities, resists to negative temperatures and tolerates draught.

Ornamental features of plant could be put in light in landscape designs of rocks-shape, groups and massive types, but also as cut flowers.

***Allium saxatile* Bieb.** (golden garlic), **Alliaceae** family (fig. 2), is a geophytes perennial specie which presents bulbs in soil, it is original from Pontic-Balkans. In Romania is a rare species and could be found on rocky hills from Dobrogea steppe and silvo-steppe. It decorates by white-pink small

flowers grouped in umbelliform inflorescences. It blooms, in summer –autumn (June – September).

Biologic material which is represented by seeds was gathered from to populations from Turcoaia and Babadag areas.

It grows well in sunny places, on sandy soils, well drained, with a neutral pH. Requires moderate water quantities, resists to negative temperatures and tolerates draught.

Plants could be used in landscape designs such as rock-shape, groups, massive, colour spots, mixed borders or as fresh cut flowers to realise small bunches.



Fig. 1 - *Allium flavum* ssp. *tauricum*



Fig. 2 - *Allium saxatile*

***Echinops ruthenicus* (Fischer) Bieb, Asteraceae** family (fig. 3,) is hemi-cryptophytes specie, original from Pontic-Pannonia-Balkans area. In Romania is rarely found from the steppe area till beech level, on sunny meadows. Specie is decorative through blue flowers which are grouped in small globular inflorescences.

It is a sub-thermophile specie, which resist at long or moderate draught periods and could capitalize the lands with a low content in nutritive elements.

Biologic material represented by seeds was gathered from Babadag area, Tulcea County.

Present interest from ornamental point of view due to the flowers and could be recommended to landscape designs such as groups, massive but also as cut flower, used in dry state (immortelle).



Fig. 3 - *Echinops ruthenicus*

***Silene compacta* Fischer.**, **Caryophyllaceae** family (fig. 4), is an annual or perennial specie, therophyte, of a Pontic-Mediterranean origin. In Romania is a rare specie, endangered, are could be found in the north of Dobrogea on the rocky slopes.

Specie is decorative by its pink flowers grouped in a dense, head less, inflorescence. It blooms in summer (June – August).

The biologic material represented by seeds was gathered from a population from Turcoaia area.

It grows in sunny places, on sandy soils, well drained, with a neutral-alkali pH. Have moderate water requests and tolerates the draught periods.

The decorative value of the plant could be enlightened in landscape designs such as groups and massive type, spot of colours, rondos mixed and stoned landscapes.

***Silene supina* Bieb. (sin. *S. spergulifolia* (Willd.) Bieb.),** **Caryophyllaceae** family (fig. 5), is a perennial specie with a Continental Eurasian origin, rare in Romania and could be found in the rocky areas of Tulcea, Mehedinți, Caraș-Severin Counties. It has stains more or less crawling, small and linear leaves and white flowers. It blooms in summer (July – August).

Specie was recorded in Turcoaia area, Tulcea County and was gathered seeds as biological material for multiplication.

Prefers sunny places, rocky and sandy lands, with less fertile soils and well drained.

Specie could be used in alpine gardens, groups and mixed borders.



Fig. 4 - *Silene compacta*



Fig. 5 - *Silene supina*

CONCLUSIONS

1. The studies effectuated in Tulcea County allowed us to identify 5 species, *Allium flavum* ssp. *tauricum* (Besser ex Rchb.) Stearn, *Allium saxatile* Bieb., *Echinops ruthenicus* (Fischer) Bieb., *Silene compacta* Fischer. and *Silene supina* Bieb., which could be recommended for cultivation as ornamental plants.

2. To establish the crop technologies and the usage modalities will be take into account the specific biologic and ecologic particularities.

3. Function of ornamental features capitalization of the studied taxa could be made either in different type of vegetal compositions and also as cut flowers (fresh or dry).

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ORNAMENTAL GRASSES WITH CULTIVATION POTENTIAL IN THE PEDO-CLIMATIC CONDITIONS OF IAȘI COUNTY

IERBURI ORNAMENTALE CU POSIBILITATE DE CULTIVARE ÎN CONDIȚIILE PEDOCLIMATICE DIN JUDEȚUL IAȘI

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Abstract. *Ornamental grasses are less used in the landscape design from the NE area of Romania. In the current paper is presented an assortment of ornamental grasses cultivated in other areas, but which due to the ecologic and technologic demands could be cultivated in Romania. NE area of Romania, in according with Hardiness Zone Map of Europe, is in the fifth zone of rusticity with minimum temperatures between -29 °C and -23 °C.*

Key words: ornamental grasses, landscape design, NE area of Romania

Rezumat. *Ierburile ornamentale sunt puțin utilizate în amenajările peisagere din zona de NE a României. În această lucrare este prezentat un sortiment de ierburi ornamentale cultivate în alte areale, dar care datorită cerințelor ecologice și tehnologice se pretează pentru cultivare în România. Zona de NE a României conform Hardiness Zone Map of Europe, se încadrează în zona de rusticitate 5, cu temperaturi minime cuprinse între -29 °C și -23 °C.*

Cuvinte cheie: ierburi ornamentale, amenajări peisagere, zona de NE a României

INTRODUCTION

Species called “ornamental grasses” belongs, from botanic point of view, to several families. The majority of the species belongs to Poaceae family, a small number to families Cyperaceae, Juncaceae, Typhaceae and less to other botanic families (for example Liliaceae, Agavaceae, Araceae).

Mentioning the ornamental grasses as elements of a natural, free style, could be found in tropical gardens, from Victorian age at the end of 19th century (Hobhouse, 1992 cited by Michael N. Dana, 2002), and then to the middle of 20th century. Karl Foerster (1874-1970) was one of the pioneers in research of ornamental grasses. In his garden in Potsdam-Bornim, Germany, Foerster evaluated plants gathered from all over the world. In 1940 he published a catalogue with 100 species, varieties and cultivars of ornamental grasses (Marilyn Raff, 2005). During 1980 and 1990 decades the usage of decorative grasses increases, both from Poaceae family and also from others botanic families, thanks to advertise the information through bulletin „A Cornell Cooperative Extension Publication” (Meyer Mary et al., 1973, cited by Michael N. Dana, 2002). Due to this publication were known more taxons and the sources for gathering the biological material used for landscape designs (Michael N. Dana, 2002). The assortment of ornamental grasses cultivated in the world is very diversified

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and have species with different ecological demands function of origin place. Some species have a high ecologic plasticity and are spreaded in many geographical areas of the world: America (Hockenberry Meyer Mary, Mower G.R., 1997; Leppert St., 2009), Europe (Walters S.M., 1983; Taylor N., 1994; Rice Graham, 2006; Ardle J., 2007; Darke R., 2007); Asia and Australia (Gao H., Liu J., 2005; Wu J., Teng W., Wang Q., 2006; Wu Ju-ying et al., 2008; Qian Sun et al., 2010).

MATERIAL AND METHOD

Observations were carried out in the experimental field of Floriculture Discipline from USAMV Iași, in 2011. Were studied a number of seven cultivars belonging to four species from Poaceae botanic family (table 1). To establish the experimental crops were used as multiplication biologic material fragments resulted after bushes division. Morphologic characterisation was made in according with the literature (Walters S.M., 1983; Greenlee J., 1992; Taylor N., 1994; Ardle J., 2007).

Table 1

Ornamental grasses which could be cultivated in the pedo-climatic conditions from Iași, Romania

Nr.	Name of specie / variety / cultivar	Rusticity area	Provenience of biologic material
1	<i>Festuca glauca</i> „Elijah Blue”	3(4)	Young plants of 1 year (Hungary)
2	<i>Imperata cylindrica</i> „Red Baron”	(5)6	
3	<i>Miscanthus sinensis</i> „Gracillimus”	(5)6	Mother plants cultivated 3 years in Bucium area, Iași
4	<i>Miscanthus sinensis</i> „Silberfeder”	(5)6	
5	<i>Miscanthus sinensis</i> „Variegatus”	(5)6	
6	<i>Miscanthus sinensis</i> „Zebrinus”	(5)6	
7	<i>Pennisetum alopecuroides</i> „Little Bunny”	5	

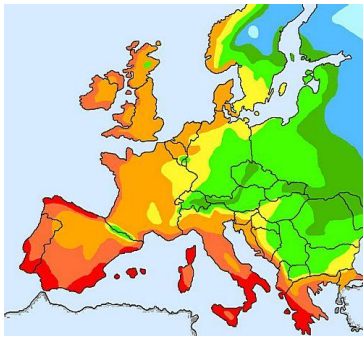
Area in which were carried out the observations (North-East of Romania) belongs to the rusticity area number 5 in according with *Hardiness Zone Map of Europe*, characterized by annual minimum temperatures between -29 °C and -23 °C. Local climate of Iași area is continental type with excessive nuances. The annual average air temperature is of 9.6 °C, and the amplitude of the monthly averages is of 24-25 °C.

RESULTS AND DISCUSSIONS

In landscape designs ornamental grasses could be not only companions for other plants but could be the real attraction points. These plants could assure the décor all year round, from spring till autumn decorates through foliage and inflorescences and in winter by their dried inflorescences.

The assortment of decorative grasses is very diversified having species with high ecological plasticity or only species typical to certain areas.

On world level the rusticity areas are numbered on a scale from 1 to 12 (in area Z1 minimum temperature is below -46 °C and in area Z12 +16 °C) in according with *World Hardiness Zones* (Graham Rice, 2006). In Europe could be found rusticity areas of plants from 3 to 10 according with *Hardiness Zone Map of Europe* (fig. 1). This map shows the rusticity areas function of minimum temperature recorded in each area.



Area	Fahrenheit	Celsius
3	-40 to -30 F	-40 to -34 °C
4	-30 to -20 F	-34 to -29 °C
5	-20 to -10 F	-29 to -23 °C
6	-10 to 0 F	-23 to -18 °C
7	0 to 10 F	-18 to -12 °C
8	10 to 20 F	-12 to -7 °C
9	20 to 30 F	-7 to -1 °C
10	30 to 40 F	-1 to 4 °C

Fig. 1 - Europe – Rusticity areas of plants
 (<http://www.your-garden-ponds-center.com/plant-hardiness-zones.html>)

Assortment of decorative grasses is very rich and diversified, species being cultivated in different areas of rusticity. The North-East area of Romania is in area 5 of rusticity in according with *Hardiness Zone Map of Europe* (fig. 2) and function of this criteria were selected species which could resist at conditions with minimum temperatures according to the following areas: Z3 (t = -40...-35 °C), Z4 (t = -35...-29 °C), Z5 (t = -29...-23 °C).

In the last 10 years (2000-2010) minimum temperature recorded at Iași was -23.6 °C, in February 2005, and in the others years between -18 °C and -23 °C. From this reason were selected for our study also species which are cultivated in rusticity area Z6 (t = -23...-18 °C). Function of plants' biology and ecological demands those species are cultivated as annual or as perennial ones.

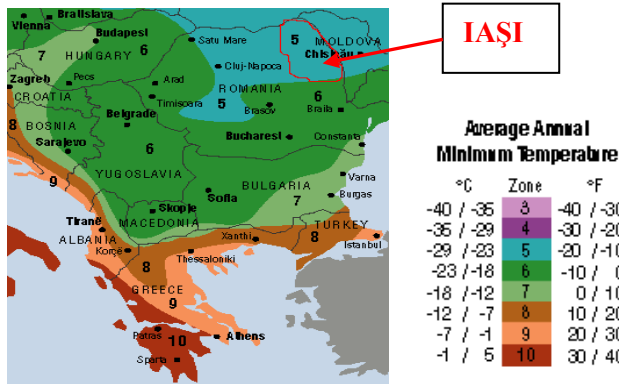


Fig. 2 – Rusticity areas of plants for Europe
 (<http://www.gardenweb.com/zones/europe/hze7.html>)

Festuca glauca „Elijah Blue” (blue fescue) is a perennial cultivar (fig. 3 original). Have the aspect of a compact and dense bush, with height of 25-50 cm and diameter 50-75 cm. Leaves are green-blue, with a bloom aspect, linear, thin, with soft texture. The flowers are green-lilac, grouped in panicles. Blooms took place in June - July.

It prefers lands with sunny exposure, soils well drained and low moisture. Could tolerate drought periods and air polluting. The plant didn't like moisture excess.

Decorate through leaves and port from early spring till the beginning of winter and through flowers in June – July. Could be used in borders, rocks shape designs, ornamental pots but also as cut flowers.

It is cultivated as ornamental grass from rusticity area 3 up to area 8.

***Imperata cylindrica* „Red Baron”** (Japanese bloodgrass) is a perennial plant with a bushy aspect (fig. 4 original). Leaves have a vertical grow, and the colour is red. At maturity could reach a height up to 30-50 cm. It blooms very rare.

It has a good development both on lands with sunny exposure and also on semi-shadows, on well drained soils with moderate moisture. Could tolerate drought periods and polluted air.

It is used due to the leaves colouring and the aspect of the bush in landscape designs such as: borders, rock gardens, edging plant, accent or massed as a ground cover. Foliage colour can be superb when backlit by early morning or late day sun. It is also good for patio containers or tubs.

Cultivar could be found in landscape designs from rusticity area 5 up to area 9.

***Miscanthus sinensis* „Gracillimus”** (maiden grass) have an aspect of a compact bush (fig. 5 original). Cultivar could reach the height of 1.2-1.8 m. Flowers are grouped in digital panicles, of a purple-brown colour. It blooms late in autumn.

Prefer sunny lands or semi-shadowed ones. Develop well on fertile soils, well drained. Demand moderate moisture. Tolerate drought periods and polluted air.

Decorate through bush aspect and by flowers and it is cultivated in rusticity area 5 up to area 9. Versatile ornamental grass, but clumps need lots of room. It could be used for borders, meadows, wild gardens, cottage gardens, naturalized areas or pond/water garden peripheries.

It could also be used as cut flowers, in fresh or dry state and also to control soil erosion.



Fig.3 - *Festuca glauca* „Elijah Blue”



Fig.4 - *Imperata cylindrica* „Red Baron”



Fig.5 - *Miscanthus sinensis* „Gracillimus”

***Miscanthus sinensis* „Silberfeder”** (silvergrass) (fig. 6 original). Foliage is green, the blade width is 2.5 cm, 150-200 cm in height. It flowers in August through frost.

Prefer full sun; moist fertile soil. Tolerate a wide range of soil types; moderately drought tolerant; holds up to wind and snow.

Is cultivated from area 5 of rusticity up to area 9 and used as specimen, border, screen, hedge, background plant, drifts, by the water, dried arrangements.

***Miscanthus sinensis* „Variegatus”** (striped eulalia) (fig. 7 original). It is a perennial plant with an aspect of a compact bush, 150-200 cm in height. Foliage is variegated, almost equal amount of green and white; blade width is 1.5 cm. Flowers are grouped in inflorescences of fingered panicle type, and flowering rods could reach the height of 175-225 cm. It blooms in September - October.

Prefer full sun; moist fertile soil; tolerates a wide range of soil types; moderately drought tolerant; holds up to wind and snow.

It is cultivated from rusticity area 5 up to area 9.

It could be used as: specimen, English border, woodland edge, accent plant, hedge, massing, by the water, dried arrangements.

Miscanthus sinensis „**Zebrinus**” (zebra grass) (fig. 8) is a deciduous, clump-forming, perennial grass, high of 200 cm and diameter of 120 cm. It has upright or arching bluish-green leaves with pale yellowish horizontal bands across them. Maroon-purple leaves appear in autumn complementing the rest of the plant, which turns a russet colour. In autumn, it may carry awed, hairy, pink-white spikelets in fan-shaped panicles. Flowering rods could have a length of 180-200 cm.

This plant prefers full sun or very light shade, is drought-tolerant, and grows in most well-drained soils. Resist at air pollution. Plants look good either as specimen plants or planted in groups in herbaceous borders.

It is a versatile ornamental grass. It could be used as: accent, specimen, grouping, mass or screen. Also could be used for borders, meadows, wild gardens, cottage gardens, naturalized areas or pond/water garden peripheries.

It is cultivated from rusticity area 5 up to area 10.

Pennisetum alopecuroides „**Little Bunny**” (dwarf fountain grasses, Chinese pennisetum) (fig. 9) is a perennial cultivar, with a globular bush, height of 25-40 cm. Leaves of dark green colour. Flowers are white-green, grouped in spike form inflorescences. It blooms from August till October.

Full sun is best but chinese pennisetum can be grown in partial shade. Chinese fountain grass is moderately tolerant of drought, but does best with regular watering. It requires supplemental water in arid climates. This is actually a good grass for the edge of the water garden.

It is cultivated from area 5 of rusticity up to area 9 and it is utilised as cut flower, dried flower, groundcover, erosion control, rain garden.

“Little Bunny” is the smallest of the dwarf fountain grasses. It is particularly at home in a rock garden setting or on a slope with other mat-forming or small perennials.



Fig.6 - *Miscanthus sinensis* „Silberfeder”



Fig.7 - *Miscanthus sinensis* “Variegatus”



Fig.8 - *Miscanthus sinensis* „Zebrinus”



Fig.9 - *Pennisetum alopecuroides* „Little Bunny”

CONCLUSIONS

1. Assortment of decorative grasses cultivated in the NE area of Romania is very reduced, so it is necessary to complete it with species or cultivars which correspond to the eco-pedologic conditions of the area.

2. Due to the ecological particularities *Festuca glauca* „Elijah Blue”, *Imperata cylindrica* „Red Baron”, *Miscanthus sinensis* „Gracillimus”, *Miscanthus sinensis*

„Silberfeder *Miscanthus sinensis* “Variegatus”, *Miscanthus sinensis* „Zebrinus”, *Pennisetum alopecuroides* „Little Bunny”, *Phalaris arundinacea* are framed in the pedo-climatic conditions of NE area of Romania.

3. Ornamental grasses could be used in landscape designs due to their decorative features and their adaptability capacities. It could be used for groups, massive, borders, ornamental pots, on the shore or even inside water ponds and as cut flowers.

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GERMPLASM SOURCES FROM SPONTANEOUS FLORA OF CONSTANȚA COUNTY

SURSE DE GERMOPLASMĂ DIN FLORA SPONTANĂ A JUDEȚULUI CONSTANȚA

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Abstract. The purpose of the study has been the identification of some ornamental value species from the spontaneous flora of Dobrogea. From the administrative point of view, the natural habitat where the studies were carried out was located in Constanta County, where some areas known for the flower variety and the presence of some plant species entered in various zoological categories (rare, threatened species) were targeted. In the present document, six of the representative taxa identified on the field are presented, from which reproductive material was harvested with the purpose of setting up experimental "ex situ" cultures in the conditions from Iași: *Jasminum fruticans* L.; *Sedum maximum* (L.) Suter (sin. *S. telephium* ssp. *maximum* (L.) Krock., *S. stepposum* Boiss.), *Sedum urvillei* DC. (sin. *Sedum sartorianum* Boiss.) ssp. *hillebrandtii* (Fenzl) Soó, *Sempervivum ruthenicum* Schnittsp. et C.B. Lehm., *Statice latifolia* Sm. (sin. *Limonium latifolium* (Sm.) O. Kuntze), *Teucrium polium* subsp. *capitatum* (L.) Arcangeli. The ornamental value of these taxa is supported not only by the characteristic morphological traits, but also by the ability to adapt to culture conditions different from the natural habitat.

Key words: germplasm, spontaneous flora, ornamental value, Constanța County.

Rezumat. Studiul a avut ca scop identificarea unor specii cu valoare ornamentală din flora spontană a Dobrogei. Din punct de vedere administrativ, habitatul natural în care s-au făcut studiile a fost reprezentat de județul Constanța, fiind vizate, în special, câteva areale cunoscute prin bogăția floristică și prin prezența unor specii de plante încadrate în diferite categorii zoologice (specii rare, subamenințate). În lucrarea de față sunt prezentate șase dintre taxonii reprezentativi care au fost identificați în teren și de la care s-a recoltat material pentru înmulțire, cu scopul înființării culturilor experimentale "ex situ" în condițiile de la Iași: *Jasminum fruticans* L.; *Sedum maximum* (L.) Suter (sin. *S. telephium* ssp. *maximum* (L.) Krock., *S. stepposum* Boiss.), *Sedum urvillei* DC. (sin. *Sedum sartorianum* Boiss.) ssp. *hillebrandtii* (Fenzl) Soó, *Sempervivum ruthenicum* Schnittsp. et C.B. Lehm., *Statice latifolia* Sm. (sin. *Limonium latifolium* (Sm.) O. Kuntze), *Teucrium polium* subsp. *capitatum* (L.) Arcangeli. Valoarea ornamentală a acestor taxoni este susținută nu numai de însușirile morfologice caracteristice, ci și de capacitatea de adaptare în condiții de cultură diferite de habitatul natural.

Cuvinte cheie: germoplasmă, flora spontană, valoare ornamentală, județul Constanța.

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INTRODUCTION

Located in the SE of Romania, between the Danube and Black Sea, Dobrogea is a specific area, where the eco-climatic conditions have caused a great diversity of ecosystems (Sălăgeanu G. et al., 1978). The vegetation is typical steppe; plant species are adapted to a temperate climate with pronounced continental accents, dry summers, cold winters and lack of humidity. In this area there are both Eastern European floral elements and Mediterranean and Balkan flora.

The aim of research was the identification, characterization and collection of potentially ornamental taxa present in the spontaneous flora of Dobrogea representative areas, which, administratively belong to Constanta. The literature contains numerous studies on the flora of Pontic-Danubian area (Chelariu Elena-Liliana et al., 2010), and aspects of biology, ecology, reproduction, etc. of the species and genera presented in this paper (Al-Qudah Tamara et al., 2011 Mirela Ardelean et al., 2009; Draghia Lucia et al., 2011 Y. Li, 2008; Nadjafia F. et al., 2006) .

MATERIAL AND METHOD

In year 2010, during the vegetation period (May – October) six taxa from two representative habitats in Constanta county have been identified, studied and collected:

- Cogealac: *Statice latifolia* Sm. (sin. *Limonium latifolium* (Sm.) O. Kuntze);
- Cheia (Cheile Dobrogei): *Jasminum fruticans* L.; *Sedum maximum* (L.) Suter (sin. *S. telephium* ssp. *maximum* (L.) Krock., *S. stepposum* Boiss.), *Sedum urvillei* DC. (sin. *Sedum sartorianum* Boiss.) ssp. *hillebrandtii* (Fenzl) Soó, *Sempervivum ruthenicum* Schnittsp. et C.B. Lehm., *Teucrium polium* subsp. *capitatum* (L.) Arcangeli.

The taxonomic nomenclature is that adopted by V. Ciocârlan and Flora Europaea (Tutin TG, colab, (eds.) (1964 – 1980 & 1993). The zoologic classification of the taxa has been made according to the *Critical List of Vascular Plants of Romania* (Oprea A., 2005).

The study method consisted of observations regarding the main morphological and ecological characteristics of the taxa, specifying at the same time their natural spreading areas in Romania (Ciocârlan V., 2000; Oprea A., 2005).

The biological material harvested for the set up of the “ex situ” cultures in the experimental field of the Floriculture Department from UASVM Iași has consisted of seeds, fruit, sapling, full flowers, depending on the biological particularities of the plants of the zoologic category some in which some of the taxa are classified.

RESULTS AND DISCUSSIONS

The studies regarding the cultivation potential with ornamental purpose of some spontaneous species from Romanian flora, have been carried out in the South-Eastern part of the country, namely in Constanta county.

In the following, the taxa collected in year 2010 are presented with their main biological, morphological and ecological traits, the habitat, the place where the harvesting was carried out and the ornamental interest traits.

1. *Jasminum fruticans* L., Oleaceae family

The species has a Mediterranean origin. In Romania it is considered to be a rare sub-threatened species (NT) that can be found in the barren areas of Dobrogea. The plant uses skeletal, stony and calcareous soils well.

It is a scrub species (fig. 1), 1,5-3 m high, with succeeding leaves, clovered, persistent and yellow flowers (it flowers in May-June). The fruit are bacca, black when mature.

The entire plant presents a high ornamental interest (leaves, flowers, shrub) and can be used in groups or solitary specimens in the landscaping of gardens or as plant in decorative vases.

The species has been identified in Cheile Dobrogei, and the harvested biological material for the setup of the experimental cultures comprised sprouts for slipping and fruit.

2. *Sedum maximum* (L.) Suter (sin. *S. telephium* ssp. *maximum* (L.) Krock., *S. stepposum* Boiss.), Crassulaceae family

It is a sub-thermofil species, xero-mezoxerofite, frequently met in Romania, on cliffs, rock slides, soils that are low in humus, from the steppe area until the level of the spruce. The plant has an erect stem, ramified in the upper part, 20-50 cm high, with fleshy, sessile, oval leaves, light green-ash in color, located opposite one from the other on the stem and in rosette at the base. The flowers are white-green or white-yellow and flower from July until October (fig. 2).

The plant raises ornamental interest due to the flowers and leaves, being recommended for stone arrangements, edging, decorative vases, green roofs and even for the cut flowers. In using the plant we must take into consideration of fact that it can be considered a pioneer species for rocky soils.

The species has been identified in the Cheile Dobrogei area, and for the setup of the experimental cultures, seeds and whole plants have been harvested.



Fig. 1 - *Jasminum fruticans* (original)



Fig. 2 - *Sedum maximum*

3. *Sedum urvillei* DC. (sin. *Sedum sartorianum* Boiss.) ssp. *hillebrandtii* (Fenzl) Soó, Crassulaceae family

It is an evergreen species of Panonian -Pontic origin. In Romania it is found sporadically in Constanța, Tulcea, Timiș and Mehedinți counties and it uses sandy soils and grovels well, being an oligotroph, xerophytes, sub-thermophite plant.

Its stems are 5-15 cm high and the leaves are succulent, cylindrical or semi-cylindrical. The inferior part of the stem is covered with dead leaves that remain persistent. The sterile sprouts, usually crawling, can also be recognized by their leaves that are thicker. The flowers are simple, yellow and they flower in May-July (fig. 3).

The plant insures a permanent décor through its leaves, and through its flowers during spring. It can be used ornamentally for cliffs, decorative vases and edging.

It has been identified in Cheile Dobrogei and whole plants and sprouts were selected for slipping.

4. *Sempervivum ruthenicum* Schnittsp. et C.B. Lehm., Crassulaceae. family

The species is camefit everlasting, with the flower stem 15-30 cm high. It has Pontic origin and in Romania it is sporadically found in Dobrogea and Moldova, in the oak forest areas until the level of the holm. The sozologic category of the species is that of rare, sub-threatened species (NT).

The plants are characterized by a short stem with succulent leaves laid out in dense rosettes (fig. 4). The flower stem is glandulous, 15-25 cm high and the flowers are star-shaped and yellow and flower in July- August.

The ornamental value is given by the everlasting green leaves laid out in rosettes and flowers.

The species can be recommended for the use in landscaping setups like rocks, decorative vases and edging. It can also be used as flower pot plant. It is an excellent plant for green roofs and the covering of inclines, being a pioneer species in rocks areas, with high soil fixing ability, due to its radicular system and dense rosettes.

The plant was identified in Cheile Dobrogei and seeds and leaves rosettes have been harvested for slipping.



Fig. 3 - *Sedum urvillei* ssp. *hillebrandtii*



Fig. 4 - *Sempervivum ruthenicum* (original)

**5. *Statice latifolia* Sm. (syn. *Limonium latifolium* (Sm.) O. Kuntze),
Plumbaginaceae family**

It is a everlasting hemicriptophite species of Pontic-Balkan origin. In Romania it is a rare species, found on the dry plains from the steppe area.

The stem is hairy (at least in its upper part) and can be 50-80 cm high. The leaves are large, elliptically spatulated and pubescent along the median nerve. The flowers, grouped in uni-flower spikes, are completely hyaline bractee, blue-violet in color (fig. 5). Flowering takes place during the summer (July – September).

The species offers ornamental interest due to its violet flowers, with the possibility of being used as cut, dried flower (everlasting flower). In landscaping setups it is recommended for massive groups.

The biological material, whole plants and seeds has been harvested from Cogealac.

6. *Teucrium polium* subsp. *capitatum* (L.) Arcangeli, Lamiaceae family

It is a sub-shrub of Central European – Sub-Mediterranean region, in Romania being a sporadic species found on the grass land on the calcareous rocks from the steppe area until the level of the beech.

Its height is 10-35 cm and the stem: tomentous, bushy, ascendant, very ramified at the base (fig. 6). The leaves are narrow and oblong – narrow obovate, crenated, ash green, scented and the flowers are white, grouped in thick inflorescences, dense, capitulform, and they flower in summer (July- September).

The plant decorates through its flowers and leaves, and seed cover, so that it offers an ornamental interest for the entire duration of vegetation (May – October). Moreover the plant emits a pleasant, specific scent. It can be recommended for edging, decorative vases, color spots in setups with rocks and to cover inclines or walls. It can also be used as edible plant (to scent cheeses, salads, drinks) and medicinal plant (with hypoglycemic effect).

The species has been identified in the Cheile Dobrogei area, and for the setup of experimental cultures, seeds have been harvested.



Fig. 5 - *Statice latifolia*



**Fig. 6 - *Teucrium polium* subsp. *Capitatum*
(original)**

CONCLUSIONS

1. The spontaneous flora of Dobrogea is a rich source of germoplasm for the ornamental plant sort.

2. The specific eco - pedological conditions of the natural habitats where the studied taxa have been identified, offer the plant drought-resistance and the possibility of their being cultivated on barren soils, poor in nutritive elements.

3. The ornamental importance of some taxa is amplified by the permanent decor that the everlasting insures (*Sedum urvillei* ssp. *hillebrandtii*, *Sempervivum ruthenicum*).

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ASPECTS REGARDING THE ORNAMENTAL VALUE OF SOME TEAHIBRIDA AND FLORIBUNDA ROSE VARIETIES FROM „TUDOR NECULAI” NURSERY COLLECTION - IASI COUNTY

OBSERVAȚII PRIVIND VALOAREA ORNAMENTALĂ A UNOR SOIURI DE TRANDAFIRI DIN CLASA TEAHIBRIDA ȘI CLASA FLORIBUNDA ÎNTÂLNIȚI ÎN PEPINIERA „TUDOR NECULAI” IAȘI

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***Abstract.** The paper presents aspects regarding the ornamental value of some Teahibrida and Floribunda rose varieties, from „Tudor Neculai” nursery collection, cultivated in Iasi region conditions. The observations regarded six rose varieties, three from Teahibrida class: „Burgund”, „Crimson Glory” and „Grand Prix”; and three from Floribunda class: „Betty Prior”, „Foc de Tabără” and „Rumba”. There were studied six features defining the decorative value of these varieties, respectively: the foliage, the diseases resistance, the flowering intensity, the form of the flower, the colour of the petals and the odour.*

Key words: roses, variety, flower, foliage, perfume

***Rezumat.** În lucrare sunt prezentate observații privind valoarea ornamentală a unor soiuri de trandafiri din clasa Teahibrida și clasa Floribunda întâlniți în pepiniera „Tudor Neculai” din Iași. Observațiile au fost făcute la 6 soiuri de trandafiri, 3 din clasa Teahibrida: „Burgund”, „Crimson Glory”, „Grand Prix” și 3 din clasa Floribunda: „Betty Prior”, „Foc de Tabără”, „Rumba”. Au fost luate în studiu 6 însușiri ce definesc valoarea decorativă a acestor soiuri și anume: frunzișul, rezistența la boli, intensitatea înfloritului, forma florii, culoarea petalelor, parfumul.*

Cuvinte cheie: trandafiri, cultivar, floare, frunzis, parfum

INTRODUCTION

One of the basic components of the green spaces ensuring the aesthetic aspect of the localities and which contributes to the health and good state of mind of people and to insuring a favourable work climate, is constituted by the floral and rose arrangements.

The rose has been considered ever since the past “The Queen of Flowers”, because of its multiple qualities and especially the richness and beauty, perfume and the different colours and shapes. (Eckart H., 2003; Haenchen E., 2003)

They are characterized through a series of characteristics, among which we mention:

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1. - the bush shape; 2. - the vigour; 3. - the leafage; 4. - the resistance to diseases; 5. - the shank and the floral peduncle; 6. - the blooming intensity; 7 -the rose bud shape ; 8. - the flower shape; 9. -the durability of the flower in the field; 10. - the colour at opening; 11. - the colour at blossoming ; 12. - the manner of petals fall; 13. - the perfume.

MATERIAL AND METHOD

The observations regarding the roses were made within the nursery “Tudor Neculai” Iași. The nursery is placed outside the built-up area of Iași on a land of Miroslava commune, being destined to production of the dendrological seeding material for decorating and embellishing the green spaces from the perimeter of Iași city.

The nursery also has a rich variety of roses, among which we mention: *Acapulco*”, „*Betty Prior*”, „*Burgund*”, „*Crymson Glory*”, „*Foc de Tabără*”, „*Grand Prix*”, „*Luchian*”, „*Queen Elizabeth*”, „*Rumba*”, „*Super Star*” etc.

The research was done on six varieties of rose from dendrological nursery, three from Teahibrida class: „*Burgund*”, „*Crimson Glory*”, „*Grand Prix*” (fig. 1) and three from Floribunda class: „*Betty Prior*”, „*Foc de Tabără*”, „*Rumba*” (fig. 2).

They consisted in studying 6 more important characteristics that define to the greatest extent the decorative value of these varieties and namely: 1: the leafage, 2. the resistance to diseases; 3. the blooming intensity; 4. the flower shape; 5. the colour of petals; 6. the perfume (Luban E., 1967; Wagner Șt., 2002).

The observations were made in 6 period, starting with the date of June 5th approximately every 2 weeks. In the end, we calculated the arithmetical mean for each characteristic in part and the total of points for the characteristics analyzed in each variety.

RESULTS AND DISCUSSIONS

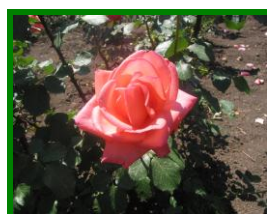
For the four varieties of roses studies we drew up quality evaluation sheets that comprise the reliability characteristics and the data regarding which we made the observations (tables 1 - 6).



„*Burgund*”



„*Crymson Glory*”



„*Grand Prix*”

Fig. 1 - Roses varieties analyzed from Teahibrida class



„*Betty Prior*”



„*Foc de Tabără*”



„*Rumba*”

Fig. 2 - Roses varieties analyzed from Floribunda class

Table 1

The quality evaluation sheet for the „BURGUND” variety

Crit. No.	Evaluated characteristic	Max. no. of points	Date of observations						Total points	Mean
			05 VI	26 VI	12 VII	30 VII	13 VIII	01 IX		
1.	Leafage	10	10	10	10	10	10	10	60	10,0
2.	Resistance to diseases	8	8	8	8	8	8	8	48	8,0
3.	The blooming intensity	10	10	10	10	10	10	10	60	10
4.	The bud shape	9	9	9	9	9	9	9	54	9,0
5.	The colour at blossoming	6	6	6	6	6	6	6	36	6,0
6.	The perfume	7	7	7	7	7	7	7	42	7,0
Total points									50,0	

Table 2

The quality evaluation sheet for the „CRIMSON GLORY” variety

Crit. No.	Evaluated characteristic	Max. no. of points	Date of observations						Total points	Mean
			05 VI	26 VI	12 VII	30 VII	13 VIII	01 IX		
1.	Leafage	10	8	8	8	8	8	8	48	8.0
2.	Resistance to diseases	8	8	8	7	7	6	6	42	7.0
3.	The blooming intensity	10	9	9	9	9	9	9	54	9.0
4.	The bud shape	9	8	8	8	7	7	7	45	7.5
5.	The colour at blossoming	6	6	6	6	6	6	6	36	6.0
6.	The perfume	7	7	7	7	7	7	7	42	7.0
Total points									44,5	

Table 3

The quality evaluation sheet for the „GRAND PRIX” variety

Crit. No.	Evaluated characteristic	Max. no. of points	Date of observations						Total points	Mean
			05 VI	26 VI	12 VII	30 VII	13 VIII	01 IX		
1.	Leafage	10	8	8	8	7	7	7	45	7.5
2.	Resistance to diseases	8	8	8	8	8	8	8	48	8.0
3.	The blooming intensity	10	8	8	8	8	8	8	48	8.0
4.	The bud shape	9	9	9	9	9	9	9	54	9.0
5.	The colour at blossoming	6	6	6	6	6	6	6	36	6.0
6.	The perfume	7	3	3	3	3	3	3	18	3.0
Total points									41,5	

Table 4

The quality evaluation sheet for the „*BETTY PRIOR*” variety

Crit. No.	Evaluated characteristic	Max. no. of points	Date of observations						Total points	Mean
			05 VI	26 VI	12 VII	30 VII	13 VIII	01 IX		
1.	Leafage	10	9	9	9	9	9	9	54	9.0
2.	Resistance to diseases	8	8	8	8	8	8	8	48	8.0
3.	The blooming intensity	10	10	10	10	10	10	10	60	10.0
4.	The bud shape	9	8	8	8	8	7	7	46	7.6
5.	The colour at blossoming	6	5	5	5	5	5	5	30	5.0
6.	The perfume	7	2	2	2	2	2	2	12	2.0
Total points									41.6	

Table 5

The quality evaluation sheet for the „*FOC DE TABĂRĂ*” variety

Crit. No.	Evaluated characteristic	Max. no. of points	Date of observations						Total points	Mean
			05 VI	26 VI	12 VII	30 VII	13 VIII	01 IX		
1.	Leafage	10	9	9	9	9	9	9	54	9.0
2.	Resistance to diseases	8	8	8	8	8	8	8	48	8.0
3.	The blooming intensity	10	10	10	10	10	10	10	60	10.0
4.	The bud shape	9	9	9	9	9	9	9	54	9.0
5.	The colour at blossoming	6	6	6	6	6	6	6	36	6.0
6.	The perfume	7	1	1	1	1	1	1	6	1.0
Total points									43.0	

Table 6

The quality evaluation sheet for the „*RUMBA*” variety

Crit. No.	Evaluated characteristic	Max. no. of points	Date of observations						Total points	Mean
			05 VI	26 VI	12 VII	30 VII	13 VIII	01 IX		
1.	Leafage	10	8	8	8	7	7	7	45	7,5
2.	Resistance to diseases	8	8	8	8	8	8	8	48	8,0
3.	The blooming intensity	10	9	9	8	8	7	7	48	8,0
4.	The bud shape	9	7	7	7	6	6	6	39	6,5
5.	The colour at blossoming	6	6	6	5	5	4	4	30	5,0
6.	The perfume	7	2	2	2	2	2	2	12	2,0
Total points									37,0	

The results regarding the studied characteristics are the following:

1. The leafage: This characteristic was appreciated according to the density of leaves on the sprouts, the colour, the shininess, the manner it maintains on the bush during the vegetation period, the maximum grade being 10. Among the varieties taken in the study the highest score was registered by the variety „*Burgund*” with 60 points, and the lowest score was registered by the varieties „*Grand Prix*” și „*Rumba*” with 45 points (Wagner Șt., 2001; Haenchen E., 2003)

2. Resistance to diseases: This represents one of the most important aspects in the culture of roses. The most frequent diseases are: the black spotting , (*Diplocarpon rosae*), the scab (*Phragmidium disciflorum*) and the mildew (*Sphaerotheca pannosa*, var. *rosae*), the maximum grade being 8. The tolerance to these diseases is determined by dense, puckered, dark green foliage and with a thick cuticle (Szekely I., Oană Șt., 1968; Eckart H., 2003).

The very good results were registered by three of the analyzed varieties, having the maximum score of 48 points, with the exception of the variety „*Crimson Glory*” which has proven sensitive to diseases, registering 42 points.

3. The intensity of blooming: This characteristic represents one of the most important qualities of the varieties of roses. In the case of this character, the maximum grade is 10.

The varieties „*Foc de Tabără*”, „*Luchian*”, „*Betty Prior*” distinguished themselves with a maximum score of 60 points, followed by followed by „*Crimson Glory*” variety, with 54 points. The minimum score was registered by „*Grand Prix*” and „*Rumba*” varieties, with 48 points (Haenchen E., 2003).

4. The bud shape: It is a trait characterising all varieties of climbing roses; taking into account both the shape and the dimensions of the flowers.

The varieties „*Burgund*”, „*Foc de Tabără*” and „*Grand Prix*”, distinguished themselves as having very beautiful flowers: registering a score of 54 points (Rusu V., 1973; Preda M., 1979).

5. The colour at blossoming: It can be assessed rather subjectively according to the person executing the pre-operation. The maximum grade for this characteristic is considered 6, and the maximum grade is given to the varieties whose petals have an intense colour, well emphasized and that remains for a longer period of time (Popescu Șt., 1986; Luban E., 1967; Rusu V., 1973).

As regards the colour at flowering, the varieties „*Burgund*”, „*Crimson Glory*”, „*Foc de Tabără*” and „*Grand Prix*” distinguished themselves.

6. Perfume: It is also a much appreciated characteristic, the maximum grade being 7.

Of the 6 varieties analyzed, as regards the most perfumed one, we noticed the flowers of the „*Crimson Glory*” and „*Burgund*” varieties. The first variety represents the velvet red claret flower and with a strong perfume of damask roses, and the second variety has a large flower, dark red velvety and intense perfume (Preda M., 1979; Rudolf C., 1978).

The quality evaluation operation of the rose characteristics offers us a general, subjective orientation, from some points of view regarding the decorative

value of roses. Through this we can thus emphasize the very decorative varieties of roses.

CONCLUSIONS

1. The most decorative leafage was ascertained in the „*Foc de Tabără*”, „*Burgund*” and „*Betty Prior*” varieties.

2. All the varieties analyzed, with the exception of „*Crimson Glory*” variety that has proven to be sensitive to diseases, have proven most resistant to the attack of diseases,.

3. The varieties „*Foc de Tabără*”, „*Burgund*” and „*Betty Prior*” distinguished themselves through a great intensity of blooming.

4. The most beautiful flowers have proven to be those from the varieties „*Burgund*”, „*Foc de Tabără*” and „*Grand Prix*”.

5. As regards the colour of flowers the most valuable varieties distinguished were „*Burgund*”, „*Crimson Glory*”, „*Foc de Tabără*” and „*Grand Prix*”.

6. The most perfumed flowers, of the four varieties analyzed have proven to be the flowers of the varieties „*Crimson Glory*” and „*Burgund*”.

7. From the point of view of the total score, the most valuable variety is „*Burgund*”, registering a score of 50,0 points, distinguishing itself through a medium vigour, of 60-80/35 cm, erect.

The leaves of this variety are large, dark green, dense, semi-glossy. Buds are large, spherical, which open in a spiral, and abundant flowers (30-35 petals), large, dark red and velvety, scent of good intensity. It blooms very profusely. It is resistant to diseases and frost. Recommended for fences or planting in small groups.

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BEHAVIOR OF DISEASE RESISTANT APPLE TREE CULTIVARS IN SUPER-INTENSIVE ORCHARDS IN ORADEA

COMPORTAREA SOIURILOR DE MĂR REZISTENTE LA BOLI ÎN CULTURĂ SUPERINTENSIVĂ ÎN CONDIȚIILE DE LA ORADEA

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Abstract. *The studied cultivars and hybrids can be planted at 3/1 m using spindle bush type crown formations. This can lead, over a period of eight years of production, to average yields of 48.8 t/ha for Florina, 46.2 t/ha for Auriu de Bistrița, 45.2 t/ha for Baujade, 44.8 t/ha for T195 and 42.3 t/ha for Liberty. The indices of size and weight of the fruit are not significantly influenced in a negative way by the high density of trees per ha.*

Key words: hybrids, phenophases, super-intensive

Rezumat. *Soiurile și hibrizii studiați se pot cultiva la 3/1m utilizându-se forme de coroană fus-tufă. Se pot obține producții medii pentru opt ani de rod de 48,8 t/ha la Florina, 46,2 t/ha la Auriu de Bistrița, 45,2 t/ha la Baujade, 44,8 t/ha la T195 și 42,3 t/ha la Liberty. Indicii de mărime și greutate ai fructelor, datorită densității ridicate de pomi la ha, sunt influențați negativ nesemnificativ.*

Cuvinte cheie: hibrizi, fenofaze, superintensivă

INTRODUCTION

Cultivars that are resistant to disease and pests have revolutionized apple production in the last two-three decades, both worldwide and in our country.

Generally, the introduction and study of their behavior in Romania has been conducted in intensive orchards (N. Braniște, N. Ghena 2003; I. Botu, M. Botu 2003; Șcheau and colab. 2006; Valeria Petre 2009).

MATERIAL AND METHOD

In 1997, some branches were taken from I.C.D.P. Pitești – Mărăcineni that came from the following apple cultivars and hybrids resistant to apple scab and powdery mildew: Florina, Generos, H8/12/87 – Pitești, T 195, H6/80/87 – Pitești, Liberty, Priam, Romus 3, Braeburn, Baujade and Auriu de Bistrița.

In the nursery of the S.C.D.P. Oradea, these cultivars and hybrids were grafted on the M 106 rootstock and planted in the spring of 1999 at a distance of

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three meters between rows and one meter within row (3333 trees per ha), linearly, having 12 trees per variant (4 repetitions of 3 trees).

Amounts of 150 kg N, 100 kg P₂O₅ and 200 kg K₂O were administered annually.

Grass was planted between rows, while within the rows only manual labor was performed during the first three years since plantation; during the following years the herbicide Roundup 3l/ha was used.

The evaluations and determinations referred to:

- the main phenophases of fruit-bearing;
- the surface of the trunk section;
- the production of fruit per ha;
- the physico-chemical indices of the fruit (the index of size, the index of weight and dry substance determined by refractometry).

All the data was statistically processed through the variance analysis method.

RESULTS AND DISCUSSIONS

Table 1 presents the main phenophases of fruit-bearing of the studied apple cultivars and hybrids.

The start of the flowering phase occurs on the 7th of April for the Priam cultivar and ends on the 16th of April with the Elstar cultivar.

The ending of flowering begins with the Priam and Auriu de Bistrița cultivars, on the 22nd of April and ends on the 30th of April with the Baujade cultivar.

As to number of days, the flowering period ranges between 11 days for Liberty and Auriu de Bistrița and 17 days for Florina, Baujade and the H8/12/87 – Pitești hybrid.

Regarding ripening age, Romus 3 is harvested between the 1st and 10th of July, being a summer cultivar, H8/12/87-Pitești and H6/80/87-Pitești during the first twenty days of August, being autumn cultivars, and the others after the 20th of September.

Table 2 presents the surface of the trunk section in the 11th year since plantation.

Compared to the average of the 12 studied cultivars and hybrids, there are some very vigorous cultivars: Liberty, Auriu de Bistrița, Baujade and Braeburn are statistically ensured as positive, very significant; cultivars and hybrids of average vigor: H8/12/87-Pitești, H6/80/87-Pitești, Florina and hybrids of average vigor: H8/12/87-Pitești, H6/80/87-Pitești, Florina and Elstar and cultivars of little vigor like Generos, Romus 3, Priam and T195, negative statistically very significant.

Table 1

**The main fruit-bearing phenophases of apple cultivars and hybrids
(average values 2003-2010)**

Nr. Crt.	Cultivar or hybrid	Flowering phase			Readiness for harvesting	
		Beginnig	Middle	End	Beginning	End
1	Florina	10 - IV	20 - IV	26 - IV	01 - X	10 - X
2	Generos	15 - IV	22 - IV	28 - IV	20 - IX	30 - IX
3	H _{8/12/87} -Pitești	08 - IV	19 - IV	24 - IV	10 - VIII	20 - VIII
4	T 195	13 - IV	19 - IV	26 - IV	20 - IX	30 - IX
5	H _{6/80/87} -Pitești	09 - IV	18 - IV	23 - IV	20 - VIII	30 - VIII
6	Liberty	08 - IV	18 - IV	28 - IV	01 - X	10 - X
7	Priam	07 - IV	18 - IV	22 - IV	20 - IX	30 - IX
8	Romus 3	09 - IV	16 - IV	23 - IV	01 - VII	10 - VII
9	Braeburn	15 - IV	18 - IV	27 - IV	20 - IX	30 - IX
10	Elstar	16 - IV	20 - IV	29 - IV	15 - X	30 - X
11	Baujade	14 - IV	20 - IV	30 - IV	10 - X	25 - X
12	Auriu de Bistrița	12 - IV	17 - IV	22 - IV	20 - IX	30 - IX

Table 2

**The surface of the trunk section in the 11th year since plantation
of apple cultivars and hybrids**

Nr. crt	Cultivar or hybrid	Surface of the trunk section - 2010		±d (cm ²)	Significance
		Absolute (cm ²)	Relative (%)		
1	Liberty	80.2	153.1	+27.8	xxx
2	Auriu de Bistrița	77.8	148.5	+25.4	xxx
3	Baujade	67.0	127.9	+14.6	xxx
4	Braeburn	64.1	122.3	+11.7	xxx
5	H _{8/12/87} -Pitești	59.1	112.9	+6.7	x
6	H _{6/80/87} -Pitești	53.3	101.7	+0.9	-
7	Florina	52.4	100.0	-	-
8	Media(Mt)	52.4	100.0	-	-
9	Elstar	51.1	97.5	-1.3	-
10	Generos	40.1	76.5	-12.3	ooo
11	Romus 3	33.4	63.7	-19.0	ooo
12	Priam	30.1	57.4	-22.3	ooo
13	T 195	20.6	39.3	-31.8	ooo

LSD5% = 6.3

LSD1% = 8.5

LSD0.1% = 11.4

Table 3

Fruit production of apple cultivars

Nr. crt.	Cultivar or hybrid	Production (t/ha)								Average production		±d (t/ha)	Significance
		2003	2004	2005	2006	2007	2008	2009	2010	Absolute (t/ha)	Relative (%)		
1	Florina	30.1	36.5	40.8	48.4	50.7	55.3	61.7	66.8	48.4	140.6	+ 14.1	xxx
2	Auriu de Bistrița	28.2	34.7	38.2	44.7	48.4	53.5	58.7	63.1	46.2	133.1	+ 11.5	xxx
3	Baujade	27.5	34.9	38.4	43.1	49.3	51.8	55.2	61.2	45.2	130.3	+ 10.5	xxx
4	T 195	28.1	33.3	39.5	42.1	47.1	50.9	56.2	60.9	44.8	129.1	+ 10.1	xxx
5	Liberty	25.6	27.2	31.3	42.6	48.5	52.2	50.6	60.5	42.3	121.9	+ 7.6	xxx
6	H _{8/12/87} -Pitești	19.7	21.8	24.7	32.4	39.8	46.4	47.2	51.2	35.4	102.0	+ 0.7	-
7	Media(Mt)	19.3	22.6	26.2	32.3	37.7	42.4	46.3	50.7	34.7	100.0	-	-
8	Elstar	18.5	20.6	24.3	30.7	36.1	40.2	44.9	49.8	33.1	95.4	- 1.6	-
9	Generos	17.2	19.1	22.6	27.3	32.5	37.3	42.6	45.7	30.5	87.9	- 4.2	o
10	Braeburn	15.1	16.3	19.9	25.9	31.7	36.2	39.7	43.4	28.5	82.1	- 6.2	oo
11	H _{6/80/87} -Pitești	8.4	9.6	12.7	17.3	24.2	31.1	40.5	38.5	22.8	65.7	- 11.9	ooo
12	Romus 3	7.3	9.4	11.6	17.4	23.9	28.7	30.9	35.3	20.6	59.4	- 14.1	ooo
13	Priam	6.2	7.7	9.9	15.1	20.2	25.6	27.2	31.1	17.9	51.6	-16.8	ooo

LSD5% = 4.2

LSD1% = 5.6

LSD0.1% = 7.6

Table 3 presents the production of fruit from the third year since plantation and up to the 11th year. For the eight years of fruit-bearing, average yields range between 17.9 t/ha for Priam and 48.8 t/ha for Florina.

The following cultivars and hybrids: Florina with 48.8 t/ha, Auriu de Bistrița with 46.2 t/ha, Baujade with 45.2 t/ha, T195 with 44.8 t/ha and Liberty with 42.3 t/ha are positive statistically very significant.

Priam, Romus 3 and H6/80/87 are negative statistically very significant, Braeburn is negative distinctly significant and Generos is significantly negative.

Table 4 presents the average physico-chemical characteristics of fruit coming from the studied apple cultivars and hybrids.

The weight index varies from 90.6 g for H6/80/87-Pitești and 180.6 g for Generos.

Except for the Romus 3 and Priam cultivars and the H6/80/87-Pitești, H8/12/87-Pitești nad T195 hybrids, all the others classify as having large and very large fruit. Values of above 12% dry substance occur in the case of Florina, Generos, Liberty and Romus 3, and of above 13% in the case of Elstar and Braeburn.

Table 4

Physico-chemical characteristics of the fruit (average values 2003-2010)

Nr. crt.	Cultivar or hybrid	Size index (mm)	Weight index (mm)	Dry substance (%)
1	Florina	74.2	165.3	12.3
2	Generos	79.6	180.6	12.6
3	H _{8/12/87} -Pitești	59.3	103.9	10.0
4	T 195	62.2	110.5	11.0
5	H _{6/80/87} -Pitești	56.1	90.6	9.0
6	Liberty	63.6	120.2	12.3
7	Priam	60.0	105.1	10.0
8	Romus 3	61.1	110.2	12.0
9	Braeburn	61.8	129.2	13.8
10	Elstar	64.3	125.7	13.6
11	Baujade	64.1	110.7	11.2
12	Auriu de Bistrița	69.2	135.0	11.7
13	Media(Mt)	64.6	123.9	11.6

Fruit quality is insignificantly influenced by the small distances between planted trees by the reduction of their size.

CONCLUSIONS

The production of apple can be made super-intensive by planting the trees at 3/1 m and training the trees in a tall spindle bush system. The Florina, Auriu de Bistrița, Baujade, T195 and Liberty cultivars obtain average productions of 48.8 t/ha, 46.2 t/ha, 45.2 t/ha, 44.8 t/ha and 42.3 t/ha for eight years of study

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THE DISTRIBUTION OF THE ECOLOGICAL SUITABILITY FOR GRAPE GROWING IN HUȘI WINE GROWING CENTRE, DEPENDING ON THE LOCAL VARIATION OF THE GEOMORPHOLOGICAL FACTORS

DISTRIBUȚIA FAVORABILITĂȚII ECOLOGICE PENTRU CULTURA VIȚEI DE VIE ÎN CENTRUL VITICOL HUȘI, ÎN FUNCȚIE DE VARIAȚIA LOCALĂ A FACTORILOR GEOMORFOLOGICI

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Abstract. *The paper presents the results of a study regarding the distribution of the geomorphologic factors' suitability for grape growing in Husi wine-growing centre - Husi vineyard. The research is based on a complex methodology that uses the satellite images, the GIS technology, the ecological evaluation system of the vineyards and the cartographic technique. The results shows that, regarding the geomorphologic suitability for grape growing, 48.1% of the Husi wine-growing centre area has ecological potential for white table wines, sparkling wines and distilled from wine, 35.8% for high quality white wines and red table wines, and 14.3% for high quality red wines and aromatic wines.*

Key words: grapevine, vineyard, environmental factors, solar radiation, GIS.

Rezumat. *În lucrare sunt prezentate rezultatele unui studiu privind distribuția spațială a favorabilității factorilor geomorfologici pentru cultura viței de vie în centrul viticol Huși-podgoria Huși. Cercetarea folosește o metodologie complexă, care implică utilizarea imaginilor din satelit, prelucrarea acestora cu ajutorul tehnologiei GIS, evaluarea favorabilității factorilor geomorfologici cu ajutorul unui sistem de bonitare ecologică și cartografierea distribuției spațiale a favorabilității factorilor în cadrul arealului. Rezultatele relevă faptul că, din punct de vedere a favorabilității factorilor geomorfologici, 48.1% din suprafața centrului viticol Huși prezintă potențial ecologic pentru producerea vinurilor albe de masă, vinurilor materie primă pentru spumante și vinurilor materie primă pentru distilate învechite din vin, 35.8% pentru producerea vinurilor albe de calitate și roșii de masă, 14.3% pentru producerea vinurilor roșii de calitate și vinurilor aromate.*

Cuvinte cheie: vița de vie, podgorie, factori ecologici, radiație solară, SIG.

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INTRODUCTION

Researches whose results are presented in this paper are part of a broader study, whose goal is to create the map of environmental suitability for the grapevine cultivation in Husi vineyard. The study is based on a new, modern methodology, that use *Geographic Information Systems* (GIS), tools of informational technology recently introduced in viticulture research (Pythoud K., 2006). Husi vineyard center analysis shows that GIS-based methodology provides a detailed image of local variation of ecological factors in the vineyard area and, moreover, allows to set the map of the spatial distribution of environmental suitability for the grapevine in a vineyard (Irimia L.M, Patriche C.V., 2010, 2011).

MATERIAL AND METHOD

The study started from the satellite image of Husi vine growing centre. Based on this image was developed the digital elevation model (DEM), that was then resampled from the original 90m resolution to 10m, by bilinear interpolation, to render appropriately the surface configuration (SRTM - USGS, 2004). Digital elevation model was used to derive land slopes and exhibition. The suitability of slope gradient and orientation were evaluated using the system of ecological evaluation of vineyards (Irimia L. et al., 2009). The influence of these two geomorphologic factors was assessed by evaluation notes and plotted on the map of the vineyard area by suitability classes.

RESULTS AND DISCUSSIONS

Husi vineyard center has an area of 2139 hectares and includes the vineyards and the potential vineyard lands from *Rusca, Schit, Ochi, Dobrina, Lohan, Corni, Dric, Recea, Galbena* (Figure 1). The landscape is represented by hills with an altitude of 80-400 m and slopes with slope of 16-39%, affected by erosion and stabilized landslides. Plantations are established on the slopes of the natural amphitheater that surround the Husi town and on the hills that make the transition to east, from the amphitheater to the valley of the Prut River.



Fig. 1 - Satellite image of Husi wine-growing centre

Local variation of geomorphologic factors in Husi wine-growing centre.

The arrangement of hills that form the amphitheater Husi (*Lohan* to north, northeast and northwest, *Dobrina* to west, *Schit* to south) and un-uniformity of their slopes causes a significant local variation of the slopes orientation and slope inclination.

Slopes orientation. In relation to the climatic characteristics of this region, placed at the northern limit of the wine-growing areas, and so scarce in heliothermic resources, the slopes range from very suitable (S, SE, SW), up to bad (NW, NE) and unsuitable (N) for grape-growing (Figure 2a).

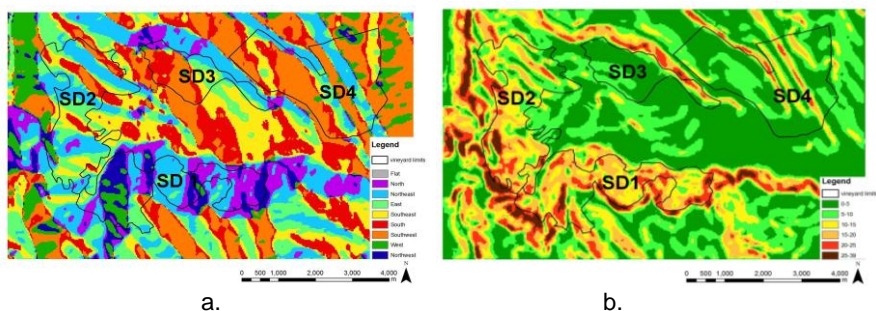


Fig. 2 - Spatial distribution of slope orientation (a) and slope gradient (b) in Husi wine-growing centre, Husi vineyard

In relation to the suitability of slopes orientation for grape growing, in Husi wine-growing center were identified four areas with different ecological characteristics:

- **SD1** area, with a surface of 554.3 ha, where slopes exhibit predominant (77.74%) is N NE and NW. This area includes *Rusca*, *Schit* and *Ochi* lands;
- **SD2** area, with a more balanced distribution of the slopes orientation: 34.33% with S, SE and SW orientation; 27.48 % with E and V orientation; 37.77 % with N, NW and NE orientation. This surface area is 570.69 hectares and includes lands *Dobrina*, *Lohan* and *Corni*
- **SD3** area with 264.42 hectares and predominantly (62.10%) S, SE and SW orientation of the slopes. This area includes *Dric* land, located in the NE of the center Husi vineyard;
- **SD4** area, that has the most favorable exposition of slopes: 70.27% of area has S, SE and SW orientation. This area covers an area of about 749.7 hectares and includes lands *Recea* and *Galbena*.

Slope inclination is extremely variable, with values between 0 and 39% (Figure 2b). In **SD1** more than half of the area (56.60%) is represented by slopes with a 15-39% inclination. In the **SD2** subdivision the slope is more favorable for grapes, the slopes with middle inclination, by 10-15%, totaling 53.78%. In the **SD3** subdivision predominate (60.34%) flat terrain, favorable for productive varieties. In **SD4** subdivision, that includes *Recea* and *Galbena* lands, has 50.76% flat terrains and 42.69% middle inclination slopes.

The spatial distribution of suitability classes for the slopes orientation and slope inclination. The suitability of these two factors for the cultivation of vines was evaluated using *ecological system of evaluation of vineyard areas (ESEV)* and mapped through GIS technology.

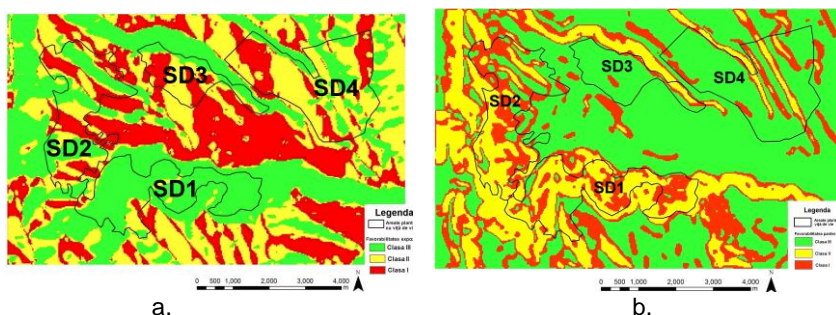


Fig. 3 - Spatial distribution of suitability classes for slopes orientation (a) and slopes inclination (b) in Huși wine-growing centre – Huși vineyard.

Distribution of classes of favorability for slopes orientation (Figure 3a). According to *ecological system of evaluation of vineyard areas*, the I suitability class includes S and SE slopes, II class includes E and SW slopes, and III class includes W slopes. In Hushi growing center 42.8% of the area (917.5 hectares) falls into class III of favorability, 35.1% (750 ha) in II class and 22% (470 ha) in I class (Table 1). The worst is the SD1 area (*Rusca, Schit, Ochi*) with 87.3% of the area included in III suitability class, and the most favorable SD3 area (*Dric land*) with 33.96% of the surface included in the I suitability class.

The less favourable for grapevine is SD1 area (*Schit, Rusca and Ochi* lands), with 87.3% of surface included in the third class of ecological suitability, and the most favorable SD3 area (*Dric land*), with 33.96% of surface included in the first class of ecological suitability.

Table 1

The spatial distribution of suitability classes for slopes orientation in Hushi wine-growing centre

Ecological suitability	SD1		SD2		SD3		SD4		TOTAL	
	ha	%	ha	%	ha	%	ha	%	ha	%
Third class (III)	483.9	8.3	227.1	39.8	62.6	23.6	143.8	19.1	917.5	42.8
Second class (II)	57.96	10.4	178.9	31.3	111	42.3	402.1	53.6	750.9	35.1
First class (I)	12.42	2.24	164.6	28.8	89.8	33.9	203.7	27.1	470.6	22.0
Total	554.3	100	570.6	100	264	100	749.7	100	2139	100

The distribution of the suitability classes for slopes inclination (Figure 3b). 45.6% (977.2 ha) from Huși wine-growing area fit in to the third suitability class (III); land of second class and first class have equal weight, approximately 27% of the total (Table 2).

Table 2

The spatial distribution of suitability classes for the slopes inclination in Husi wine-growing centre

Ecological suitability	SD1		SD2		SD3		SD4		TOTAL	
	ha	%	ha	%	ha	%	ha	%	ha	%
Third class (III)	46.4	8.37	131	23.0	228.0	86.2	571	76.1	977.2	45.6
Second class (II)	313	56.6	202	35.4	13.05	4.93	48.9	6.53	578.4	27.0
First class (I)	194	35.0	236	41.4	23.31	8.81	129	17.2	583.4	27.2
Total	554	100	570	100	264.4	100	749	100	2139	100

The spatial distribution of geomorphological factors suitability for vines in Husi wine-growing center. 48.1% of the land planted with vines in Husi wine-growing center fall in terms of geomorphological factors favorability in the third (III) suitability class (Table 3).

Table 3

The spatial distribution of the suitability of geomorphological factors in Husi wine-growing centre

Ecological suitability	Nota	SD1		SD2		SD3		SD4		TOTAL	
		ha	%	ha	%	ha	%	ha	%	ha	%
Third class	5	28	5.0	25	4.5	34	12	86	11	174	8.1
	6	293	52	150	26	117	44	315	42	876	40
Second class	7	180	32	156	27	105	39	225	30	668	31
	8	26	4.8	54	9.6	0	0	22	2.9	104.1	4.8
First class	9	24	4.4	120	21	7.8	2.9	91	12	244.2	11.0
	10	0.8	0.1	62	10	0	12	8.0	11	70.8	3.3
Total	-	554	100	570	100	264	100	749	100	2139	100

The least favorable for vine cultivation is **SD1** area (*Schit, Rusca* and *Ochi* lands), where the northern slopes orientation, limiting for the vines, is associated with higher slopes inclination, that require terracing (Figure 4). Land from second suitability class that have the potential to produce white and red table wines, represents 35.8% of the area. Land in first class of geomorphologic suitability and appreciated by 9-10 points, represent only 14.3% from the total Husi wine-growing area (Table 3). The most favorable for grape-growing are **SD2** (with 31.9% of surface in the first class of of geomorphologic suitability) and **SD4** (with 23.6% surface in the first class of geomorphologic suitability).

CONCLUSIONS

1. 48.1% of the Husi wine-growing area fall, in terms of geomorphologic suitability, in the third class, that reveals the ecological potential for *white table wines, sparkling wines* and *wines for distillates*.
2. 14.3% of the Husi wine-growing area enter, in terms of geomorphologic suitability, in the first class, that indicate the ecological potential for *white quality wines, red quality wines* and *aromatic wines*.

3. The most favorable for the wine varieties is **SD2** area, that includes *Dobrina* and *Lohan* lands, 31.9% (182.61 ha) from its surface being represented, in terms of geomorphologic suitability, by terrains from the first class of suitability.

4. Unfavorable for wine grapes varieties is **SD1** area, that includes *Schit*, *Rusca* and *Ochi*, where 57.98% (321.8 ha) from the surface is represented by terrains from the third class of suitability.

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VITICULTURAL BIOLOGICAL TIME - A NEW VITICULTURAL ECOLOGICAL INDEX FOR THE DISTRIBUTION OF VINE VARIETIES BY GEOGRAPHICAL AREA

UN NOU INDICE ECOLOGIC ÎN VITICULTURĂ INTITULAT *TIMPUL BIOLOGIC VITICOL* PENTRU ZONAREA SOIURILOR DE VIȚĂ DE VIE

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Abstract. *Vine is characterized by biological rhythm, or the biorhythms/phenophases inscribed in the genome of each variety. The biological time of each variety must correspond to the ecological potential of the vineyard. Based on these, a new ecological index has been proposed in viticulture, namely viticultural biological time. The paper presents the calculation formula and the interpretation of the new index.*

Key words: ecological potential, biological time, vineyard

Rezumat. *Vița de vie se caracterizează printr-un timp biologic în care își desfășoară bioritmurile/fenofazele de vegetație înscrise în genomul fiecărui soi. Timpul biologic al soiurilor trebuie să se încadreze în oferta ecologică a podgoriei. Plecând de la aceste considerente, a fost formulat un nou indice ecologic în viticultură, intitulat timpul biologic viticol. Relația de calcul a indicelui și interpretarea lui este redată în lucrare.*

Cuvinte cheie: potențial ecologic, timp biologic, podgorie.

INTRODUCTION

Vine, which is a multiannual plant, is characterized by a biological time, or the biorhythms/phenophases inscribed in the genome of each variety.

The biological time of each variety must correspond to the ecological potential of the vineyard, so that it can reach its maximal biological production potential (Țârdea C., Dejeu I., 1995).

Awareness of the viticultural biological time of vine varieties is a must for every professional and a prerequisite for the selection and geographical distribution of varieties.

In order to correlate viticultural biological time with the ecological potential, a new ecological index for viticulture has been proposed, namely viticultural biological time ($I_{e_{btv}}$).

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MATERIAL AND METHOD

The ecological potential of a vineyard is represented by the number of days with temperatures above 8°C during the active phenophases of vine (April 1 to September 30).

The biological time of vine is given by the number of days between bud opening (phenophase D) and the end of grape maturation (phenophase N).

Subtracting the biological time of vine from the ecological potential of the vineyard yields the unused ecological supply of a vine variety expressed as a number of days.

For its interpretation as a viticultural ecological index, the following formula has been used:

$$I_{e_{btv}} = \frac{Pe \times Cv}{Pe} \times 10$$

where :

I_{e_{btv}} - an ecological index, viticultural biological time;

Pe - the ecological potential of the vineyard;

Cv - the vegetation cycle/viticultural biological time of the variety;

10 - coefficient for the conversion of the subunitary values of the index into units.

The materials used were climate and phenological data from the varieties of the Murfatlar and Tarnave vineyards in the Jidvei viticultural centre (table 1).

RESULTS AND DISCUSSIONS

For the Tarnave vineyard in the Transylvanian Plateau, the ecological potential of the vine is limited between 174 and 181 days. The unused ecological supply of vine varieties ranges between 18 and 27 days, with an average temperature of > 8°C during the vegetation period of vine. Consequently, *I_{e_{btv}}* values are low, between 1,00-1,50, and the variety best suited to the ecological potential here is the Feteasca regala (topmost in the geographical distribution of the varieties).

For the Murfatlar vineyard in Dobrogea, the ecological potential is larger, between 184 and 193 days, while the unused ecological supply is higher, between 22 and 48 days, depending on the biological time of each variety. *I_{e_{btv}}* values are higher as well, between 1,2 and 2,84.

Best suited to the ecological potential are the white wine varieties Pinot gris and Chardonnay, followed by the red wine varieties Merlot and Cabernet Sauvignon.

The suitability ranking is as follows:

1-Pinot gris;

2-Chardonnay;

3-Merlot;

4-Cabernet Sauvignon.

Table 1

The values of the ecological index le_{btv} in the Târnavă vineyard (Jidvei wine growing centre) and Murfatlar vineyard

Varieties	Ecological potential of the vineyard/ecological offer (days))		Vegetative cycle of the varieties / viticultural biological time (days)		Ecological reserve (days)		le_{btv} values		The rank of varieties in viticultural biological time
A. Târnavă vineyard- Jidvei wine-growing centre (1)									
Periods	2000-2005	2006-2010	2000-2005	2006-2010	2000-2005	2006-2010	2000-2005	2006-2010	
Fetească regală	174-179	176-181	156	154	18-23	22-27	1,03-1,28	1,30-1,50	1
Riesling italian	174-179	176-181	156	156	18-23	20-25	1,00-1.30	1,16-1,40	2
B. Murfatlar vineyard (2)									
Periods	1996-2000	2001-2005	1996-2000	2001-2005	1996-2000	2001-2005	1996-2000	2001-2005	
Pinot gris	184-193	191-193	149	145	35-44	46-48	1,88-2,27	2,40-2,84	1
Chardonnay	184-193	191-193	154	150	30-37	41-43	1,60-1,86	2,14-2,23	2
Merlot	184-193	184-193	159	156	25-37	28-37	1,36-1,90	1,50-1,90	3
Cabernet Sauvignon	184-143	184-193	162	160	22-31	24-33	1,20-1,60	1,41-1,70	4

(1)-Horșia C., 2009

(2)-Ciarnă Tănase, 2008

CONCLUSIONS

The ecological index called the viticultural biological time, proposed by the author, and representing a novelty in viticulture, ought to be used alongside the other ecological indices in the literature, for the geographical distribution of vine varieties.

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PHENOLIC COMPOUNDS FROM BUSUIOACĂ DE BOHOTIN OBTAINED THROUGH DIFFERENT MACERATION TECHNOLOGIES

COMPUȘI FENOLICI ÎN VINURILE DE BUSUIOACĂ DE BOHOTIN OBTINUTE PRIN DIVERSE TEHNOLOGII DE MACERARE

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Abstract. *This study aims at identifying the main phenolic characteristics of an original Busuioaca de Bohotin wine from Pietroasa area, in Dealu Mare region. In 2009, the Busuioaca de Bohotin grapes were processed using different maceration technologies like: classical maceration, cryo-maceration, ultrasound maceration and microwave maceration, the general steps of wine-making following after. Different analytic methods (HPLC, index Folin-Ciocalteu, D₂₈₀) were used to determine the quantities of polyphenolic compounds from the obtained wine samples, while a computerised color of the wine is represented by the main chromatic parameters L, a, b.*

Key words: phenolic compounds, Busuioaca de Bohotin, maceration technologies

Rezumat. *Compușii fenolici din vinurile aromate românești reprezintă un domeniu prea puțin studiat. Această lucrare are ca obiectiv principal identificarea substanțelor cromatice din vinurile obținute din struguri de Busuioacă de Bohotin recoltați din podgoria Dealu Mare, centrul viticol Pietroasa, în anul 2009. Vinurile au fost procesate prin aplicarea diverselor tehnologii de macerare (macerare pe boștina, criomacerare, macerare cu ultrasunete, macerare cu microunde). Vinurile au fost analizate prin utilizarea lichid-cromatografei și a altor metode analitice, determinându-se compușii ce formează faimoasa culoare de „foiță de ceapă”. Este, de asemenea, descrisă și variația diversilor compuși identificați în funcție de metoda de macerare utilizată.*

Cuvinte cheie: compuși fenolici, Busuioacă de Bohotin, tehnologii macerare

INTRODUCTION

In Romania, rose wines are weakly represented on the market, being obtained only in the south of the country, on the sandy soils of Oltenia, from the Roșioară, Băbească neagră and Merlot grape varieties (Muntean Camelia, 1997). Aromatic wines are much better represented, due to their flavour and sweetness: Muscat Ottonel, Tămâioasă românească and Busuioacă de Bohotin, in many local vineyards: Târnave, Dealu Mare (Pietroasa), Drăgășani, Murfatlar, Cotnari, Huși (Bohotin center), Iași (Tomești center) and more. The colour of rose wines varies on a large segment, from a pale pink (onion skin), to a light red. There are no well defined limits for the colour

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of rose wines differing according to viticultural area, used grape variety, technological process of wine-making. A special place among rose Romanian wines is occupied by Busuioacă de Bohotin, that can easily rival cosmopolitan varieties not only through its phenolic quality but also through its aroma (Vărățiceanu Gh. et al., 1998).

According to the annual climatic conditions, the obtained wines have a color intensity that varies between 0,048-0,325 nm and have a faint and very pleasant rose-like aroma.

MATERIAL AND METHOD

The research concerning the influence of different technological processes of maceration-fermentation on the extraction degree of phenolic compounds from Busuioacă de Bohotin grapes was done at the oenology Laboratory of the Agronomical University of Iasi. The Busuioacă de Bohotin grapes were harvested from Pietroasa center in 2009, at their technological maturity, being processed according to the steps of the general technology for obtaining rose-aromatic wines. The accent of the whole process was put on the maceration phase, done either in a classical manner (skin contact maceration) or through the modern methods described below.

The must analysis registered a sugar content of 240 g/L and a must acidity of 6 g/L tartaric acid. The characteristics of each maceration-fermentation technology was as follows:

- Classical maceration: in order to better underline the efficiency of the technological variants, in this case, the Busuioacă de Bohotin grapes were processed following the steps of the general technological flux for obtaining rose-aromatic wines. The pomace was macerated for 18 hours. After that, it was pressed with a hydraulic press and the must finished its alcoholic fermentation in glass vessels. The wines were racked, conditioned, filtered and bottled.

- Maceration with microwaves was done in the microwave oven of the oenology laboratory, with radiating waves of 350 W, respectively 650 W, for 10 minutes. Due to the irradiation, the cell's wall is destroyed, fact visible when the berries become opaque.

- Maceration with ultrasounds was performed in the ultrasounds bath of the Oenology Laboratory (frequency 45 kHz, power 160 W). The ultrasonic cavitation develops string forces that mechanically destroy the cell's wall and improve the material transfer. The pomace samples were treated for 15 minutes.

- Criomaceration was performed by keeping the grapes in the freezer at -20°C and then processing them while still frozen.

The pomace obtained as described above was pressed with a hydraulic press and the must finished its alcoholic fermentation (QA23 yeast- *Saccharomyces cerevisiae*) in glass vessels. The wines were racked, conditioned, filtered and bottled.

The obtained wines were analysed physical-chemically: density, total acidity, volatile acidity, free and total SO₂, reductive sugars content, alcoholic concentration, non-reductive dry extract) as well as the phenolic compounds from them (total anthocyanins content, total polyphenolic index, Folin-Ciocalteu index, color determination). For these analyses, a UV-VIS Analytik Jena Specord 200 spectrophotometer was used as well as a Hewlett-Packard HP-1100 chromatograph with a C18 column.

RESULTS AND DISCUSSIONS

It is well known that when choosing a rose wine, the consumer is first attracted by its sensorial properties (color, acidity, aroma, body, astringency).

Therefore, in order to obtain rose wines of a high quality, a significant role is played by the used maceration-fermentation technique.

Table 1 presents the results obtained at the determination of the total polyphenolic index (TPI), for each used maceration-fermentation variant, as well as some data concerning the used dilution and absorbency. The data from the table prove that the classical maceration method extracts the highest quantity of anthocyanins. A high quantity of anthocyanins was also extracted by the microwave maceration method, at radiating doses of 650 W, respectively 350 W. The weakest results concerning the polyphenols quantity were registered in the ultrasounds maceration techniques, respectively in the criomaceration obtained wine samples.

Table 1

Values of the total polyphenolic index of wines obtained from Busuioacă de Bohotin grape variety through different maceration-fermentation methods

Technological variant	A280	Dilution	D280
Classical maceration	0,0997	100	9,97
Microwave maceration 650 W	0,0989	100	9,89
Microwave maceration 350 W	0,0872	100	8,72
Ultrasounds maceration	0,0212	100	2,12
Cryomaceration	0,014	100	1,4

Analysing the data from table 2 one notices that the highest quantities of anthocyanins were extracted by classical maceration, while the microwave maceration at 650 W follows very close. The usage of criomaceration and maceration with ultrasounds registered the lowest quantities of anthocyanins, fact proven also by the reduced absorbency noted at the wine sample.

Table 2

Values of anthocyanins in wines obtained from Busuioacă de Bohotin grapes through different maceration-fermentation methods

Technological variant	A ₅₂₀ (sample)	A ₅₂₀ (control sample)	A _{520 p} - A _{520 m}	Anthocyanins mg/L
Classical maceration	0,1537	0,0265	0,1272	48
Microwave maceration 650 W	0,1345	0,0235	0,111	41
Microwave maceration 350 W	0,0996	0,0225	0,0771	28
Cryomaceration	0,0713	0,0135	0,0578	21
Ultrasounds maceration	0,0712	0,0165	0,0547	20






Table 3 shows data of the main chromatic parameters that characterise wine color: luminosity (L), a*-chromatic component of complementary colours red-green, b*- chromatic component of complementary colours yellow-blue, C*-clarity, H*-angle that characterises the hue.

With the help of the obtained data, a simulation of the wine's color was done with the help of a software (DIGITAL COLOUR ATLAS 3.0) in order to better accentuate the color differences and to classify the wines on sensoric perceptions. Digital Colour Atlas can compare the color tones of more than 150 color systems.

The changes of color components are relevant for underlining the influence of each technological variant.

Table 3

Values of chromatic parameters in wines obtained from Busuioacă de Bohotin grapes through different maceration-fermentation methods

Technological variant	L	a*	b*	C*	H*	L	Hue	Color
Classical maceration	43,10	57,39	16,29	28,86	47,78	0,98	1,43	
Ultrasounds maceration	59,26	43,06	43,78	11,98	44,19	0,32	1,15	
Microwave maceration 350 W	60,12	50,91	29,43	9,04	59,64	0,27	1,59	
Microwave maceration 650 W	79,02	29,40	24,78	7,33	67,51	0,21	1,92	
Criomaceration	85,24	12,43	5,68	5,60	76,68	0,14	2,40	

CONCLUSIONS

The maceration technologies influence the production technologies of rose wines.

1. It is noticed that for the obtaining of intensely coloured rose wines and a high anthocyanins content the classical maceration method is optimal, while for the obtaining of paler wines, criomaceration and ultrasound maceration can be used.

2. According to the obtained results concerning the wines' color, the clearest wines are those obtained by criomaceration, in comparison with the wines processed by the classical maceration method, the darkest in color.

3. The color intensity decreases proportionally with the results of the wine's color simulation and with the classification established on the basis of the absorption spectra, while the hue values show an indirect proportional behaviour compared to the results of the color simulation, also taking into consideration the influence of the used technological variant.

4. These data have an important role in correcting the wine's color according to consumer's preferences, its destination, as well as diversifying the chromatic pallet as to tickle not only the smell senses but also the visual ones.

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WINE BLENDING ASSISTED BY EXPERT SYSTEM

CUPAJAREA VINURILOR ASISTATĂ DE SISTEM EXPERT

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Abstract. An expert system has been made in order to assist the process of wines blending, using Monte Carlo methods for searching and selecting of those recipes that meet the requirements for obtaining the desired blending, called standard - an assortment of wine with well-defined characteristics. To verify and validate the system there has been developed an original stochastic model of the blending components properties. It has been allocated the standard unit value for each property. The properties of the recipes selected by the expert system are enclosed between the standard tolerances. Setting these tolerances is done interactively with the expert oenologist, correlated with the actual conditions of blending. Tests have shown the efficiency in selecting the optimum blending recipe both by high-speed search and by using of the optimization criteria adapted to the restrictions inherent to the actual situation of blending with well-defined natural ingredients. These criteria are interactively improved, by means of the oenologist expert..

Key words: blending, Monte Carlo method, expert system

Rezumat. S-a realizat un sistem expert de asistare a procesului de cupajare a vinurilor, care utilizează metode Monte Carlo pentru căutarea și selectarea rețetelor care satisfac cerințele impuse pentru obținerea cupajului dorit, numit etalon - un sortiment de vin cu caracteristici bine definite. Pentru a se verifica și valida sistemul, s-a elaborat un model stochastic original al proprietăților componentelor cupajului și s-a alocat pentru toate proprietățile etalonului valoarea unitară. Rețetele selectate de sistemul expert au proprietățile cupajului încadrate între toleranțele aferente etalonului. Stabilirea acestor toleranțe se realizează interactiv cu expertul oenolog degustător în corelație cu condițiile reale de cupajare. Testele efectuate au dovedit eficiența sistemului în selectarea rețetei optime de cupajare atât prin viteza mare de căutare, cât și prin utilizarea de criterii de optimizare adaptate restricțiilor inerente situației reale a cupajării cu componente fizice bine definite, criterii perfecționate interactiv cu expertul oenolog.

Cuvinte cheie: cupajare, metoda Monte Carlo, sistem expert

INTRODUCTION

Blending means combining several types of wines. Blending is art and innovation; varieties of wine are chosen so as to complement each other in a unique and charming manner. At this time, the most searched in terms of wines is blended wine.

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Blending means - beyond the combination of at least two wines that complement each other leading to obtaining a work of art - uniqueness in taste, color and aroma. It takes artistic sense, talent, inspiration, and courage in combination of the proportions and varieties. What results is a close "friendship" between varieties of wine, unique harmony and personality, because nowhere in the world you will find the same varieties combined in the same way. One has a mystery in every glass of wine. There are two important things one should know about the blending process: what can be done and what can not be done.

MATERIAL AND METHOD

Defining the problem of blending wines

It is determined a prescription dose of a nv wines with the characteristics $V[p,s]$ in order to obtain a mix similar with the standard, with mass MR , defined by the properties $R[p]$ and tolerances $Tr[p]$ compared to standard, where:

$$Tr[p]=100 \cdot (R[p] - E[p]) \quad (1)$$

Similar means that the properties of the result are assigned to the tolerances for the standard:

$$R[p] \in E[p] \cdot (1 \pm Te[p]/100) \quad (2)$$

The blending recipe is defined by the dose coefficients $k[s]$ through the relation:

$$\sum_1^{nv} k[s] = 1 \quad (3)$$

The MR mass of the mixture resulted by blending is the sum of the dosed masses $MD[s]$ from each component $V[s]$:

$$MR = \sum_1^{nv} MD[s] \quad (4)$$

where:

$$MD[v] = k[s] \cdot MR \quad (5)$$

This means that the calculation algorithm should determine an optimum recipe $Ro [p]$ with errors $Tro[p]$ to meet an optimization criterion that ($CO1$) can be defined as:

$$CO1 = \sum_1^{ntp} ABS(Tro[p]) = \min \quad \text{where } ABS(Tro[p]) \leq Te[p] \quad (6)$$

or as a quadratic index:

$$CO1^* = \sum_1^{ntp} (Tro[p])^2 = \min \quad (7)$$

Blending algorithm

The result $R[p]$ of the blending process can be defined with the relation:

$$R[p] = \sum_1^{nv} V[s,p] \cdot k[s] \quad (8)$$

which represents a relationship with nv terms. As ntp properties there are taken into account, a system of ntp linear equations with nv variables results, which is characterized by:

$$nv < ntp \quad (9)$$

As a result, the algorithm for determining the optimal values for $k[s]$ has to be designed as an overdetermined system.

RESULTS AND DISCUSSIONS

Defining the principles of Monte-Carlo method

In order to check the convergence of procedures for determining the solutions of a system of ntp properties with nv blending components, it was designed a dimensionless approach of structure of the coefficients of concentration which determines the $E[p]$ properties of the standard and those of the blending wines components, $V[p, s]$. For all values of the standard proprieties, the dimensionless value 1 was adopted at this stage:

$$E[p] = 1 \quad (10)$$

It was considered that the standard is a average wine obtained in vineyard from a variety of vine in a long period of time, which have a registered trademark. In this acknowledge, because the basis for the blending is the current year's production denoted by index $s=1$, it will be considered (as an economic condition) that the share of current production in resulted blending mixture (mean value of coefficient $k[1]$) to be maximum in the selected $[v]$ variant.

$$k[v,1] \Rightarrow Maxim \quad (11)$$

Another important aspect regarding the management of the blending process is the value for the $Te[p]$ accepted tolerances, which decisively influence the real qualities of the product obtained by blending, as well as the algorithm for selecting the optimal blending variant.

The $Te[p]$ tolerances required for the standard can be determined from the results of analysis of several batches of wine which were manually blended and which have been successfully marketed, being accepted and bought by customers. So, the limits of $Te[p]$ were statistically established.

Manual blending is under the direct management of the expert oenologists, the optimal variant for blending being establishing through successive tests. In order to validate the procedures and the inference laws of the expert system, a model of the components entering in the blending process is necessary.

The model is sufficiently accurate, but must have a clear implementation procedure in order to be general and to satisfy a variety of situations that may arise in blending practice. The law who statistically governs the living world, and thus the viticulture, is the normal stochastic distribution (Gauss).

Procedures for generating the model

To achive the model, there will be used stochastic methods to generate the tolerances $Te[p]$ with a range of values randomly generated, belonging to a uniformly distributed string, called SRU.

As the model to be as general as possible, there were established ranges where tolerances must fit.

The $V[p,s]$ property values for the wine patterns entering in the blending process, will be generated from a random allocation, with a random number with normal distribution SRN. This way of modeling covers a very wide field of the possibilities to choose the components for blending.

The following is an example of this new, original method of modeling and simulation of the components of wine blending process. There were selected $ntp=10$ properties for the standard of wines and $nv=4$ wine components in the blending process. In table 1 there are presented the results of the modelling components of a blending dimensionless process.

Table 1

Proprieties and tolerances for the components of blending

p	E[p]	Te[p]	V[p,1]	V[p,2]	V[p,3]	V[p,4]
1	1	0.07	1.002	0.988	0.994	1.080
2	1	0.062	0.930	1.015	1.097	0.925
3	1	0.057	1.083	0.909	0.968	0.929
4	1	0.095	0.923	0.948	0.965	1.004
5	1	0.080	1.042	0.884	0.992	1.019
6	1	0.053	0.965	0.969	1.056	0.966
7	1	0.055	0.816	0.877	1.085	0.917
8	1	0.084	0.957	1.113	1.054	1.038
9	1	0.080	1.120	0.957	1.007	0.918
10	1	0.097	1.008	1.000	1.016	1.061

Principles of random sorting of the determined system $NV \times NV$

To select a number of nv components from the ntp or nv components, it will be used a Uniformly Distributed Random Stream (abbreviated UDRS) with values in the range 0 .. 1.

The range 0...1 is divided in ntp sectors with $\Delta=1/ntp$ value.

1. $j:=0$.
2. It generates a random number SRU.
3. It is calculated the i index of the equation: $i = Int(SRU/\Delta)+1$.
4. If i is repeating, continues from 2.
5. $j:=j+1$.
6. until $j=nv$

Results of the random search for the optimal solution of blending

There have been simulated experiments to determine the optimal solutions for blending. There were initiated 170 searches, resulting 16 acceptable solutions from which there were selected the first five with the lowest values for the optimization criterion COI . It was also calculated an optimization criterion $OPT2$ to reveal a higher weight given to the contribution for the current harvest.

In table 2.a there are presented the values for the blending coefficients $K[i]$, sorted by the value of the optimization criterion COI . In table 2.b there are

presented the values of the dosing coefficients $Kd[i]$ sorted by the value of the optimization criterion $K[1]$.

It can be seen the reduced contribution of (Cristea D., 2002) and (Rubinstein Y. R., Kroese P.D., 2008) components to achieve blending. As a result, there has been allocated the value 0 for $K[2]$, where their values are very small. Solutions from the tables 3.a and 3.b have resulted.

Table 2.a

The best solutions of blending

Blending coefficients (Sort CO1)								
poz	K[1]	K[2]	K[3]	K[4]	CO1	RAD	OPT2	$\sum K[i]$
1	0.3927	0.2946	0.4128	0.1313	0.00658	0	0.0167558	1.2314
2	0.3974	0	0.5784	0.0204	0.00716	1	0.0180171	0.9962
3	0.4127	0	0.5364	0.0407	0.00745	0	0.0180519	0.9898
4	0.4102	0.0073	0.5228	0.0465	0.00784	1	0.0191126	0.9868
5	0.4246	0.0003	0.5036	0.0565	0.00866	1	0.0203957	0.985

Table 2.b.

The best solutions of blending

Dose coefficients (Sort CO1)								
poz	Kd[1]	Kd[2]	Kd[3]	Kd[4]	CO1	RAD	OPT2	$\sum Kd[i]$
1	0.31891	0.23924	0.3352	0.10663	0.00658	0	0.0206331	1
2	0.39892	0	0.5806	0.02048	0.00716	1	0.0179486	1
3	0.41695	0	0.5419	0.04112	0.00745	0	0.0178677	1
4	0.41569	0.0074	0.5298	0.04712	0.00784	1	0.0188603	1
5	0.43107	0.0003	0.5113	0.05736	0.00866	1	0.0200897	1

Table 3.a

The best solutions of blending

Blending coefficients (Sort K[1])								
poz	K[1]	K[2]	K[3]	K[4]	CO1	RAD	OPT2	$\sum K[i]$
1	0.4246	0	0.5036	0.0565	0.00866	1	0.0204074	0.9847
2	0.4127	0	0.5364	0.0407	0.00745	0	0.0180519	0.9898
3	0.4102	0	0.5228	0.0465	0.00784	1	0.0191248	0.9795
4	0.3974	0	0.5784	0.0204	0.00716	1	0.0180171	0.9962
5	0.3927	0.2946	0.4128	0.1313	0.00658	0	0.0167558	1.2314

Table 3.b

The best solutions of blending

Dose coefficients (Sort K[1])								
poz	Kd[1]	Kd[2]	Kd[3]	Kd[4]	CO1	RAD	OPT2	$\sum Kd[i]$
1	0.43120	0	0.5114	0.05738	0.00866	1	0.0200836	1
2	0.41695	0	0.5419	0.04112	0.00716	1	0.0171722	1
3	0.41879	0	0.5337	0.04747	0.00745	0	0.0177896	1
4	0.39892	0	0.5806	0.02048	0.00784	1	0.0196533	1
5	0.31891	0.23924	0.3352	0.10663	0.00658	0	0.0206331	1

No major changes of the hierarchy are noted, being reduced only the time and the complexity of the physical blending process. It must be noted a high percentage of the component (Cristea D., 2002), because it is closest to the properties of the standard, the production of that year being very close to the registered trademark commercial product.

CONCLUSIONS

1. It was developed a stochastic Monte Carlo type modeling and simulation for the wine properties that are used in the blending procedure, starting from the fact that the properties of biological products have laws of a random distribution, Gaussian type.

2. In order to determine the optimum recipes of blending, there was developed an optimal random searching algorithm based on the principles of Monte Carlo methods.

3. Experimentation of the developed algorithm have confirmed that assumptions that led to the elaboration of this method are valid, resulting a powerful search convergence, with reduced working time and which provides to the oenologist expert more options that are very close to the required standard.

4. Searching algorithm has been incorporated into the expert system that manages the blending process.

5. Finally we can say that the method and the selection algorithm of the optimal solutions with Monte-Carlo methods offer a great flexibility in the process of improvement of the selection of an optimal variant of blending. It is very fast and can achieve a sufficient number of searches in order to find the best solution depending on the desired optimization criteria and the restrictions inherent in the real situation of physical blending.

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GENERAL ISSUES CONCERNING THE WAYS OF CONTAMINATION HORTICULTURAL PRODUCTS RAW MATERIALS FOR INDUSTRIALIZATION

ASPECTE GENERALE PRIVIND CĂILE DE CONTAMINARE A PRODUSELOR HORTICOLE MATERIE PRIMĂ PENTRU INDUSTRIALIZARE

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Abstract. *Hygienic quality (innocuity) to food is influenced by microbiological contamination or with other organisms, by chemical pollution and natural toxicity of food. To maintain population's health, vegetables and fruits for industrial must meet primarily in terms of innocuity, because the failure of the condition can lead to disease more or less serious. The environment the fruits and vegetables are produced in which are obtained, can be a source of contamination of horticultural products with different chemical pollutants or biological contaminants. Normally existing in nature or taken from human activity, nitrites, heavy metals, pesticide residues, bacteria and dangerous molds, can accumulate in horticultural products, sometimes up to dangerous concentrations for the human body. Also, must be considered the contamination with various human pathogens (viruses, parasites) and presence of toxic compounds in the product that forms naturally.*

Key words: innocuity, contamination, toxic compounds

Rezumat. *Calitatea igienică (inocuitatea) a alimentelor este influențată de contaminarea microbiologică sau cu alte organisme, de poluarea chimică și de toxicitatea naturală a produselor alimentare. Pentru a menține starea de sănătate a populației, legumele și fructele pentru industrializare trebuie să corespundă în primul rând sub aspectul inocuității, deoarece neîndeplinirea acestei condiții poate conduce la îmbolnăviri mai mult sau mai puțin grave. Mediul înconjurător în care se obțin fructele și legumele poate reprezenta o sursă de contaminare a produselor horticole cu diverși poluanți chimici sau biologici. Existenți în mod normal în natură sau preluați din activitatea umană, nitriții, metalele grele, reziduurile de pesticide, bacteriile și mucegașurile periculoase, se pot acumula în produse horticole, uneori la concentrații periculoase pentru sănătatea omului. De asemenea, trebuie avută în vedere și contaminarea cu diverși agenți patogeni pentru om (virusi, paraziți) cât și prezența în produs a unor compuși toxici care se formează în mod natural.*

Cuvinte cheie: inocuitate, contaminare, compuși toxici

INTRODUCTION

The products consumed must provide us with the optimal quantities of all substances our body needs. A correct nutrition also means the fulfillment of

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another essential condition: the canned fruits and vegetables should lack toxic agents or these should be below the dangerous limits (Banu C. et al., 1982).

Fruits and vegetables in fresh state or in a processed form may represent a valuable source of nutritive principles contributing to a healthy nutrition and fortifying the human body at the most different ages. But in certain situations, we lose the initial and favorable benefit by resorting to unprofitable technologies in terms of food safety and seeking first the quantity and the volume of merchandise for trading (Beceanu D., 2009).

MATERIAL AND METHOD

Bibliographic material was used both from national and international specialized literature, as well as electronic databases from the internet network, with scientific papers in the field, which allowed studying and evaluating ways of contamination of horticultural products, raw material for industrialization.

RESULTS AND DISCUSSIONS

Sometimes irreproachable in terms of appearance and with a good storage period, fruits and vegetables are relatively frequently contaminated with diverse substances that might jeopardize the health of certain categories of consumers on a medium or long term. We may say that the effect is not obvious in case of a small dose or quantity since the body reacts differently depending on numerous factors (Beceanu D., 2009).

The migration of different chemical and biological compounds and the presence in the food of some toxic products appeared naturally may have two side effects: they may give the food an unpleasant flavor and/or smell and they may be toxic for the consumer. The first situation is generally encountered by the manufacturer; consequently they will take remedial measures. The efforts and national and international regulations focus on the toxic potential of these compounds (Deshpande S.S., 2002).

The toxic action of nitrites and nitrates has been known for a long time. The toxicological implications of these chemical substances have become even more complex in order to highlight the cumulative effect of nitrates. High concentrations of nitrites in plants (especially vegetables) are dangerous for the human body for two reasons: the possibility of appearance of methemoglobinemia in children and the conversion of nitrates into nitrites in saliva and the formation of carcinogenic nitrosamines in the intestinal tract.

Based on some studies made on animals and the clinical experience in human beings, the admissible daily intake mentioned by FAO/OMS Expert Committee on Food Additives for 0-5mg/kg body weight (expressed as sodium nitrate) had to be increased to 0-25 mg/kg. On the basis of the same criteria, the admissible daily intake for nitrite is 0-0.1 mg/kg, expressed as sodium nitrite.

From the nutritional viewpoint, the metals found in food products are metals having a well determined physiological role, thus they are called essential or biometals and nonessential metals, respectively.

Sodium, potassium, calcium, magnesium, iron, copper, zinc, manganese, cobalt, and selenium belong to the first category. Their lack or insufficiency from human nutrition triggers after a certain time period disorders of metabolic processes and the appearance of deficiency diseases.

Nonessential metals are lead, mercury, aluminum, tin, nickel, cadmium, chromium, silver etc. their presence into foods appears as a contamination. Introduced in the body, metals behave like chemical impurifiers traversing the body and getting eliminated.

The severity of the toxic effect is dependent on the nature, quantity and chemical form under which the metal exists in fruits and vegetables, the share of the contaminated food in the menu structure, the body's resistance, the synergic or antagonic effect of other chemical compounds, and other factors. Some metals start producing their toxic effect only after they already accumulated in the body in a critical quantity. This cumulative effect is encountered for lead, cadmium and mercury.

The toxic metals that appear most frequently in food poisonings are: lead, cadmium, chromium, copper, mercury (Dumitru V., 2008).

Lead poisonings appear after the lead has entered the body and accumulated in it. This acts on the peripheral nervous system causing disorders in intellectual development, disorders of the function of the peripheral nerves manifested in most serious cases by motor paralyses. It is estimated that if the lead absorption does not exceed 1 mg/day, the body manages to eliminate it through the renal tract (Watson D.H., 2002).

Cadmium causes numerous and profound modifications of metabolic functions within the body manifested by the increase of blood pressure. The water for nutrition must contain less than 5 µg of cadmium per liter (Dumitru V., 2008; Banu C., 2007).

The main way of exposure to cadmium for nonsmokers is the nutritional one, since smoking triggers an important quantity of cadmium. There is no evidence that any of the inhabitants of villages have suffered from side effects (Watson D.H., 2002).

Chromium is present in a concentration close to 0.1 mg/kg of dry substance in the vegetal and animal tissues. The hexavalent chromium derivatives (chromic acid, chromates and bio-chromates) are very dangerous because they are allergic and carcinogenic (Dumitru V., 2008; Savu C., Georgescu N., 2004).

Copper manifests its toxicity directly on tissues by accumulating into the liver, kidneys and suprarenal glands. It mainly appears in root crops, nuts, and alcoholic drinks.

Like lead and cadmium, **mercury** has a cumulative effect. Its toxicity it is for a long term and manifests at the level of kidneys and the nervous system. 5 to 15% from the swallowed quantity of ionized mercury is absorbed by the body (Clemensa T., 2001).

Human being's main source of pollution with methyl mercury is represented by foods, especially by fish and products resulted for them. According to the statistical data related to the fish consumption in the countries

having a fish tradition, for a consumption of 600 g fish/week (80 g/day) containing 0.5 mg Hg/kg, a significant quantity of mercury accumulated in the body that may cause problems to the consumer. The provisional tolerable weekly intake (PTWI) for mercury and methyl mercury, approved by EFSA (European Food Safety Authority) in 2004 is 1.6 µg/body weight (Savu C., Georgescu N., 2004; Banu C., 2007).

The heavy metals existing in the soil in large quantities may penetrate fruits without being metabolized in synthesis processes and through these into the human body. Though the cases where fresh fruit contain large quantities of such elements are rare, this issue is regulated by the national legislation, thus according to order no. 975/1998 of the Romanian Ministry of Public Health and JECFA 2005, they establish maximum limits accepted for heavy metals (table 1).

Table 1

Maximum limits of heavy metals in vegetables and fruits expressed in mg / kg of fresh product according to Order no. 975/1998 of the Romanian Ministry of Public Health and JECFA 2005

Vegetables and fruit	As	Cd	Pb	Zn	Cu	Sn	Hg
Fresh vegetables except leafy vegetables	0,5	0,1	0,5	15	5	-	0,05
Leaf Vegetables	-	0,2	0,5	-	-	-	0,03
Fresh Fruit	0,5	0,05	0,5	0,5	5	-	0,05

The pollution of foods with pesticides represents a considerably hazardous potential for consumer's health. The toxicity of pesticides manifests by acute and chronic intoxications, the influence on the nervous system, histological modifications of liver, disturbance of immunologic responsiveness and interferences within the vitamin metabolism (Diaconescu I., 2007).

The contamination of vegetables and fruits in fresh state may occur easily during their growing, maturation, harvest and delivery.

The environment in which fruit and vegetable raw materials are obtained may represent a source of contamination of horticultural products with diverse chemical or biological pollutants. Normally existing in nature or taken over by the human activity, nitrites, the heavy metals, the pesticide residues, hazardous bacteria and molds may accumulate in horticultural products sometimes in dangerous concentrations for the human health (Dumitru V., 2008; Banu C., 2007).

Of a special importance is the contamination a chemical pollution (chemical innocuity) of horticultural raw materials as a result of the occasional or permanent use of some chemical substances in agriculture. In this respect, we mention the pollution with pesticides of horticultural products, the consequence of their use in phytosanitary treatments (fungicides, insecticides, acaricides, herbicides etc.). The ways of contamination of food products with pesticides are multiple and an important role is played by air, water and soil (Banu C. et al., 1982; Cuciureanu R., 2002).

The fixation by plants of the polluting chemical substances largely depends on the type of cultivated plants. For example, in case of pesticides the plants

concentrating the highest quantity of pollutant in the soil are carrots and potatoes. Fruits may contain variable quantities of pesticides due to the phytosanitary treatment of trees in their different vegetative periods (Cuciureanu R., 2002).

The chemical contamination of fresh fruits and vegetables may also occur naturally by means of some chemical compounds of natural origin or during harvest, transport and handling (natural toxins, mycotoxins etc.).

Another contamination source is the heavy metals (Cu, Fe, Sn, Zn, Pb, As and Cd) that may reach the vegetal products on several ways:

- air pollution;
- absorption into the soil, the use of waste waters in agriculture;
- following the treatments applied in agriculture (spraying of insecticides and fungicides containing heavy metals in their composition);
- use of fertilizers; cultures situated in areas near roads etc.

At the same time, nitrites and nitrates may penetrate vegetables and fruits through the use of natural organic fertilizers (manure) in agriculture, especially the synthetic nitrogenous ones. Their degradation products enrich the soil and may accumulate in the plants cultivated up to hazardous levels for consumers.

The temporary storage of vegetables and fruits after harvesting in inadequate conditions (in large piles, humid and warm areas etc.) may determine the accumulation of large quantities of nitrites through the reduction of nitrates (Dumitru V., 2008).

Natural pollution of waters with chemical substances resulted from different industries (derivatives of aluminum, antimony, arsenic, bromine, chlorine, chromium, iron, fluoride, cadmium, manganese, magnesium, mercury, lead, selenium, amines, cyanides, pesticides, detergents, tars, solvents etc.) may contribute to the contamination or pollution of products of vegetal origin.

Biological contamination (biological innocuity) of the horticultural raw materials with pathogen microorganisms occurs by several ways: soil, water, plants and products of plants, tools for working the soil, air and dust (Banu, C. și colab., 1982).

The contamination of foods with microorganisms may also occur through the contact with contaminated individuals having precarious body hygiene during harvest, processing and delivery. Fruits and vegetables in fresh state may be contaminated with the following pathogen bacteria: *Campylobacter* sp, *Clostridium* sp., *Escherichia coli*, *Listeria monocytogenes*, *Shigella* sp., *Salmonella* sp., *Vibrio* sp., *Yersinia enterocolitica*, *Staphylococcus aureus* (Banu C., 2007).

Viruses appear on the fresh fruits and vegetables by means of contaminated water and the employees that fail to comply with the rules of personal hygiene. The main viruses transmitted via foods are: hepatitis A virus, Norwalk virus, Rotavirus.

Mycotoxins and the compounds naturally released by molds into the environment contaminate the food products depending on the state of the product, temperature, air oxygen, the nature of substrate and the water quantity. Thus, in carrots *Aspergillus parasiticus* synthesizes *A. flavus* and on the surface of citric fruit *A. parasiticus* develops.

The environment conditions may favor the pollution of food products with pathogen germs, viruses, the eggs of some parasitic worms, including heavy metals, pesticides, different chemical substances resulted from industry (Tofan C., 2001, Diaconescu I., 2007, Banu C., 1982).

Industrial pollution of air with different emissions, smoke, gases, aerosols, dust, vapors, mist represent at the same time a pollution factor of food products of vegetal origin.

Radioactive pollution of the environment and implicitly of the food products is the consequence of nuclear explosions, the wider and wider use of ionized radiations, radioactive elements and nuclear power. Radioactive contamination of vegetal products occurs directly through the radioactive deposits on such plants or indirectly via water and soil. The radionuclides that are mostly frequent in vegetables and fruits are: ^{137}Cs , ^{90}Sr , ^{131}I (Cuciureanu R., 2002).

CONCLUSIONS

1. Fruits and vegetables, raw material for industrialization can represent ways to convey different contaminants (nitrites, heavy metals, pesticide residues, bacteria and fungi) present in the environment;

2. Chemical and biological contaminants can accumulate in horticultural products, sometimes to dangerous concentrations for the human body;

3. Raw materials, the first elements in the food chain, make very difficult problems to industries in terms of determining the concentration of toxic compounds in food.

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GENERAL ISSUES CONCERNING ON THE CONTENT OF ASCORBIC ACID IN FRESH HORTICULTURAL PRODUCTS

ASPECTE GENERALE PRIVIND CONȚINUTUL ÎN ACID ASCORBIC LA PRODUSELE HORTICOLE PROASPETE

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Abstract. Ascorbic acid also called vitamin C or antiscorbutic vitamin, is synthesized by vegetal organism, animal organism (except human, primates, rat) and some microorganisms, using glucose or galactose as precursors. Accumulation of vitamin C is a specific process for every horticultural product. In some species there is a decrease in content with the evolution of the ripening process, in others can be found an increasing amount of tissue ascorbic acid as sequence of the baking phases. The stability of ascorbic acid in tissues is influenced by the presence of the ascorbatoxidase enzyme that catalyzes its oxidation reaction. During maturation of horticultural products the content of vitamin C decreases (apples, plums), while the tomatoes or melons content grows. During storage, most species tend to lower their ascorbic acid content; as far as acid products goes, the process in their case is slower than the case of those with higher pH.

Key words: vitamin C, synthesis, stability

Rezumat. Acidul ascorbic denumit și vitamina C sau vitamină antiscorbutică, este sintetizat de organisme vegetale, organismele animale (cu excepția omului, primatelor, șobolanului) și de unele microorganisme, folosind ca precursori glucoza sau galactoză. Acumularea vitaminei C este un proces specific fiecărui produs horticol. La unele specii are loc o diminuare a conținutului odată cu evoluția procesului de maturare, la altele se poate constata o creștere a cantității de acid ascorbic din țesuturi pe măsura succesiunii fazelor de coacere. Stabilitatea acidului ascorbic în țesuturi este influențată de prezența enzimei ascorbatoxidaza, care catalizează reacția de oxidare a acestuia. În timpul maturării unor produse horticole conținutul de vitamina C scade (mere, prune), în timp ce la tomate sau pepene galben crește. Pe parcursul perioadei de păstrare, majoritatea speciilor au tendința de a-și diminua conținutul de acid ascorbic, la produsele acide procesul fiind mai lent spre deosebire de cele cu pH mai ridicat.

Cuvinte cheie: vitamina C, sinteză, stabilitate

INTRODUCTION

Ascorbic acid is an organic acid with antioxidizing properties, it is soluble in water and encountered under the form of bright yellowish white powders or crystals. L enantiomer of ascorbic acid is known under the name of vitamin C (fig. 1).

L – ascorbic acid is the main vitamin synthesized by plants having an important role in the synthesis of unsaturated fat acids, the degradation of some amino acids, the sugar metabolism etc. (wikipedia.org).

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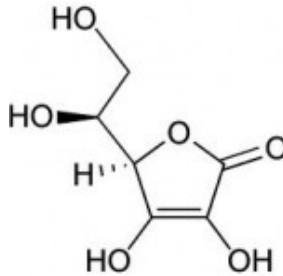


Fig. 1 - Chemical formula of vitamin C

MATERIAL AND METHOD

Besides the study of specialized literature represented by scientific work, treatises, and books, I consulted various websites of foreign non-governmental agencies dealing with research in the public nutrition field.

RESULTS AND DISCUSSIONS

The vitamin C content of foods is considered by many specialists as the best criterion when appreciating their quality. Some authors showed a parallelism between the vitamin C content and the taste of some vegetal origin foods. (Cuciureanu Rodica, 2002)

The vitamin C content of horticultural products is influenced by:

- species/assortment/variety
- soil conditions,
- climate where they developed.

Ascorbic acid may be found in the regions of active growth of vegetal tissues being synthesized by chloroplasts. In seeds it appears only after germination. The synthesis process is proportional to the intensity of breathing and the activity of oxidizing enzymes (peroxidase, catalasis, ascorbinoxidase).

They noticed that the more flavored fruit species, where anaerobic processes are more important, have a lower content of ascorbic acid.

The use of fertilizers determines the increase of the ascorbic acid content in the horticultural products, but there are also substances diminishing this content (compounds containing copper, herbicides like caprometrin).

Dynamics during the storage period – the trend of most species is to diminish the ascorbic acid content. There are also cases where during storage the vitamin C content increases (tomatoes, onion, potatoes) due to the appearance of new tissues (stems) (Beceanu D. et. al., 2011).

The ascorbic acid content of some vegetables and fruits are given in the table 1.

The horticultural products having the highest content in ascorbic acid for 100g of product are the green walnuts (1000-1800mg/100g), rosehip (120-800mg), red peppers (250-300mg), blackcurrant (140-300mg), spinach (225mg), horseradish (200mg), and the lowest content may be found in: cucumbers (5mg), eggplant (2mg), fig (2mg).

Table 1

Ascorbic acid content in some vegetables and fruits in mg/100g
(after G. Neamtu, 1996)

Product	Content mg/100g	Product	Content mg/100g	Product	Content mg/100g
cranberries	8-10	green beans	7-14	watermelons	7
gooseberries	30-50	strawberry	28-45	melons	20
pineapple	40	grapefruit	40	peaches	10-19
pepper	80	quince	10-38	oranges	40-80
red peppers	250-300	horseradish	200	plums	7-14
green peppers	100-200	lemons	30-78	radishes	20
cucumbers	5	orache	140-150	salad	10-50
apricots	7-20	tangerines	30-45	beet	5-10
potatoes	15-22	mango	20	sugar beet	30-40
strawberries	25-120	green peas	25-35	fig	2
Sea Buckthorn	2500	rosehip	120-800	grapes	6-10
onion	60	apple	6	spinach	225
cherries	16	dill	50-150	scotch kale	50
horns	50-60	carrot	5-10	celery	10
redcurrant	30-70	blackberry	5-8	nettles	100
white currants	5-6	green walnuts (shells)	1000-1800	fresh tomatoes	18-45
blackcurrant	140-300	parsnip	40	eggplant	2
cauliflower	70	parsley	150	sour cherry	12
courgettes	26-30	pears	4-10	raspberry	28-45

Factors of influence are:

- species and variety (intensity of metabolism, product pH);
- storage temperature;
- atmospheric composition;
- storage period.

a. In more acid products, the decrease of the ascorbic content acid is slower whereas those having a less acid pH have a faster decrease.

In tomatoes having a red pigmentation on more than 10-15% of their surface as they grow the red coloration extends on 80-90% of their surface and the ascorbic acid content of tomatoes rises to about 24.0 mg/100g.

In case of marrows, the accumulation of ascorbic acid occurs in the phase when the marrow is in bloom and the values are 40mg/100mg. as marrows mature, the ascorbic acid content decreases on average to 23mg/100g and then to 15mg/100g, when they reach the size characteristic to the species.

For the melons in their ripening period the ascorbic acid content is below 28mg/100g, and when they are ready for consumption it increases to 31mg/100g.

In the ripening period of Jonathan apples, they found a content of 10.2mg ascorbic acid, and then during 18 day period when they get ripened for consumption the ascorbic acid content decreased to 7.9mg/10g.

For deep purple Italian plums, the ascorbic acid content was 6.7mg/100g in the ripening period, and the presence of some compounds as vitamin P or tanoid

substances with a protective role delayed the speed of degradation of ascorbic acid.

b. The lower storage temperature for capsicums determined the decrease from 1.5% daily losses of ascorbic acid (20-22°C) to only 0.8% every day at 10°C.

The rate of daily losses is very high for lettuce (almost 20% even when refrigerated). Reduced losses are registered by carrots, onion, cabbage (0.08 – 0.18%).

There are also situations when the ascorbic acid content increases during storage. Onions and potatoes register a slight increase of the ascorbic acid content at the end of the storage period following the start of sprouting phenomenon.

By keeping vegetables and fruit for several days at room temperature, which is a common practice in the normal circuit of these products from producer to consumer, there is a significant decrease of vitamin C content (table 2).

Table 2

The decrease in vitamin C content of vegetables acquired through trade "retail"
(after Cuciureanu Rodica)

Vegetables	mg vitamin C (%)		Losses (%)
	harvest	bought at market	
peas	154	56	64
potatoes	112	8	93
tomatoes	250	250	0
beans	136	40	70,5
onion	128	75	41,5
asparagus	364	146	32,5
cucumbers	220	68	69
spinach	414	134	68

The structural particularities of every horticultural product influence the decrease of vitamin C content; if products have a relatively thick skin preventing the diffusion of oxygen towards the inside, the destruction of vitamin C occurs at a slower rate (Cuciureanu Rodica, 2010)

According to Inoue K et al. (1988), some vegetables cultivated in hydroponic solution, in which they added 1-2g/l sodium ascorbate, significantly increased their ascorbic acid content within 14 ± 2 hours.

Researches carried out on the storage of vegetables in a controlled atmosphere showed that in these conditions the ascorbic acid content maintained a high level as compared to the ones determined in the products kept in normal frigorific conditions (Burzo I., 2001).

The controlled atmosphere inhibits the fast degradation of vitamin C in apricots, peaches and grapes. In apples and pears there was no difference and in case of plums the normal atmosphere better preserved the ascorbic acid content.

Table 3

Change in ascorbic acid content during storage of vegetables and fruits
(after I. Burzo)

Species	Storage Conditions	Storage period, days	Vitamin C content, mg/100g	Species	Storage Conditions	Storage period, days	Vitamin C content, mg/100g
Apples	-	0	7,84	Plums	-	0	3,46
	10°C	200	5,70		0°C	40	2,75
	5%CO ₂ , 3%O ₂ , 0°C	200	6,53		5%CO ₂ , 3%O ₂ , 0°C	40	2,42
Apricots	-	0	9,69	Grapes	-	0	4,95
	0°C	30	5,00		0°C	120	3,20
	5%CO ₂ , 3%O ₂ , 0°C,	30	6,32		5%CO ₂ , 3%O ₂ , 0°C	120	2,83
Pears	-	0	7,71	Sour cherry	-	0	5,43
	0°C	120	5,21		0°C	10	4,75
	5%CO ₂ , 3%O ₂ , 0°C	150	4,48		5%CO ₂ , 3%O ₂ , 0°C	15	3,75

During the storage period, a continuous diminution of the ascorbic acid quantity occurs in the vegetables and fruits harvested at their maturity and the intensity of decrease of this content depend on species, variety and temperature (table 3).

A diet rich in foods containing vitamin C keeps the body healthy, especially the bones, skin and teeth (www.ziare.com).

When natural vitamin C is found in the natural food matrix, for example in fruits, due to the matrix effect, it has the highest biological value synergizing with other components of the food matrix, namely bioflavonoids. In contrast with this, for example, highly purified synthesis vitamins intentionally introduced as E numbers do not have the same biological activity (www.remediu.ro).

The main properties of vitamin C are:

- ~ Occurs in the redox phenomena, the most powerful antioxidant;
- ~ Is anti-infective, tonic, antitoxic;
- ~ Involved in iron uptake by the body;
- ~ Prevents and cures scurvy;
- ~ Increases the resistance of blood vessels;
- ~ Contribute to the formation of red blood cells, teeth and bones;
- ~ Serves to regulate blood sugar and cholesterol;
- ~ Interfere with proper functioning of tissues and various organs;
- ~ Is effective in reducing the rate of opacification of the lens;
- ~ Intervenes in the metabolism of carotenes;
- ~ Protects folic acid;
- ~ Ensures cohesion protein cells, thus increasing life expectancy;
- ~ Decreases incidence of clots in blood vessels;

~ Is allergic activities (www.tratamente-naturiste.ro).

For a healthy adult, the recommended daily intake is 60÷90 mg/day, and for children the intake is 1.5÷2 mg/kg of body weight/day.

The intake of vitamin C must be increased for the workers working in environments with lead, benzene or varnishes, athletes during their training sessions (up to 200 mg/day) as well as for the people working under stress conditions (Guilland J.C., 1992).

At the same time, a higher intake is necessary in the pathological cases having an increased metabolism, in infectious diseases, tuberculosis, gastric ulcer and duodenal ulcer (<http://www.tratamente-naturiste.ro>).

CONCLUSIONS

The lowest amount of vitamin C is found in eggplant (2mg), cucumbers (5mg) and in greater quantities in red peppers (250-300mg) and walnut (bark) (1000-1800mg). These high values are influenced by the presence of anthocyanins (fruit and vegetables are more colored with the increasing of vitamin C content), the pH (at the horticultural products with a low pH, the content of ascorbic acid is high) and storage conditions (temperature, atmospheric composition).

During storage of some vegetables (potatoes, onions), the vitamin C content increases due to the emergence of new tissue (corners and stems).

Sick people, those who work in polluted environments, athletes, requires additional intake of vitamin C for proper functioning of the body.

Biological value of vitamin C in fruits and vegetables that are fresh, is more easily assimilated by the human body, compared with vitamin C obtained by synthesis.

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ANTHOCYANIN PIGMENT CONTENT OF SOME CHERRY VARIETIES GROWN IN IASI AREA, ROMANIA

CONȚINUTUL ÎN PIGMENȚI ANTOCIANICI AL UNOR SOIURI DE CIREȘ CULTIVATE ÎN ZONA IAȘI, ROMÂNIA

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Abstract. *The purpose of the study was the determination of the total monomeric anthocyanins content (AC) by pH differential method and anthocyanin profile, obtained by HPLC-DAD technique, from fruits of six local varieties of sweet cherry (Prunus avium), grown in experimental field of RDSF (Research-Development Station for Fruit growing), Iasi. AC ranged between 46.84±1.86 mg/100g, at Van variety and 443.72±1.54 mg/100g, at Amar Maxut variety. Based on the chromatograms obtained were identified 4 anthocyanins: cyanidin (cy)-3-glucoside, cy-3-rutinoside, pelargonidin (pg)-3-rutinoside, peonidin (pn)-3-rutinoside, expressed as percentage of area (%). Cy-3-rutinoside was found in the highest proportion in all varieties examined (over 91 % of total anthocyanins area), the ratio of the pigments identified was specific to each variety.*

Key words: cherries, anthocyanins, phenolics, HPLC-DAD

Rezumat. *Scopul studiului a fost determinarea conținutului total în antociani monomerici (CA) prin metoda diferenței de pH și obținerea profilului antocianic, prin tehnica HPLC-DAD, din fructele a 6 soiuri autohtone de cireș (Prunus avium), cultivate în câmpul experimental al SCDP (Stațiunea de Cercetare - Dezvoltare pentru Pomicultură), Iași. CA a avut valori cuprinse în intervalul 46,84±1,86 mg/100g, la soiul Van și 443,72±1,54 mg/100g, la soiul Amar Maxut. Pe baza cromatogramelor obținute au fost identificați 4 antociani: cianidină (cy)-3-glucozid, cy-3-rutinozid, pelargonidină (pg)-3-rutinozid, peonidină (pn)-3-rutinozid, exprimarea valorilor fiind în procente de arie (%). Antocianul cy-3-rutinozid, se găsește în proporția cea mai ridicată în toate soiurile analizate (peste 91 % din totalul ariei corespunzătoare antocianilor), raportul dintre pigmenții identificați fiind specific fiecărui soi.*

Cuvinte cheie: cireșe, antociani, fenoli, HPLC-DAD

INTRODUCTION

Cherries (fr. *cerises douces*, eng. *sweet cherries*), are fruits appreciated for their early appearance (early varieties, are mature in May) and the nutritional value (Beceanu D., 2002). Cherries are required both as fresh fruit and for industrialization (compotes, jams, syrups, juices etc.). In Romania, cherry tree finds optimal conditions for expression of their agrobiological potential (Budan S.

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and Grădinariu G, 2000), cherry production in Romania was constant in recent years (2007-2009), 65-68 thousand tons (Beceanu D., 2011).

Anthocyanins represent one of the major groups of hydrosoluble pigments belonging to the flavonoid class, which are metabolism secondary products (Davies, K., 2004). On the basis of the studies carried out on the cell line in animals and clinical in humans, it has been suggested that anthocyanins have an anti-inflammatory and anticarcinogenic action, they prevent cardiovascular diseases, all these actions being associated more or less to their antioxidizing capacity (He J., and Giusti Monica, 2010).

Anthocyanins are the second large class of phenolic compounds in cherries (after hydroxycinnamates), with a rate of about 26 % of total phenolic compounds (Kelley D. S., 2006). The specialized literature, offers data, varying within very large limits, related to the anthocyanin content of cherries, between 2 and 450 mg/100 g (Coşofreţ S. *et al.*, 2006; Horbowicz M. *et al.*, 2008; Gould K., 2009).

Only few studies have been registered in the international databases, focused on the cherries and sour cherries anthocyanins, by using the HPLC method, coupled with DAD or UV-VIS detector (Esti M. *et al.*, 2002). Content in the main anthocyanidins in cherries, is dominated by cyanidin (cy), followed, in much smaller quantities, by peonidin (pn) and pelargonidin (pg) (Horbowicz, M. *et al.*, 2008). Major anthocyanins from cherries, were identified as: cy-3-glucoside, cy-3-rutinoside, cy-3-sophorozide, pn-3-glucoside, pn-3-rutinoside (Mazza G., Miniati E., 1993). The occurrence of these anthocyanins and the ratio between them is specific to each variety (Davies K., 2004, Mozetič B., Trebše P., 2004).

MATERIAL AND METHOD

Was measured the anthocyanin content (AC) and total quantity of phenolic compounds (TPC) of ethanolic extracts from fruits of six varieties of cherry (*Prunus avium* L.), three of sweet cherry: *Van*, *Stella*, *Maria*, two hybrid elites proposed for patent application by RDSF (Research-Development Station for Fruit growing) Iasi: *Oana* (HC-840 860), *Radu* (HC-840 836) and a variety of bitter cherry: *Amar Maxut*, all grown in experimental field of RDSF Iași, Miroslava area, Romania. The harvesting of samples was made at their maturity of consumption, when the fruits have developed the varietal characteristic color and optimal gustatory features (Grădinariu G. *et al.*, 1998), in the interval 09.06.2010 – 16.06.2010.

We determined certain physico-chemical properties of fruits: the average mass of a fruit, the moisture content (drying off in a drying chamber, 4 hours at 105°C), the soluble dry substance (the refractometric method), titratable acidity, pH (the potentiometric method), reducing sugars (Schoorl method), activity of catalase (the gasometrical method) and peroxidase, as factors influencing the anthocyanin content.

Fruits were stored at the temperature of $-18\pm 2^{\circ}\text{C}$, anthocyanins transformation being considered as minimal for cherries kept in a frozen state (Mazza G., Miniati E., 1993). Ethanolic extracts, were obtained with a ratio between plant material and solvent of 1:20 (5g fruit/100 mL extraction solution). The efficiency of phenolic compounds extraction can be enhanced by an increase of the ratio between the solvent and solid (Cacace J.E., Mazza G., 2003). The containers were left in the dark at room temperature ($18\pm 2^{\circ}\text{C}$), overnight. Before the third filtering, we applied an

ultrasound treatment to the samples, to reduce aggregation and agglomeration of particles.

Being necessary to obtain extracts for alimentary use, which should not contain toxic reagents, extraction was performed with ethanol-HCl-water system (96:1:3) (pH 1.5±0.1). Acids are very important in maintaining stability of anthocyanins, are necessary in the formation of flavylium cation, the most stable form (at pH 1.5 - 2) (Socaciu Carmen, 2008). The three extraction fractions were cumulated, and stored at low temperatures (6±1°C) and in the dark, to avoid acidic hydrolysis, which takes place in a weak acid warm medium, when anthocyanidins are formed and the glucidic part is released (Cercasov Cornelia *et al.*, 2005).

pH differential method, is based on the following principle: in the acidic environment, there is a balance between the colored and colorless forms of anthocyanins (Lee J. *et al.*, 2005). This balance is in function of pH (Lee J. *et al.*, 2008). Calculation formula: A (absorbance) = (A520 - A700)pH 0.68 - (A520 - A700)pH 3.5. Coloring intensity variation between these two pH values is proportional to the anthocyanin content (mg anthocyanins /100 g fruit). A700, is reduced, due to the presence of other phenolic compounds (Horbowicz M. *et al.*, 2008).

To obtain the total phenolic compounds content (TPC), was used Folin-Ciocalteu colorimetric method. Measurements were made using a UV-VIS Analytik Jena Specord 200 spectrometer, at wavelength (λ) 765 nm. Expression of content in phenolic compounds was made in grams gallic acid equivalent (g GAE)/100 g fruit.

Using HPLC-DAD technique, we was drawn a profile of anthocyanins, identifying the main representatives of this class, and the ratio of the anthocyanins in each variety, expressed as a proportion of area (% area). By means of a Shimadzu LC 20 liquid chromatograph, using a Hypersil ODS C18 column type (25 cm length) at a temperature of 25°C, can be obtained the separation of the extraction mixture. Anthocyanins have been individualised, using a Shimadzu DAD, at a wavelength of 518 nm. Reagents used were purchased from Merck Romania, Bucharest. Statistical data processing was performed with Microsoft Excel software (ANOVA test).

RESULTS AND DISCUSSIONS

Physico-chemical properties of the fruits are presented in table 1, values being specific to each variety.

Table 1

Physico-chemical characteristics of the cherry varieties under study

Variety	M. fr. (g)	M. (%)	T. ac. (g m. a.)	Rd. sg. (g. %)	pH	SDS (°Bx)	Cat. act. (cm ³ O ₂ /g/h)
Van	6,5	84,22	0,72	10,42	3,65	16,12	0,85
Stella	6,6	86,41	0,36	5,97	3,83	13,92	1,35
Maria	7,3	83,92	0,44	9,15	3,69	18,92	0,42
Radu	6,4	79,64	0,73	7,22	3,97	14,72	1,00
Oana	7,4	81,72	0,44	8,18	3,91	17,12	0,35
Amar Maxut	4,2	81,78	0,73	8,46	3,59	12,72	1,10

M. fr. – average mass of fruit, M (%) – moisture, T. ac. (g m. a.) – titratable acidity (g malic acid /100g), Rd. sg. (g. %) – reducing sugars (mg. glucose/100 g product), SDS (°Bx) – soluble dry substance (°Brix), Cat. act. – catalase activity.

Fruits moisture ranged between 79.64 % (Radu variety) and 86.41 % (Stella variety) and titratable acidity had higher values at Radu and Amar Maxut varieties (0.73 g malic/100g acid). Van variety had the highest reducing sugars content (10.42 mg glucose/100g) and Radu variety, the highest pH (3.9). Catalase activity was best highlighted at Stella variety (1.35 cm³O₂/g/h) and peroxidase activity, as a factor influencing the content of anthocyanins, was assessed as very low.

Following the interpretation of the absorption spectra, we obtained the results for the total content of anthocyanin (AC) and phenolic compounds (TPC) (table 2). The data obtained represent the average of three determinations and have calculated the standard deviation.

Amar Maxut variety, had the highest AC value (443.72±1.54 mg/100g) and TPC (794.62±0.08 mg GAE/100 g), this variety having the most intensely colored fruits, among the analysed varieties. A major positive correlation was found between AC and TPC values ($R^2=0.957$, $p\text{-value} < 0.01 \%$) (fig. 1), the varieties with a high TPC, had also a high AC, the report being specific to each variety.

Table 2

AC and TPC values of the analysed varieties

No.	Variety	AC (mg/100g)	TPC (mg GAE/100g)
1	Van	46.84±0.88	162.62±0.33
2	Stella	77.34±0.45	240.46±0.26
3	Maria	154.19±0.90	352.17±0.21
4	Radu	191.26±0.64	387.56±0.19
5	Oana	378.93±1.02	563.42±0.42
6	Amar Maxut	443.72±1.54	794.62±0.08

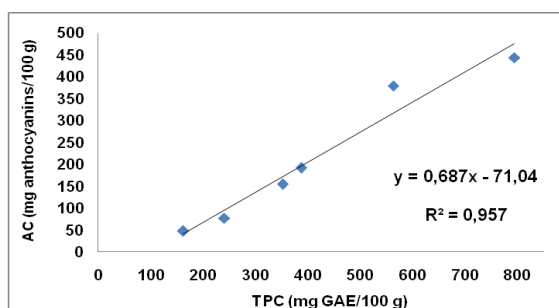


Fig. 1 - AC-TPC values correlation

HPLC chromatograms obtained were shown, for each variety (fig. 2). Following their interpretation, we have identified four anthocyanins: cy-3-glucoside, cy-3-rutinoside, pn-3-rutinoside and pg-3-rutinoside, confirmed also by the literature. Their expression was made as a percentage of area, ratio between anthocyanins identified, being specific to each variety (table 3). Cy-3-rutinoside was the main anthocyanin in all varieties examined, with the highest percentage at Stella variety (95.94 %). Anthocyanin pg-3-rutinoside was determined to have the

lowest participation rate in five of the analysed varieties, reaching the lowest percentage at Stella variety (0.21 %) and highest at Oana variety (2.03 %).

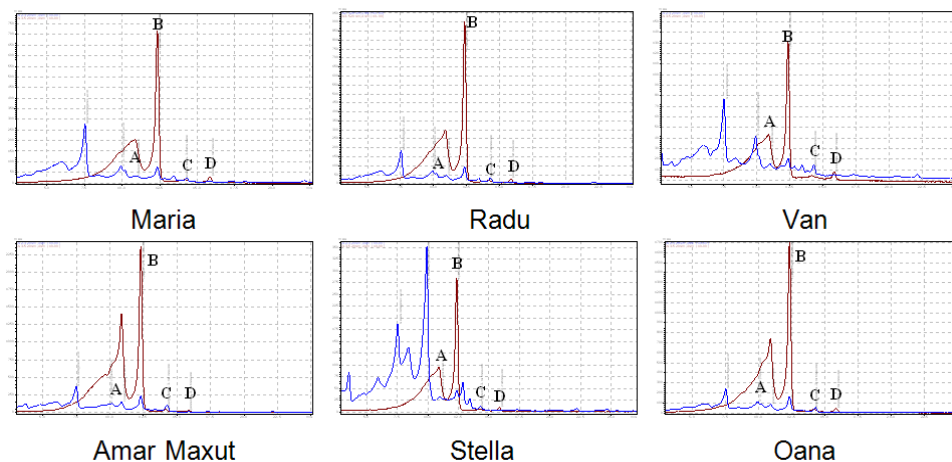


Fig. 2 - Chromatograms obtained by HPLC-DAD
 A - cy-3-glucoside; B - cy-3-rutinoside; C - pg-3-rutinoside; D - pn-3-rutinoside

Table 3

Area percentages corresponding to the anthocyanins identified

Variety / Anthocyanin	cy-3-rutinoside	cy-3-glucoside	pg-3-rutinoside	pn-3-rutinoside	Total (%)
Stella	95.94	1.38	0.21	2.46	100.00
Maria	94.00	0.78	1.52	3.70	100.00
Radu	93.78	1.98	1.52	2.72	100.00
Van	93.05	1.41	0.40	5.15	100.00
Amar Maxut	92.98	5.18	1.00	0.84	100.00
Oana	91.72	4.00	2.03	2.25	100.00

CONCLUSIONS

1. The six cherry varieties analysed showed a series of physico-chemical characteristics (the average mass of a fruit, the moisture content, titratable acidity, soluble sugars, pH), with specific values for each variety.

2. Total anthocyanin and total phenolic compounds content, had the highest value at the Amar Maxut variety, 443.72 ± 1.54 mg/100g, respectively 794.62 ± 0.08 mg GAE/100g, in this variety predominate cyanidin, with the two glycosidic forms identified: cy-3-rutinoside (92.98 %) and cy-3-glucoside (5.18 %).

3. Van variety, had the lowest amount of anthocyanins (46.84 ± 0.88 mg/100g) and phenolic compounds (162.62 ± 0.33 mg GAE/100g), at this variety, pn-3-rutinoside, being in the highest proportion (5.15 %), of all studied varieties.

4. Only Oana variety presented a percentage of pg-3-rutinoside higher than 2%, this anthocyanin being identified in the smallest proportion.

5. The data obtained, are within the range of values presented in the specialized literature, related to AC, TPC and individual anthocyanins identified, and can be used in food and pharmaceutical industry (*functional foods*).

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ANTIRADICAL ACTIVITY, TOTAL PHENOLICS AND ANTHOCYANINS CONTENT OF DIFFERENT PLUM VARIETIES

ACTIVITATEA ANTIRADICALICĂ, CONȚINUTUL DE FENOLI TOTATLI SI ANTOCIANI LA DIFERITE SOIURI DE PRUNE

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Abstract. *In this study antiradical activity, total phenolics and anthocyanin content of fifteen plum varieties were investigated. The fruits were evaluated for antioxidant potential spectrometrically using DPPH• (1,1-diphenyl-2-picrylhydrazyl free radicals) scavenging test. From all plum fruit analyzed, three showed higher antiradical activity: Silvia (125± 2.36 μM Trolox/100 g), followed by Tuleu gras (109.71±1.25 μM Trolox/100 g) and Minerva (109.71± 1.05 μM Trolox/100 g). The total polyphenols and anthocyanin contents showed a great variety amongst plum varieties and highly correlation with the total antioxidant capacity. Both total polyphenols and anthocyanin are major contributors to the total antioxidant capacity in plum fruit.*

Key words: antiradical activity, plum, total phenolics.

Rezumat. *În acest studiu au fost investigate activitatea antiradicalică, conținutul de compuși fenolici totali și conținutul de antociani a 15 soiuri de prune. Potențialul antioxidant al fructelor a fost determinat spectrofotometric cu ajutorul metodei DPPH (radical liber 1,1 difenil - 2- picrilhidrazil). Din toate probele de prune analizate s-au diferențiat trei soiuri cu activitate antiradicalică mare: Silvia cu 125± 2.36 μM Trolox/100 g, urmată de Tuleu gras cu 109.71±1.25 μM Trolox/100 g și de Minerva cu 109.71 μM Trolox/100 g. Soiurile de prune au arătat o mare varietate în ceea ce privește conținutul de fenoli totali și antociani dar și o bună corelație cu activitatea antiradicalică. Atât compușii fenolici totali, cât și antocianii contribuie la capacitatea antiradicalică a prunelor.*

Cuvinte cheie: activitate antiradicalică, prune, fenoli totali.

INTRODUCTION

Plums are an excellent source of nutrients that contribute significantly to human nutrition (Cao *et al.*, 1997). They are also an important source of compounds that affect human health and prevent many diseases (Stacewicz-Sapuntzakis *et al.*, 2001). In this context it is necessary to mention the importance of the content of anthocyanins, flavonoids, carotenoids and polyphenolic acids, compounds that contribute to the antioxidant capacity of fruits (Vinson *et al.*, 2001).

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Plums contain large quantities of sodium, potassium, iron, magnesium, manganese, selenium, copper and vitamins A, E, B and C. Also very important are the specific organic acids, beta carotene, pectic substances and, not least, small amounts of oxalic acid and fumaric. Because of complex content, prunes are considered both classical and modern medicine, as well as by the alternative medicine a real prophylactic and curative for many diseases: gout, atherosclerosis, hepatitis, diabetes, food poisoning, rheumatism, pollution caused by toxic conditions etc. The same fruit have a positive effect on hypertensive due to potassium and organic acids that streamline blood. Also, compounds present in plum reduce blood cholesterol and its deposition on blood vessels. Because iron, plums are anemic and antiasthenic medicine, decongests liver and reduce the risk of some types of cirrhosis, and copper prevents blood clots, reducing the risk of thrombophlebitis. Prunes are laxative and also reduce the risk of gastrointestinal mucosal inflammation, decrease intestinal activity and present effective anthelmintic effect (against intestinal parasites). They also have a regulating effect of glucose absorption from food, antipyretic effect (helps to reduce fever) and, last but not least, diuretic and increase immune system. Since plants contain several classes and types of antioxidants, knowledge of the total antioxidant capacity, which is the cumulative capacity of food components to eliminate free radicals, could be useful for epidemiological purposes, among others (Gey, 1998, Otakar Rop, 2009).

Since the '70s it was known that plums contain a wide range of antioxidants that reduce the mutagenic effects of free radicals and even cancer. Recently, British biologists have discovered that some anhydride (small amounts), including oxalic, may increase production of proteins protective against the development of genetic disorders. Antioxidants are very complex organic compounds that can kill viruses, foreign cells, even cancer cells, that are not recognized as being their own body. With these new remedies, the compounds in plum and plum skin especially, can significantly reduce the risk of malignant cells, reduce the onset of a tissue or organ cancerization (Takayuki Shibamoto *et al.*, 2008).

Researchers at the University of Edinburgh believes that a daily intake, even modestly, of fresh plums, may decrease cancer risk with over 25%. The same British scientists have discovered that a diet of plums may have the effect of an antidepressant medication, antistress medicine, the advantage being the complete lack of toxicity of compounds in comparison with some new drugs. Equally important for brain vitality are especially action of selenium and magnesium content from the fruit pulp (www.whfoods.com).

MATERIAL AND METHOD

Plum varieties analyzed for potential antiradical were obtained from the Fruit Research Station, Miroslava, Iasi. Fruits were harvested at consumption maturity in period 20th of July – 9th of September 2010. Immediately after harvesting plums were put in dark plastic bags (after stones removal) and stored at -20°C until extract performance (no more than a week).

For the preparation of the plums extract, 50 g fruit were homogenized and extracted in 200 ml extraction solvent (ethanol: acetone: acetic acid in the ratio 70: 29: 1) for 1 h at 37°C. (Guorong Du *et al*, 2009, Lee, HS *et al* 1991). The extract obtained was filtered through Whatman paper no. 41 and then rinsed with 50 ml extraction solvent (ethanol: acetone: acetic acid in the ratio 70: 29: 1). The extraction residue was repeated under the same conditions. The two filtrates were combined and stored at -20°C until use.

Antiradical activity was determined by DPPH method proposed by Brand-Williams *et.al.*, 1995. Absorbance was recorded at 517 nm. The antioxidant activity was calculated as $\mu\text{mole Trolox equivalent (TE)} / 100 \text{ g fresh weight}$ with Trolox calibration curve.

Total phenolic compounds in plum extracts were determined with the Folin-Ciocalteu method. Absorbance was read at 750 nm, and the results were expressed as mg gallic acid per 100 g fresh fruit.

Anthocyanin quantification was performed by the pH-differential method. The extracts were diluted in a pH 0.68 and in a pH 3.5 solution. Absorbance was measured at 520 and 700 nm. Results were expressed as mg per 100 g fresh fruit.

Tests were performed in triplicate for each sample. All results were expressed as mean values \pm standard deviation. Statistical correlations were calculated using Microsoft Office Excel.

The aim of this study was the determination of antiradical potential of certain varieties of plums, as well the total phenols and anthocyanins content and the relationship between these compounds and antiradical potential.

RESULTS AND DISCUSSIONS

Antioxidants from plum are important compounds and antioxidant activity of these fruits is largely due to phenolic compounds and less to vitamin C and carotenoids (Gil *et al.*, 2002).

In this study, the DPPH method was used to determine the antiradical potential of plum extracts. Spectrophotometric measurements were made with the AnalytikJena SPECORD 200 spectrometer.

Spectrophotometric method for assessing total antioxidant activity using the DPPH stable free radical generating system, involves measuring the decrease in absorbance at wavelength 517 nm (DPPH maximum absorption), which is proportional to the concentration of free radicals reduced from solution. In this method, antioxidants are able to reduce the stable radical DPPH to the yellow compound (Beyhan Ömer *et al.*, 2010). With the disappearance of DPPH radical, due to neutralization of the unpaired electron, takes place also the visual change of color from purple to yellow (completely stable).

Results for antiradical activity of the 15 varieties of plums are presented in Table 1. Among the varieties studied were noted Silvia, Tuleu gras and Minerva as having high antiradical activity. Varieties with low antiradical activity were BN 68 (plum rootstock) and Dâmbovița.

Total phenol content ranged from 87.45 mg GAE/100 g of fresh fruit registered at BN 68 variety to 489.23 mg GAE/100 g fresh, registered to the Record variety.

Regarding the fact that all cultivars were grown under identical conditions and in the same locality, it is possible to conclude that one can clearly see the varietal variability, which is quite typical of plums (Kim *et al*, 2003).

Table 1

Antiradical activity (DPPH), phenolics and anthocyanins content of plum extracts

Variety	Phenolic compounds (mg GAE/100 g fresh weight)	Anthocyanins content (mg/100 g fresh weight)	Antiradical activity (μM Trolox/100 g fresh weight)
Record	489,23 \pm 0,13	143,99 \pm 0,77	91,73 \pm 0,75
Blue free	359,22 \pm 4,06	117,48 \pm 2,71	87,39 \pm 0,43
Minerva	290,64 \pm 0,18	43,85 \pm 2,36	104,27 \pm 1,05
Stanley	348,03 \pm 0,83	77,58 \pm 0,77	92,52 \pm 0,84
Carpatin	225,85 \pm 0,35	38,45 \pm 3,09	83,42 \pm 0,67
Dâmbovița	93,77 \pm 0,08	349,99 \pm 10,04	96,45 \pm 1,11
Superb	166,10 \pm 0,08	34,33 \pm 1,34	91,49 \pm 1,89
Ialomița	213,99 \pm 0,08	79,64 \pm 1,61	92,92 \pm 2,07
D agen	285,28 \pm 0,14	18,62 \pm 0,89	83,72 \pm 1,82
BN 68	87,45 \pm 0,09	40,76 \pm 2,48	88,60 \pm 1,55
Centenar	216,28 \pm 0,47	51,83 \pm 3,22	96,22 \pm 1,13
BN 7-237-7	168,91 \pm 0,11	44,63 \pm 2,71	92,96 \pm 0,83
Joris plum	409,75 \pm 0,08	328,06 \pm 3,48	91,85 \pm 0,9
Silvia	154,04 \pm 0,11	85,81 \pm 5,02	125,14 \pm 2,36
Tuleu gras	188,48 \pm 0,14	34,84 \pm 3,89	109,71 \pm 1,25

In the 15 plums varieties, the anthocyanins content ranged between 18.62 to 349.99 mg/100 g fresh fruit. Anthocyanins and other phenolic compounds are responsible for many health benefits (Cevallos-Casals B., 2006). Regarding the anthocyanins content of the plum studied, Dâmbovița (349.99 mg/100 g fresh fruit) and Joris plum (328.06 mg/100 g fresh fruit) varieties showed the highest values followed by Record and Blue free, Silvia varieties.

A good correlation was obtained between antiradical capacity and total phenol content but also with the anthocyanins content, suggesting that these compounds contribute in a large extent to the antioxidant activity of the plum.

As can be seen from figure 1, there was found a good correlation between antiradical activity determined by DPPH method, and total phenolic content of plums ($R^2 = 0.879$). The level of antioxidant activity found in plums exceed the level found in blueberries and it is significantly correlated with total phenol content (Cevallos B., 2002).

Correlation obtained between antiradical activity and anthocyanin content of plum ($R^2 = 0.911$) was much higher than that of the antiradical capacity and total phenolic content (fig. 2). Anthocyanins are a widespread group of plant compounds that are responsible for their color (Usenik V., 2009).

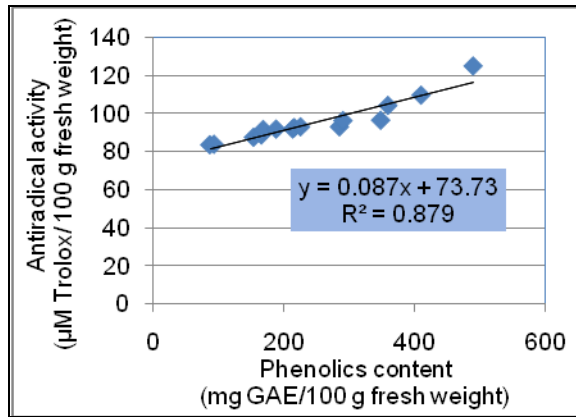


Fig. 1 – Correlation between antiradical activity and phenolics content of plum extracts.

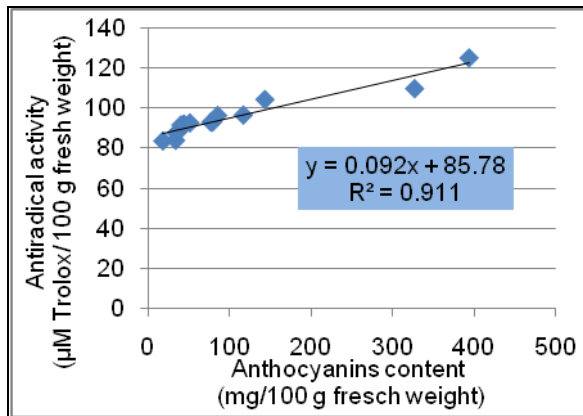


Fig. 2 - Correlation between antiradical activity and anthocyanins content of plum extracts.

CONCLUSIONS

1. The main objective of this study was to highlight the antioxidant properties of some plums varieties from Iasi region.

2. Antiradical potential of plums studied was determined by DPPH method, and Trolox was used as standard antioxidant.

3. There was a high variability of varieties in terms of total phenols and anthocyanin content. In terms of total phenol content was found that Record and Joris plum varieties have more than 400 mg galic acid /100 g fresh fruit. The highest anthocyanin content was displayed by Dâmbovița and Joris plum varieties (349.99 and 328.06 mg/100 g fresh fruit), other varieties recorded values below 150 mg/100 g fresh fruit.

4. It was found a good correlation between antiradical activity and total phenol content, but also between antiradical activity and anthocyanins content ($R^2 = 0.879$, $R^2 = 0.911$). Total phenolic compounds and anthocyanins are major contributors of plum antiradical activity. Silvia, Tuleu gras and Minerva high antiradical activity, was primarily due to the content of phenolic compounds and

other compounds, while at the Dâmbovița variety the anthocyanin content contribute to the antiradical activity.

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INFORMATION SYSTEM FOR MANAGEMENT OF GRAPEVINE GENOFOND IN REPUBLIC OF MOLDOVA

SISTEMUL INFORMATIC DE GESTIUNE A GENOFONDULUI VIȚEI DE VIE ÎN REPUBLICA MOLDOVA

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Abstract. *Elaborated Information System ensures necessary support in management of accumulated at Institute grapevine Genofond. For the description of accessions are used both general accepted descriptors: MCPD (Multi Crop Passport Data), O.I.V. Descriptor List and specific methodology applied for evaluation and documentation of genotypes. At the same time are ensured transfer to this format of data accumulated according previously used description methodologies.*

Key words: grapevine, genetic resources, information system

Rezumat. *Sistemul Informatic elaborat asigură suportul necesar în gestiunea Genofondului viței de vie acumulat la institut. Pentru descrierea intrărilor sunt utilizate atât seturile de descriptori general acceptați: MCPD (Multi Crop Passport Data), O.I.V. Descriptor List, dar și cele specifice metodologiilor aplicate în studiul și documentarea genotipurilor. Totodată, este asigurat transferul, în acest format, a datelor acumulate conform metodologiilor utilizate anterior la descrierea soiurilor.*

Cuvinte cheie: viță de vie, resurse genetice, sistem informatic

INTRODUCTION

During the process of formation, maintenance, evaluation and utilization of grapevine genetic resources in Republic of Moldova (Ivanova, 1976; Savin, 1980, 2005) was accumulated in diverse forms a vast volume of information: ampelographic descriptions, data of agrobiological characteristics of genotypes as well as data about their evolution in the frame of Ampelographic Collection and adjacent fields. Initially, ampelographic descriptions and other observations and evaluations were made according the methodologies used by Constantinescu (1958), Lazarevski (1963), Ivanova (1976) and beginning from the late nineties of last century it was initiated application of Descriptor List adopted by OIV (Descriptors for grapes, 1983). As a first stage in the process of accumulation, systematization and analysis of data processing was the elaboration and completion of Data Base (DB), the actions being in concordance with the international tendencies (Dettweler, 1994). Simultaneously, new technical and functional performances of computing allow their application in solution of specific problems concerning the grapevine Genofond, inclusively utilization of

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statistic-mathematical multi-variational methods in description and identification of grapevine varieties (Rotaru, 2002). During the last decade grapevine Genofond from Republic Moldova is involved more actively in integration process in European network of genetic resources (Savin, 2008). Thus is necessary the elaboration and utilization of adequate informational instruments for this purposes.

In order to ensure the necessary support in complex process of management of grapevine Genofond, processing according modern requirements of large spectrum of information, divers both by their nature – digital, textual, digital photos and frequency of accumulation and actualization, is developed Information System of Grapevine Genofond (ISGG).

MATERIAL AND METHOD

Data Base of ISGG includes information concerning multiple aspects of management of grapevine Genofond: stocktaking of accessions, passport data, ampelographic description, using as methodological support List of Descriptors elaborated by OIV (Descriptor List, 2009). For the genotypes included in special studies information is accumulated according the used Research sheets and is ensured their transfer to the format required by OIV Descriptors. As a tools for development of Information System is used Database Management System Visual FoxPro 9.0.

RESULTS AND DISCUSSIONS

As a central entity in projection of ISGG Data Base was used the genotype (its accession) entered in Genofond (fig. 1).

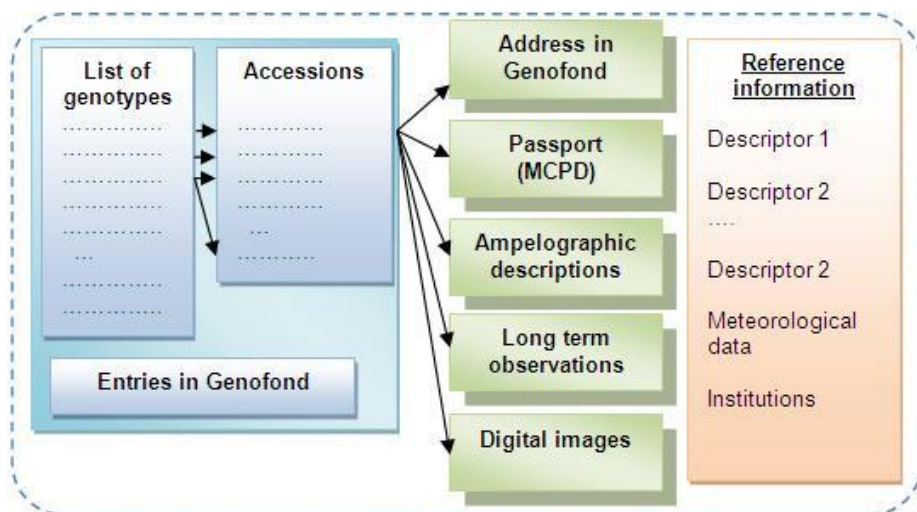


Fig. 1 - Conceptual scheme of ISGG Data Base

The Passport Data for every accession is filed according the list specified in MCPD (Multi Crop Passport Data) (Descriptor List, 2009). Following the general

accepted practice, in order to identify the accession in concrete Genofond, was used Institute's FAO code – MDA004, followed by 5 digits - sequential registration number. Against the number of sources of initial biological material for every genotype can be presented more than one accession in Genofond. ISGG ensure the evidence of “history” of every entry in Genofond – from the moment of registration of date of entry are tracked all regenerations in the frame of Genofond, evolution of biological state of every plant, dissemination of biological material to other research centers and diverse beneficiary. For every presented genotype (some time for every accession of the same genotype) are accumulated ampelographic descriptions according (OIV Descriptor List), data of long-term observations from diverse sources (phenological stages, indexis of fertility and productivity, other agrobiological parameters).

Collection of initial data (observations, measurements) is facilitated by using of predetermined forms. For every described compartment (young shot and leaf, mature leaf, bunch etc.) in the form is included only the set of descriptors relevant to given compartment and the period of vegetation when are made the observations. In special cases user can generates interactively a custom form.

In order to use and assimilate already accumulated information during the previous studies or of information actually presented in various sources and formats (literature, Internet etc.) according actually adopted description methodology (Descriptor List, 2009), ISGG ensure their compatibility with OIV descriptors (fig. 2). Thus, going from heterogeneous information (according the applied methodology during the collection), it ensured its presentation and dissemination in common format to the diverse destinations (Ampelographic Card, European Data Base of genetic grapevine resources etc.)

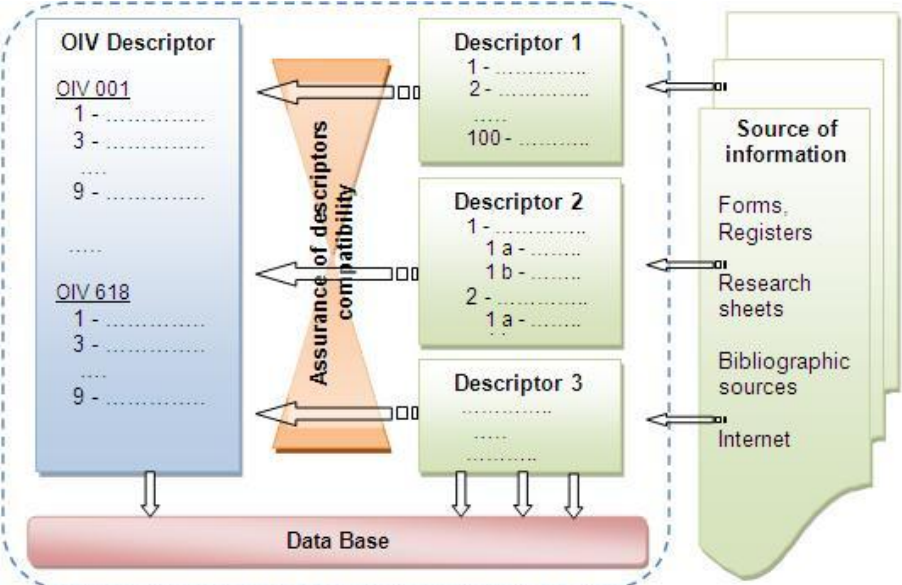


Fig. 2 - Conceptual scheme of unification of descriptors

In order to ensure more fidelity in fixation of diversity and particularities of described objects, that can't be covered and expressed only in basis of the List of Descriptors, Data Base of ISGG is completed with graphical information, inclusively digital photos. This way ensures the distribution, over the time of year, of some descriptions and evaluations, also more suitable comparison (confrontation) with reference genotypes.

The interface of ISGG is realized in form of main menu with submenu of different levels that allows their easy utilization by various categories of users already familiarized with other Information Systems.

CONCLUSIONS

1. Elaborated Information System ensures necessary support regarding some aspects of process of management, evaluation and utilization of grapevine genetic resources in Republic of Moldova: the evidence of "history" of every entry, ampelographic descriptions, data of long-term observations, digital photos etc.

2. Utilization of internationally accepted methodologies and applied mechanism of transfer to this format of previously accumulated data favour the promotion and integration of presented resources in international network of genetic resources.

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THE DATA BASE, ORIENTED TO THE PECULIAR SOIL AND CLIMATE CONDITIONS OF VINE CULTURE AT REGIONAL LEVEL IN THE BUJORU VINEYARD

BAZĂ DE DATE CLIMATICE ORIENTATĂ PE SPECIFICUL PEDO-CLIMATIC ȘI REGIONAL AL CULTURILOR VITICOLE DIN PODGORIA DEALU BUJORULUI

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Abstract. *The data base, oriented to the peculiar soil and climate conditions of vine culture at regional level allows to estimate the future production, water demand for irrigation, pests attack etc in the next year. These data are useful for predicting the budget of vine culture in the next year. All these are just estimates, the real costs being determined by the natural unverifiable realities but also breaking down by knowledge. The main information source of this data base is represented by the records of concerning the climate parameters and grape production carried out in the year 1980. They include information referring to the running phenophases (bud breaking, blooming, ripening and maturation), quantitative and qualitative grape production (juice sugar content, average weight of 100 berries, juice acidity) but also the main climate characteristics at Dealu Bujorului Vineyard (annual thermic balance, precipitations, average annual temperatures, maximum and minimum temperatures, specific indices etc.).*

Key words: phenophase, vine, production, temperature, rainfall

Rezumat. *Baza de date climatice orientată pe specificul pedo-climatic și regional al culturilor viticole, accesată permite ca pentru anul viitor să se poată face o estimare a producției, a necesarului de apă pentru irigare și eventualele atacuri a dăunătorilor. Aceste date sunt necesare pentru estimarea bugetului pentru cultura anului viitor. Toate acestea sunt doar estimări, costurile reale fiind determinate de realitățile naturale necontrolabile dar atenuabile prin cunoaștere. Principala sursă de informații a acestei baze de date o constituie înregistrările parametrilor climatici și a caracteristicilor producției de struguri, efectuate din anul 1980. Sunt centralizate informații privind desfășurarea fenofazelor (dezmugurit, înflorit, pângă și maturare), producțiile obținute și calitatea acestora (conținutul de zahăr din must, masa medie a 100 boabe, aciditatea mustului), dar și principalele elemente climatice caracteristice podgoriei Dealu Bujorului (bilanțuri termice anuale, precipitații, temperaturi medii anuale, maxime și minime termice, indici specifici etc.).*

Cuvinte cheie: fenofază, viță de vie, producție, temperatură, precipitații.

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INTRODUCTION

Climate change has an impact on vine culture and thereby affect phenological spectrum. Climate changes have a direct impact and lead to disruption of the normal course of physiological and biochemical processes with implications for the quality and specificity of the wine-making products. Variety behavior analysis over a long period of time confirms the dependence of the vine climate resources; the relationship is substantiated by studies on a series of single and multicriterial climatic indices, duration and intensity of various climatic determinants of vegetation along phenophase (Viorica Enache et al., 2009). The existence of long-term data and the processing and use of phenological observations in relation to climate change, highlighted record of climatic parameters atypical values that have made their mark on culture in particular vine (Enache Viorica et al., 2010).

MATERIAL AND METHOD

Observations and measurements were made at RDVVS Bujoru. The main source of information is the records climatic parameters and characteristics of grape production, conducted annually by at least 20 years. Are centralized information on the conduct phenophase (bud breaking, flourished, first fruits, ripening), yields and quality (sugar content of juice, the average weight of 100 grains, grape acidity) and the main climatic elements characteristic vineyard Dealu Bujorului (annual heat balances, precipitation, annual mean temperatures in the months critical thermal maximum and minimum).

RESULTS AND DISCUSSIONS

Information Source: Observations and experimental tests carried out in the firing RDVVS Bujoru. Due to superior facilities offered by relational databases in terms of functional consistency, was chosen to prepare the Microsoft Access database in Office 2007 package.

Tabular database structure consists of four tables linked by relations of type 1 - ∞ , where it was to be observed referential integrity (Fig. 1). The main table in which the main *tblClima* information on climatic factors and contains 29 fields (Fig. 2). He has a dual primary key fields consist of *Vineyard and Year* to ensure uniqueness of records and links to tables *tblPodgorii* and *tblSpectruFenol*.

SpectruFenol table contains 15 fields that include both information on the deployment phenophase and data on production and quality. Each entry details the annual data. Varieties that are recorded in Tables *tblPodgorii* and *tblSoiuri*. Primary key fields are numeric type *Autonumber* generated by automatic increments, indexed to speed up the search and has determined the property *No duplicates*.

Annex 1 shows the downloaded data in tables, except table *tblPodgorii*. Hollows occur especially if the original records, with data from the '80 and even '90s, when experimental measurements were hitting the road.

Forms: To make it possible to easily use the database was created a friendly interface consisting of a set of forms of data handling (entry, deletion, navigation) through which it operates directly on the tables above. They can be opened from an order form.

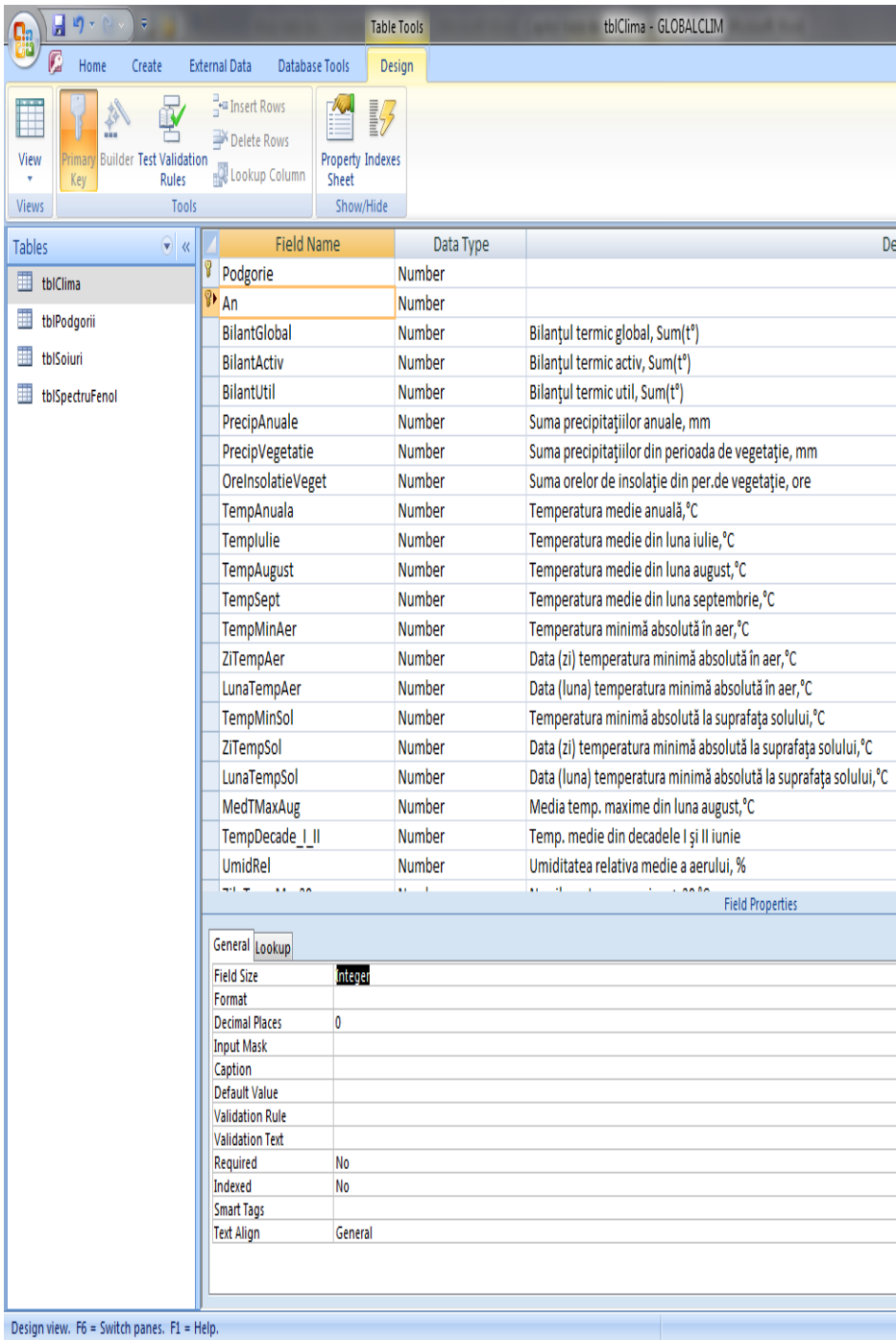


Fig.1 - Relationship / related fields of database tables

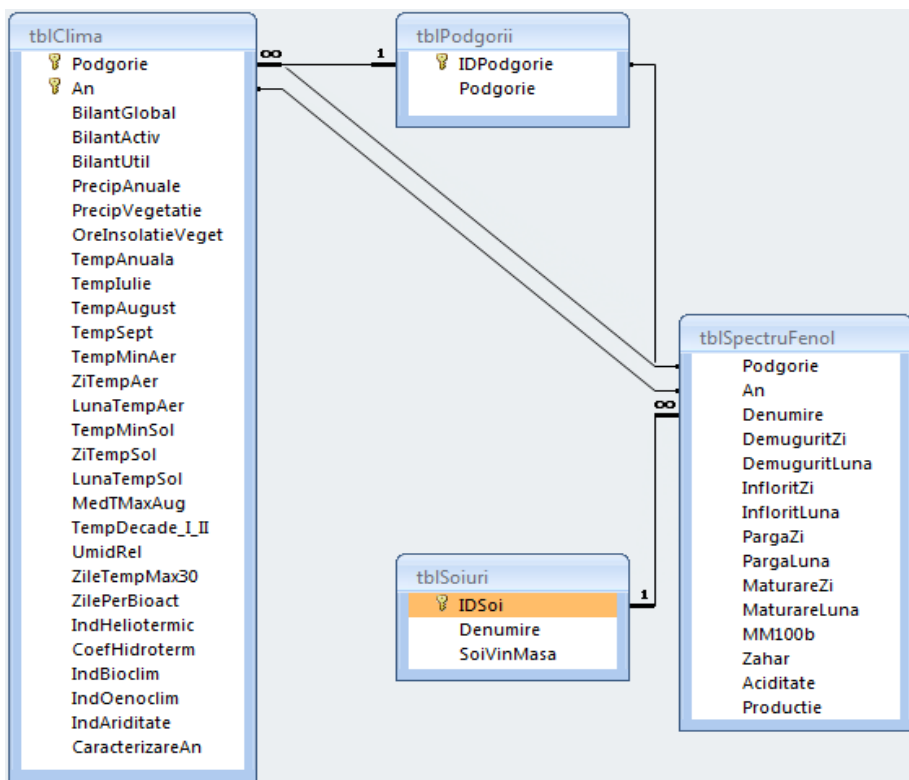


Fig. 2 – TblClima table structure

The same form also provides preview, print reports that data. The most complex form, through which data is entered directly into Table *tblClima* order to increase functionality, was filled with command buttons, one opens the form to handle the data stored in the table *tblPodgorii* (fig. 3). Also, there are forms used to manipulate data in tables and *tblSpectruFenol* *tblPodgorii*.

Queries: To select and sort the data presented in the reports were prepared queries.

Query *qryDate fenologice tblSoiuri* retrieve information from tables *tblPodgorii* and *tblSpectruFenol*.

QryClima query and retrieve information from tables *tblClima* *tblPodgorii*.

QryProductii query retrieve information about the annual grape yields in Tables *tblSoiuri*, and *tblPodgorii* *tblSpectruFenol*. Years are automatically removed for which no records exist in database production.

GLOBALCLIM - Elemente climatice

Elemente climatice

Podgorie	<input type="text" value="Iasi"/>	<input type="button" value="Podgorie noua"/>	Medie temp.maxime August (°C)	<input type="text" value="26.5"/>
An	<input type="text" value="1998"/>		Medie temp. decada I, II iunie (°C)	<input type="text" value="21.3"/>
Bilanț termic global (Suma t°C)	<input type="text" value="3279.1"/>		Umiditatea relativa medie (%)	<input type="text"/>
Bilanț termic activ (Suma t°C)	<input type="text" value="3255.5"/>		Nr. zile cu temp.maxime >30 °C	<input type="text" value="20"/>
Bilanț termic util (Suma t°C)	<input type="text" value="1455.9"/>		Durata perioada bioactiva (zile)	<input type="text" value="177"/>
Suma precipitatii anuale (mm)	<input type="text" value="653.5"/>		Indice helioteermic real	<input type="text" value="2.1"/>
Suma precipitatii vegetatie (mm)	<input type="text" value="358.8"/>		Coefficient hidrotermic	<input type="text" value="1.1"/>
Suma ore Insolatie in per. vegetatie	<input type="text" value="1458.7"/>		Indice bioclimatic vita de vie	<input type="text" value="7.2"/>
Temperatura medie anuală (°C)	<input type="text" value="10.2"/>		Indice aptitudine oenoclimatica	<input type="text" value="4605.4"/>
Temperatura medie iulie (°C)	<input type="text" value="21.6"/>		Indice anual de ariditate	<input type="text"/>
Temperatura medie august (°C)	<input type="text" value="26.5"/>		Caracterizare generala an	<input type="text" value="foarte ploios"/>
Temperatura medie sept. (°C)	<input type="text" value="15.5"/>			

Temp. minimă absolută în aer (°C) Data temp.min.abs.in aer
 Zi Luna

Temp.min.abs. la supraf.solului (°C) Data temp.min.abs.sol
 Zi Luna

Record: 14 | 1 of 23 | No Filter | Search

Fig. 3 - For handling data in table form tblClima

Selecting and centralization of data on quality grape production is made by *qryCalitateProd* query. It is based on *tblSoiuri* tables, *tblPodgorii* and *tblSpectruFenol* and extract only the years for which data in the database records are kept of production quality indexes.

Reports

Selecting Reports and results are displayed using reports. These can be previewed or printed.

RepClima report shows the main elements of climate change while at the base of the query being *qryClima*. Data are presented chronologically, grouped by vineyards.

RepFenologie report is *qryDateFenologie* query data source. It centralizes

and provides information on phenological spectrum of varieties of vines, arranged chronologically.

The report is intended for printing and viewing *repCalitate* related parameters of the quality grape production. They are grouped into two levels so that, within each vineyard, and the items are displayed chronologically, the average weight of 100 grains, the quantity of grape sugar and acidity equivalent.

Centralization of grape production is done using *repProducții* report, the vineyards and years (chronologically), is presented each year in quantities of grapes harvested per ha for each variety. Years are excluded for which no records in the database on the vineyard yields. When the report is *qryProductii* query quality

CONCLUSIONS

At present, more often when faced with climatic events, building a database focused on specific regional pedo-climatic and cultivation of vines in the vineyard Dealu Peony is a first step in knowing the trend and how weather history behaves vine culture.

Analysis of ecosystem conditions and productive capacity of the vineyard Dealu Bujorului highlighted trends in the evolution of climatic factors (air temperature rise, reduced precipitation, increased aggressiveness and unevenness in the distribution of rain during their growing season, increased drought and soil air, increase in frequency and intensity of extreme events of hail, heavy rains, frost early / late, storms, etc..) direct impact on vegetative and productive potential of vineyards and the inheritance and physiological perfection phenophase vegetation.

Database to be completed periodically and will be an important starting point for future research.

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A NEW REGULATOR OF THE PHYSIOLOGICAL PROCESSES IN GRAPE PLANTS

UN NOU REGULATOR AL PROCESELOR FIZIOLOGICE LA PLANTELE DE VIȚĂ DE VIE

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Abstract. Studies have been performed on different grape cultivars differing by ecological/geographical origin and biological and technological particular features in the vineyards of the Stăuceni Viticulture/Winemaking College situated in the central zone of the Republic of Moldova in order to establish the influence of a naturally-occurring biologically active substance that belongs to the steroid glycoside class tentatively named Melangoside O (Mo) on the components of grape hydric status, growth and producing capacity. A foliartreatment with an aqueous Mo solution has been found to contribute to the optimization of plant water exchange, which ensures an increase of yields and grape quality indices including in the unfavorable environmental conditions comparing with witness plants. The effects of the Mo action on grape plants are related to the concentration applied and genotypical particular features of plants. Melangoside O is recommended for implementation in viticulture to enhance plant resistance and producing capacity.

Key words: steroidal glycoside, grapes.

Rezumat. Cercetările au fost realizate în viile Colegiului viti-vinicol Stăuceni, situat în zona centrală a Republicii Moldova, cu diferite soiuri de viță de vie (ce diferă după proveniența eco-geografică și particularitățile biologice și tehnologice), în scopul evidențierii influenței substanței biologice active de proveniență naturală, din clasa glicozidelor steroidice – Melangozidei O (Mo) asupra componentelor statusului hidric, creșterii și productivității plantelor de viță de vie. Se constată că tratarea extraradiculară cu soluție apoasă de Mo contribuie la optimizarea schimbului de apă al plantelor, ceea ce asigură sporirea recoltei și indicilor calității strugurilor, inclusiv în condiții nefavorabile de mediu, față de plantele martor. Efectele acțiunii Mo asupra plantelor de viță de vie sunt în funcție de concentrația în care se aplică și de particularitățile genotipice ale plantelor. Melangozida O se recomandă a fi aplicată în viticultură în vederea sporirii rezistenței și productivității plantelor.

Cuvinte cheie: glicozide steroidice, plantație de viță de vie

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INTRODUCTION

It is a common knowledge that the potential of the producing capacity of crop plants, including grape, in production conditions is manifested, as a rule, only partially due to the action of unfavorable natural and technological factors of growth and development and, in the first place, of that of the hydrothermal regime. Production of stable and high quality yields necessitates physiological studies on the processes that regulate manifestation of the plant producing capacity and resistance potential, development of some operative measures to maintain a sufficient vital process level. To achieve this goal, the products based on biologically active substances which in small amounts ensure a high efficacy and are ecologically friendly are widely employed. Steroid glycosides of natural origin have proved to be quite promising (Kirilov A. et al., 2004; Kintea P. et al., 2004). Though, to accept their implementation in different crops, it is imperative to conduct special studies on manifestation of the expected effects depending on plant genotypes, environmental conditions, administration mode and concentration. This work reports our findings on the possibility of employment of a substance belonging to the steroid glycoside class, furostanolic series, tentatively named Melangoside O (Mo), isolated from *Solanum melongena* L. seeds to optimize the physiological processes occurring in grape plants during the vegetation period.

MATERIAL AND METHOD

The investigation was conducted six years (2005-2010) on different grape cultivars, differing by ecological/geographical origin and biological and technological particular features, namely Chardonnay, Muscat Amber, and Moldova in the vineyards of the Stăuceni Viticulture/Winemaking College situated in the central zone of the Republic of Moldova. The experiments were set on microparcelles each containing 20 plants, repeated three times. The plants were foliar treated with an aqueous Mo solution at concentrations of 10^{-2} , $5 \cdot 10^{-3}$, 10^{-3} % 10-12 days before full bloom and at the stage of berry fulfillment; the solution consumption was 600-800 l/ha. Water sprayed plants served as witnesses.

Parameters of hydric status components including tissue hydration, saturation deficit, water content in leaf apoplast and simplast, transpiration intensity, coefficient of the hydric status stability using classical (Cushnirenco M.D. et al., 1970) and MNR methods (Carr H.Y., Purcell E.M., 1954; Harciuc O. et al., 2003), sprout growing dynamics, yield and its quality have been evaluated keeping in mind the polyfunctional water role as a medium and indispensable component of vital processes, a factor of their interaction and integrity accomplishment, which, to a large extent, regulates metabolism and to appreciate the activity of the steroid glycoside in the studies on the grape physiological condition.

RESULTS AND DISCUSSIONS

Analyses of the multiannual experiment results demonstrated a pronounced action of the steroid glycoside Mo on water exchange, growth and producing capacity of grape plants. Essential modifications of the parameters of the hydric status components take place in the Mo treated plants, which, to a large extent, have an adaptive nature, especially during the periods of hydric regime tension. Inhibition of transpiration intensity was observed in the majority of the BAS treated plants at the

stage of berry formation and growth in comparison with the witnesses, with the exception of the plants cv. Moldova treated with a Mo solution 0.005% (table 1) at the stage of berry growth which coincided with the heat period, but water supply was sufficient for the plants in the conditions characteristic of the respective ontogenetic stage.

Table 1

Leaf transpiration intensity in the Mo treated grape plants, mg H₂O/dm²/hour

Treatment	Cv. Chardonnay	Cv. Moldova
	June 29,2006	June 29,2006
Control	410,03 ±29,30	361,65± 28,13
Melangoside, 0,01%	372,60± 17,93	299,35± 28,30
Melangoside, 0,005%	375,79± 24,90	350,30± 21,43
Melangoside, 0,001%	322,45± 45,70	286,62± 35,18

The particular features of the transpiration intensity, to a large extent, are conditioned by water compartmentalization in simplast and apoplast. The application of the MNR method of water proton relaxation provided data on the content of “free” and “bound” water. The analysis of the data revealed a dependence of transpiration intensity on the level of apoplast hydration, as well as on the content of free water in simplast (table 2). The experimental data summarized in tables 1 and 2 demonstrate that the content of free water in apoplast and simplast (in vacuoles) that was lower in the treated plants conditioned a diminution in the transpiration intensity, which indicates an enhancement of water consumption efficacy.

Table 2

Water compartmentalization in leaf simplast and apoplast of the BAS treated grape plants, % of the total content. June 29, 2006

Treatments	Free water, apoplast	simplast	
		Free water	Bound water
Cv.Chardonnay			
Control	11,96	51,49	36,55
Melangoside 0.005%	8,38	36,70	54,92

An enhancement of the water retention capacity in leaf tissues (water loss during two hours, % of the total water content) was also recorded during this ontogenetic period, especially in the cv. Chardonnay plants treated with Mo at concentrations of 0.01% and 0.005%; in the plants cv. Moldova at a concentration of 0.001% (table 3).

Table 3

Leaf water retaining capacity in the BAS treated grape plants, %

Treatment	cv. Chardonnay		cv. Moldova	
	June 13, 2007	August 14, 2007	June 13, 2007	August 14, 2007
Control	10,18 ± 0,58	17,12 ± 0,89	8,82 ± 0,38	9,10 ± 0,37
Melangoside, 0,01%	5,60 ± 0,04	14,55 ± 0,63	8,44 ± 0,27	9,21 ± 0,65
Melangoside, 0,005%	6,35 ± 0,09	16,9 ± 0,01	8,57 ± 0,13	6,14 ± 0,03
Melangoside, 0,001%	9,06 ± 0,23	14,47 ± 1,06	7,34 ± 0,19	6,90 ± 0,41

A tendency towards enhancement of leaf tissue capacity to retain water under the influence of the used BAS was also observed on the background of the favorable conditions of humidity and temperature that are necessary for a normal proceeding of the processes characteristic of the respective ontogenetic stage.

Modifications of the water exchange components induced by the BAS action resulted in the optimization of the plant hydric status, especially in the stress conditions. The hydration of grape plant tissues was established at a level that was, in general, higher in comparison with the witness plants. Table 4 shows the data on the water content in the leaves at the stage of growth and berry fulfillment in 2007 when the climatic conditions exceeded multiannual mean values, but had no impact, to a larger extent, on the intensity of water exchange in the grape plants, yet, the values were recorded, which were slightly reduced in comparison with those characteristic of this ontogenetic stage. In these conditions, the application of BAS contributed to the maintenance of water content in leaves at a level that was higher in comparison with the witness in the cv. Chardonnay plants, with the exception of the treatment Melangoside 0.01%. This tendency was less pronounced in the cv. Moldova plants, with the exception with the treatment Melangoside 0.005%.

Table 4

Water content in the leaves of the BAS treated plants, %

Treatment	cv. Chardonnay		cv. Moldova	
	June 13, 2007	August 14, 2007	June 13, 2007	August 14, 2007
Control	70,00 ± 0,95	62,46 ± 0,25	72,40 ± 0,16	67,93 ± 0,03
Melangoside, 0,01%	70,52 ± 0,10	60,42 ± 0,47	72,81 ± 0,04	69,31 ± 0,11
Melangoside, 0,005%	71,69 ± 0,14	63,63 ± 0,07	73,20 ± 0,02	67,97 ± 0,18
Melangoside, 0,001%	71,72 ± 0,73	62,16 ± 0,19	72,11 ± 0,04	68,19 ± 0,16

Table 5

Saturation deficit in the leaves of the BAS treated grape plants (%)

Treatment	cv. Chardonnay		cv. Moldova	
	June 29, 2006	August 1, 2006	June 29, 2006	August 1, 2006
Control	10,15 ± 0,44	10,54 ± 1,98	7,75 ± 0,89	9,92 ± 0,53
Melangoside, 0,01%	8,90 ± 0,46	9,08 ± 0,23	4,64 ± 0,30	7,90 ± 0,57
Melangoside, 0,005%	6,63 ± 0,38	9,86 ± 0,56	7,16 ± 0,41	7,35 ± 0,21
Melangoside, 0,001%	6,61 ± 0,28	8,06 ± 0,46	7,02 ± 0,27	10,70 ± 1,43

The modification of the saturation deficit values, as a rule towards diminution depending on the plant genotype, ontogenetic stage, and environmental conditions proves a beneficial action of the steroid glycoside in the studies on the grape water exchange (table 5).

The optimization of water exchange and its stabilization in the unfavorable environmental conditions caused a coordinated evolution of the growth and development processes in the grape plants. In general, the Mo treated plants were characterized by a higher producing capacity and enhanced yield quality in comparison with the witness plants (table 6).

Table 6

The BAS influence on the producing capacity and yield quality of grape plants (year 2005)

Treatments	Yield per bush, kg	Weight of a grape bunch, g	Weight of 100 berries, g	Sugar content, %	Acid content g/l
cv. Muscat Amber					
Control	7,2	189,5	193,96	14,8	10,1
Capsicoside 0,001%	9,03	220,2	210,83	15,1	8,6
Melangoside 0,01%	7,03	219,7	244,54	15,0	8,4
Melangoside 0,005%	9,2	191,7	249,21	15,3	8,4
Melangoside 0,001%	7,8	185,7	221,86	15,7	8,1
cv. Chardonnay					
Control	3,8	51,1	129,23	17,8	10,4
Capsicoside 0,001%	4,03	66,6	138,5	18,1	9,6
Melangoside 0,01%	4,4	90,5	147,99	19,9	9,8
Melangoside 0,005%	5,63	83,7	163,62	18,95	10,5
Melangoside 0,001%	5,33	93,3	165,6	19,3	9,5

Table 7

The BAS influence of the producing capacity and yield quality of grape plants, the year of 2007

Treatments	Yield per bush, kg	Weight of a grape bunch, g	Weight of 100 berries, g	Sugar content, %	Acid content, g/l
cv. Moldova					
Control	4,7	127,76	293,09	17,2	7,57
Melangoside 0,01%	5,22	118,99	295,29	16,4	7,37
Melangoside 0,005%	6,45	138,15	294,49	18,2	7,6
Melangoside 0,001%	3,53	84,28	231,08	17,8	8,07
cv. Chardonnay					
Control	8,0	90,4	107,09	22,5	5,7
Melangoside 0,01%	4,48	67,0	95,7	22,7	5,3
Melangoside 0,005%	7,64	92,07	115,52	23,3	5,2
Melangoside 0,001%	9,56	119,0	132,80	21,3	6,1

At the same time, the results of yield records indicate that the dependence of the producing capacity of the BAS treated grape plants on both genotype and plant physiological condition and product concentration was more pronounced in conditions of extreme (critical) climatic conditions during the vegetation period. In the plants cv. Moldova, Mo administration contributed to the yield enhancement by 11-37%, the concentration of 0.005% being more efficient; Mo at a concentration of 0.001% caused a negative effect (table 7). In the plants cv. Chardonnay, a positive effect was recorded at a product concentration of 0.001%, while the Mo treatment at a concentration of 0.01% accounted for a negative effect in the plants (table 6).

A tendency towards inhibition of the sprout growth processes was observed in the plants of both cultivars treated with Melangoside O, with the exception of the concentration of 0.005%, the application of which produced a weakly pronounced effect on sprout growth stimulation in the plants cv. Moldova. The employment of the product also ensured a normal sprout maturation.

CONCLUSIONS

1. Foliar treatment of grape plants with the steroidal glycoside Melangoside O results in optimization and enhancement of hydric status stability, including in the unfavorable environmental conditions, which ensures an intensive evolution of vital processes, enhancement of producing capacity and plant resistance to rehydration (draught, heat).

2. The effects of the Melangoside O action on grape depend on the concentration employed and genotypical particular features of plants.

3. The Melangoside O concentrations of 0.005% and 0.001% prove to be more active physiologically.

4. The experimental results allow Melangoside O to be recommended for employment in viticulture to enhance plant resistance and producing capacity.

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ÉTUDE DE LA MATURITÉ PHÉNOLIQUE DES PRINCIPAUX CÉPAGES DE CUVE ROUGE DU VIGNOBLE DEALUL BUJORULUI

STUDIUL MATURĂRII FENOLICE LA PRINCIPALELE SOIURI DE STRUGURI PENTRU VINURI ROȘII DIN PODGORIA DEALUL BUJORULUI

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Résumé. Cette étude a été réalisée entre 2007 – 2009, sur les parcelles expérimentales du SCDVV Bujoru. L'évolution de la maturité phénolique a été suivie sur les principaux cépages rouges cultivés dans la région: Merlot, Cabernet Sauvignon, Fetească neagră, Burgund et Băbească neagră. Les résultats obtenus montrent que, dans la majorité des cas, la maturité phénolique est atteinte entre 2 à 4 jours après la pleine maturité, lorsqu'ele taux d'anthocyanes des grappes commencent à diminuer, après une accumulation maximale comprise entre 28 et 88 mg/kg.

Mots - clé: maturité phénolique, pleine maturité, anthocyanes, composés phénolique.

Rezumat. Cercetările au fost efectuate în perioada 2007 – 2009 în parcelele experimentale ale SCDVV Bujoru. Realizarea maturității fenolice a fost urmărită la principalele soiuri pentru vinuri roșii cultivate în regiune. Rezultatele obținute au condus la concluzia că, în majoritatea cazurilor, soiurile urmărite ajung la maturitatea fenolică la circa 2 – 4 zile după realizarea maturității deplină, atunci când conținutul de antociani din boabe începe, după atingerea unui maxim de acumulare, să se diminueze cu 28 – 88 mg/kg.

Cuvinte cheie: maturitate fenolică, maturitate deplină, antociani, compuși fenolici.

INTRODUCTION

Le suivi de la maturité des raisins, pour déterminer la date optimale de récolte, constitue une étape technologique indispensable pour l'industrie vinicole (Țârdea C. et colab., 2000). Les principaux indicateurs utilisés sont: concentration en sucre, acidité totale et poids des 100 baies. Pour les vins rouges, la valeur de ces paramètres ne suffit pas à exprimer la qualité de la récolte (Vivas N., 2007). Cette méthode s'intéresse uniquement à l'évolution qualitative de la pulpe, alors que la qualité des vins rouges est principalement liée à celle de la pellicule (De Montmollin S. et colab., 2007). Dans ces conditions, la détermination de la maturité

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phénolique constitue une donnée indispensable dans la détermination de la date optimale de récolte.

MATÉRIEL ET METHODE

Sur la période 2007 – 2009, la Station de recherche-développement pour la Viticulture et la Vinification Bujoru, a suivi sur des parcelles de référence l'évolution de la maturité phénolique des cépages rouges suivants: Merlot, Cabernet Sauvignon, Fetească neagră, Burgund et Băbească neagră. Des échantillons de raisin sont été récoltés tous les 5 jours, à partir de la veraison jusqu'à la surmaturité. Sur chacun des échantillons, les analyses suivantes ont été effectuées: poids des 100 baies, sucres (réfractomètre), acidité totale (par titration), concentration anthocyannique (méthode Puissant-Léon). À chaque étape de la maturité (maturité technologique - MT, concentration maximale en anthocyanes - MA et phénolique - MP), des raisins de chacun des 5 cépages étudiés ont été vinifiés à la cave expérimentale de SCDVV Bujoru. Les vins obtenus sont ensuite analysés et dégustés par un groupe de chercheurs de la station.

RÉSULTATS ET DISCUSSIONS

Parmi les différents composés phénoliques, ont été utilisés comme marqueurs de la maturité phénolique, les anthocyanes. À l'aide des résultats obtenus a été construite une courbe qui représente l'évolution des anthocyanes tout au long de l'évolution de la maturité des raisins (fig. 1, 2, 3, 4, 5).

De tous les cépages analysés dans le vignoble „Dealul Bujorului”, c'est le Cabernet Sauvignon (fig. 1) qui présente le potentiel le plus élevé d'accumulation des anthocyanes. Quoique, le cépage atteint sa maturité phénolique environ 4 jours après sa pleine maturité, suivie d'une légère perte d'anthocyanes, il supporte plus facilement la surmaturité, ce qui implique une période de récolte prolongée.

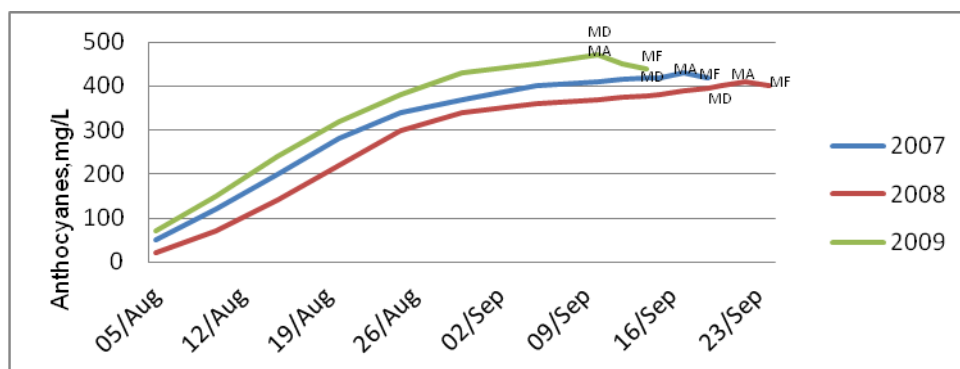


Fig. 1 – Dynamique d'accumulation des anthocyanes du cépage Cabernet Sauvignon

Le Merlot et la Fetească neagră, cépages avec un bon potentiel anthocyannique, atteignent la maturité phénolique environ une semaine avant le

Cabernet Sauvignon (fig. 2 și 3). Le décalage entre la pleine maturité et celle phénolique est plus réduite pour ces cépages, en revanche, la diminution des anthocyanes étant, notamment pour Feteasca neagră, très rapide, leur période de récolte est plus courte. Dans cette situation, la vendange doit être réalisée rapidement, idéalement avec une légère surmaturité.

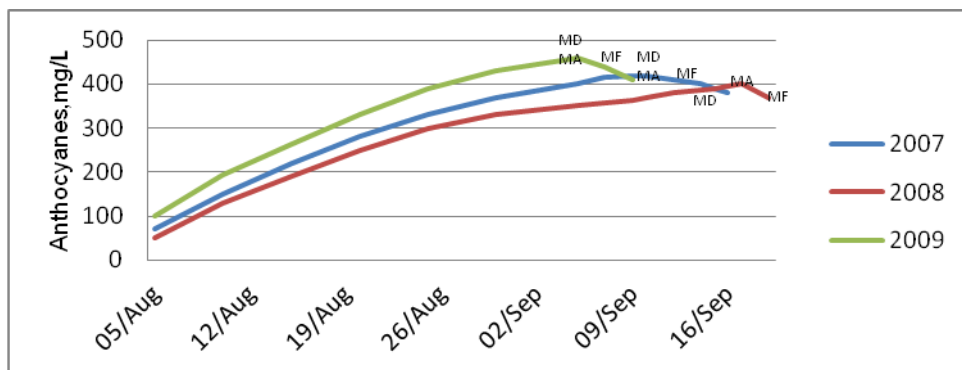


Fig. 2– Dynamique d'accumulation des anthocyanes du cépage Merlot

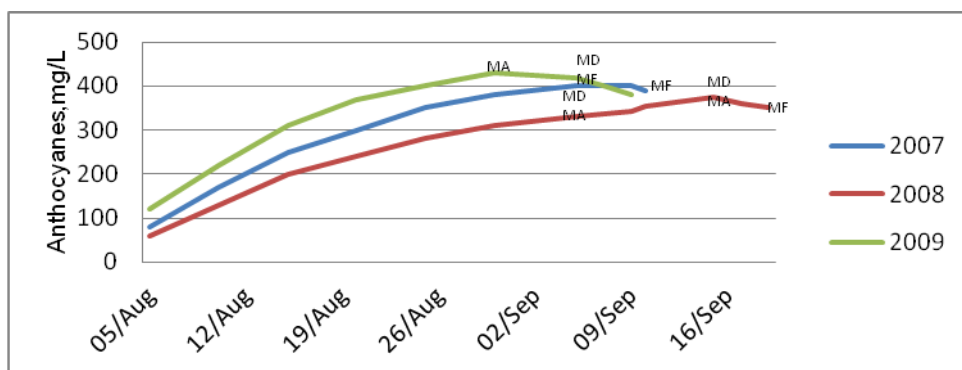


Fig. 3 – Dynamique d'accumulation des anthocyanes du cépage Feteasca neagră

Avec un potentiel anthocyanique plus bas, le Burgund c'est le cépage qui, dans la vignoble „Dealul Bujorului”, réalise au plus tard sa maturité phénolique (fig. 4). L'accroissement des anthocyanes est plus lente et plus longue que pour celle des autres cépages étudiés. Comme pour Cabernet sauvignon, sa période de récolte est longue, supportant facilement la surmaturité. La Băbeasca neagră est le cépage présentant le potentiel anthocyanique le plus faible (fig. 5). Identique au Cabernet Sauvignon, il atteint la maturité phénolique environ 4 jours après la pleine maturité. Les pertes en anthocyanes pendant la période de surmaturité étant

plus petites que pur le Merlot ou la Feteasca neagră, il peut être récolté sur une période plus longue que ces dernière.

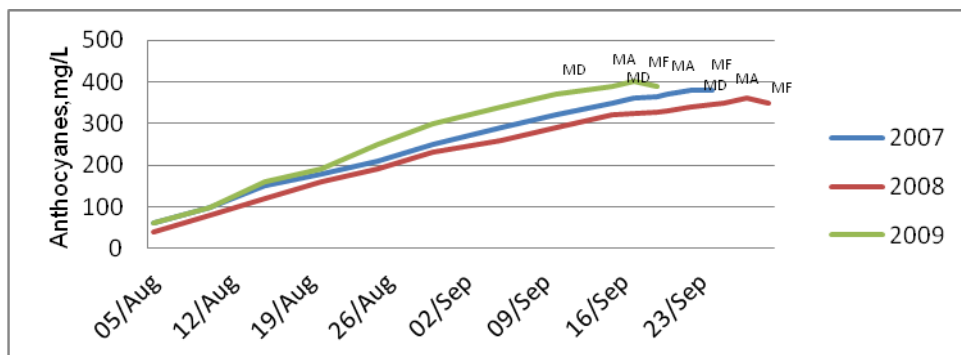


Fig. 4 – Dynamique d'accumulation des anthocyanes du cépage Burgund

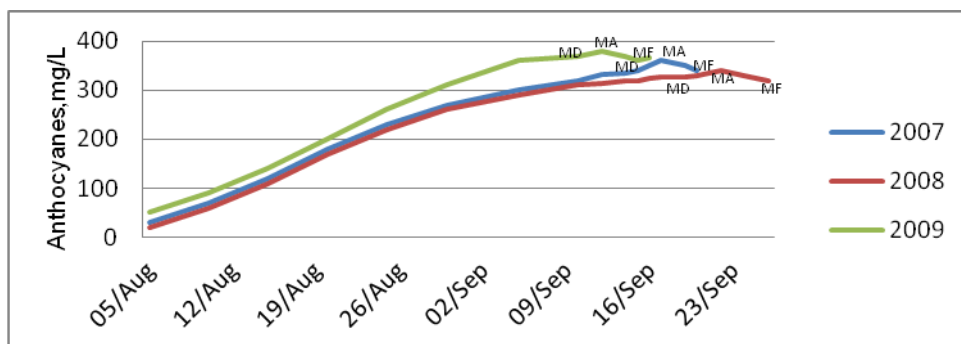


Fig. 5 – Dynamique d'accumulation des anthocyanes du cépage Băbească neagră

La période optimale de vendange a été estimée en fonction de la composition chimique et des caractéristiques organoléptiques des vins obtenus à parti des raisins récoltés à la MD – pleine maturité, MA – maxim d'anthocyanes et à la MF – maturité phénolique. Les résultats obtenus (tableaux 1, 2, 3) montrent que les vins les plus riches en anthocyanes ne sont pas obtenus par les raisins récoltés au moment de la MA. Ce phénomène, qui se base sur la maturité phénolique, s'explique par l'augmentation de l'extrahibilité des anthocyanes pendant la sur maturité, résultat du processus de dégradation des membranes cellulaires. En analysant les résultats obtenus, nous estimons le début de la phase de surmaturité, pour les cépages étudiés, au moment de la diminution de la concentration en anthocyanes des pélicules, avec 28-88 mg/kg.

Tableau 1

Relation entre la date de la vendange et les caractéristiques analytiques et organoléptiques des vins, récolte 2007

Moment de la vendange	Cépage														
	Cabernet-Sauvignon			Merlot			Fetească neagră			Burgund			Babească neagră		
	Anthocyanes		Classement des vins	Anthocyanes		Classement des vins	Anthocyanes		Classement des vins	Anthocyanes		Classement des vins	Anthocyanes		Classement des vins
Raisins, mg/kg	Vins, mg/L	Raisins, mg/kg		Vins, mg/L	Raisins, mg/kg		Vins, mg/L	Raisins, mg/kg		Vins, mg/L	Raisins, mg/kg		Vins, mg/L		
MD	1258	692	3	1259	642	2	1203	602	2	1109	566	3	1017	488	2
MA	1287	710	2	1259	642	2	1203	602	2	1139	570	2	1078	528	3
MF	1259	856	1	1228	835	1	1172	785	1	1107	642	1	1049	587	1

Tableau 2

Relation entre la date de la vendange et les caractéristiques analytiques et organoléptiques des vins, récolte 2008

Moment de la vendange	Cépage														
	Cabernet-Sauvignon			Merlot			Fetească neagră			Burgund			Babească neagră		
	Anthocyanes		Classement des vins	Anthocyanes		Classement des vins	Anthocyanes		Classement des vins	Anthocyanes		Classement des vins	Anthocyanes		Classement des vins
Raisins, mg/kg	Vins, mg/L	Raisins, mg/kg		Vins, mg/L	Raisins, mg/kg		Vins, mg/L	Raisins, mg/kg		Vins, mg/L	Raisins, mg/kg		Vins, mg/L		
MD	1198	647	3	1170	585	3	1122	550	2	1052	505	3	988	464	2
MA	1230	676	2	1194	597	2	1122	550	2	1079	518	2	1022	491	3
MF	1198	785	1	1106	741	1	1079	702	1	1048	597	1	989	543	1

Tableau3

Relation entre la date de la vendange et les caractéristiques analytiques et organoléptiques des vins, récolte 2009

Moment de la vendange	Cépage														
	Cabernet-Sauvignon			Merlot			Fetească neagră			Burgund			Babească neagră		
	Anthocyanes		Classement des vins	Anthocyanes		Classement des vins	Anthocyanes		Classement des vins	Anthocyanes		Classement des vins	Anthocyanes		Classement des vins
Raisins, mg/kg	Vins, mg/L	Raisins, mg/kg		Vins, mg/L	Raisins, mg/kg		Vins, mg/L	Raisins, mg/kg		Vins, mg/L	Raisins, mg/kg		Vins, mg/L		
MD	1405	788	2	1379	731	2	1258	855	1	1168	607	3	111	533	2
MA	1405	788	2	1379	731	2	1291	671	2	1197	610	2	1138	558	3
MF	1348	918	1	1318	883	1	1258	855	1	1168	701	1	1105	630	1

Suite aux dégustations organoléptiques réalisés, les vins les plus appréciés sont été, à chaque fois ceux obtenus avec des raisins vendangés au moment de la maturité phénolique. Ces vins ont été décrits comme plus fruités, extraits, équilibrés et intenses en couleur.

CONCLUSIONS

1. Dans le vignoble „Dealul Bujorului”, les principaux cépages pour vins rouges arrivent à la maturité phénolique lorsque le niveau d'anthocyanes dans la pellicule des baies commence à diminuer, autour 28-88 mg/kg;

2. Dans la majorité des cas, les cépages étudiés atteignent leur maturité phénolique environ 2 à 4 jours après leur pleine maturité;

3. Au cours des 3 années d'étude, la maturité phénolique fut atteinte entre le 12.09 et le 24.09 pour Cabernet sauvignon, entre 7 et 19.09 pour le Merlot, le 5 et le 17.09 pour la Feteasca neagră, le 19 et le 29.09 pour le Burgund et entre le 14 et le 24.09 pour la Băbeasca neagră;

4. Les vins obtenus à partir des raisins récoltés en pleine maturité phénolique sont les plus riches en anthocyanes et les plus appréciés d'un point de vue organoléptique.

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COMPOUNDS WITH SENSORIAL CHARACTER OF TAMĂIOASA ROMANEASCA WINES OBTAINED THROUGH DIFFERENT MACERATION TECHNOLOGIES

COMPUȘI CU CARACTER OLFACTIV DIN VINURILE DE TĂMĂIOASĂ ROMÂNEASCĂ OBTINUTE PRIN DIVERSE TEHNOLOGII DE MACERARE

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Abstract. *The volatile compounds in local origin Romanian wines represent an insufficiently researched domain. This study wants to identify aroma substances in Tămăioasă românească wines from Cotnari vineyard, in the northeast of Romania. During 2007 harvest, different maceration technologies were applied to Tamăioasă românească grapes like: classical maceration, cryo-maceration, ultrasound maceration and microwave maceration. A SPE extraction prior to gas-chromatography mass-spectrometry was used to determine individual aroma compounds. As expected, Tamăioasă românească has terpenes, acids, alcohols and esters that form its highly appreciated aroma. At the same time, the variation of these compounds according to the used maceration method is described.*

Key words: Tamăioasă românească wines, maceration technologies, aroma compounds

Rezumat. *Compușii aromați din vinurile românești reprezintă un domeniu puțin studiat. Această lucrare are ca obiectiv principal identificarea substanțelor ce imprimă note senzoriale vinurilor obținute din struguri de Tămăioasă românească recoltați din podgoria Cotnari, în anul 2007. Vinurile au fost procesate prin aplicarea diverselor tehnologii de macerare (macerare pe boștină, criomacerare, macerare cu ultrasunete, macerare cu microunde). Vinurile au fost analizate prin gazcromatografiere cuplată cu extracție în fază solidă, identificându-se astfel compuși (terpene, acizi, alcooli și esteri) ce concură la formarea aromei. Este, de asemenea, descrisă și variația diversilor compuși identificați în funcție de metoda de macerare utilizată.*

Cuvinte cheie: vinuri Tămăioasă românească, tehnologii de macerare, compuși de aromă

INTRODUCTION

Aromatic wines represent a very narrow segment on the Romanian and international wine market, defavoured because of the small production yields and bad marketing. Tămăioasă românească, Muscat Ottonel and Busuioacă de Bohotin are the main three grape varieties used in the production of aromatic

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wines. A fourth variety, Gewürtztraminer, is cultivated only in the west of the country.

Up to the present, the technology for obtaining these wines was not efficiently researched. This article studies the processing of Tămâioasă românească wines in order to diversify and enlarge the aromatic wine segment on the market.

The aromatic profile of wines is determined by the combined effects of hundreds of chemical compounds (Cabaroğlu, T, 1997; Cotea D.V., 1985, Cotea, 1988). The formation of the aroma bouquet depends on many factors that are dependent on the cultural conditions of the vineyard but also on the production technologies, fermentation conditions and aging of the wine (Marais J., 1988, Günata Y.Z, 1993).

Although there are many data concerning the type and chemical composition of aromatic substances, at present, little is known about the optimisation of maceration technologies for an improved extraction of volatile compounds. Evaluation of the maceration methods for a higher extraction degree becomes an essential objective in optimisation of wine production technologies.

This study is focused especially on the first part of the wine-making process – maceration – analysing in parallel both classical tendencies (skin contact maceration, enzymatic maceration) as well as modern technologies: ultrasound maceration, microwave maceration and cryomaceration.

This article tries to make some light on the effect of different maceration technologies on the aromatic compounds extraction and presence in Tămâioasă românească wines.

MATERIAL AND METHOD

Variante V0. Control sample: Tămâioasă românească grapes were processed by observing the stages of the general technological flux for white non-aromatic wines. As such, after crushing and de-stemming, the must was pressed directly, without any contact with the grape skins. Fermentation occurred as a result of the activity of the indigenous yeasts. The wines were racked, conditioned, filtered and bottled.

Variante V1. Enzymatic maceration: Maceration with/by means of enzymes was performed by using two commercial enzymatic products, ZYMARÔME G[®] and ZYMOCLAIRE Muscat[®]. Three aromatic wines-specific yeasts were also used (FERMOL AROMATIC[®], FERMACTIVE MUSCAT[®] and FERMOL GRAND ROUGE NATURE[®]) and non-aromatic wines-specific yeasts (FERMACTIVE AP[®]) were added in the control sample.

Variante V2. Classical maceration: The de-stemmed and crushed grapes underwent classical maceration, i.e., 12 and 48 hours respectively, following which fermentation took place for two weeks at low temperatures, 15°C maximum.

Variante V3. Microwave maceration: Microwave maceration was performed by means of the microwave oven from the Oenology Laboratory. The must was radiated at 350W and 650 W.

Variante V4. Ultrasound maceration: Ultrasound maceration was carried out with the help of the ultrasound bath from the Oenology Laboratory (45 kHz frequency, 160W power).

Variante V5. Criomaceration :The grape samples were stored in the freezer at

ca. -20 °C and then crushed while still frozen.

All of the musts obtained as described above were pressed with a hydraulic press and then moved to glass containers to complete alcoholic fermentation with Fermactive Ap[®] yeast. The wines were racked, conditioned, filtered and bottled.

The samples obtained through the process described above were subjected to the SPE extraction by means of LiChrolut EN/RP-18 (40-120 µm) 100 mg and RP (40-63 µm) 200 mg, 6mL Standard PP and LiChrolut EN (40-120 µm) 500 mg, 6 mL Standard PP cartridges.

20 mL wine samples were passed through a C¹⁸ bed SPE cartridge. The adsorbant bed was first conditioned with 10 mL dichlormethane, 10 mL metanol and 10 mL aquaeous solution of ethanol 13% v/v. The adsorbant bed was dried up by means of a 20-minute forced air jet. The compounds retained in the adsorbant layer were then recovered by percolating the bed with 2 mL diclormethane. The resulting extract was sealed hermetically and then injected into the Shimadzu GC-2010 gas-chromatograph coupled with a QP2010 Plus mass spectrometer.

1000 µL extract were injected splitless into the chromatographic pipe. The duration of the analysis/test was 72 minutes for each wine sample. The aroma compounds were determined by means of the NIST 08, Wiley 08 and SZTERP spectrum library. The acceptable resemblance percentage was fixed to no less than 70%. The area of the representative peak for each compound is considered to be a direct proportion of the amount of the respective substance in the wine sample.

RESULTS AND DISCUSSIONS

The compound linalool from the control sample of Tămăioasă românească from 2007 is generally in smaller quantities than the same compounds indentified in wines obtained through different maceration methods (fig. 1).

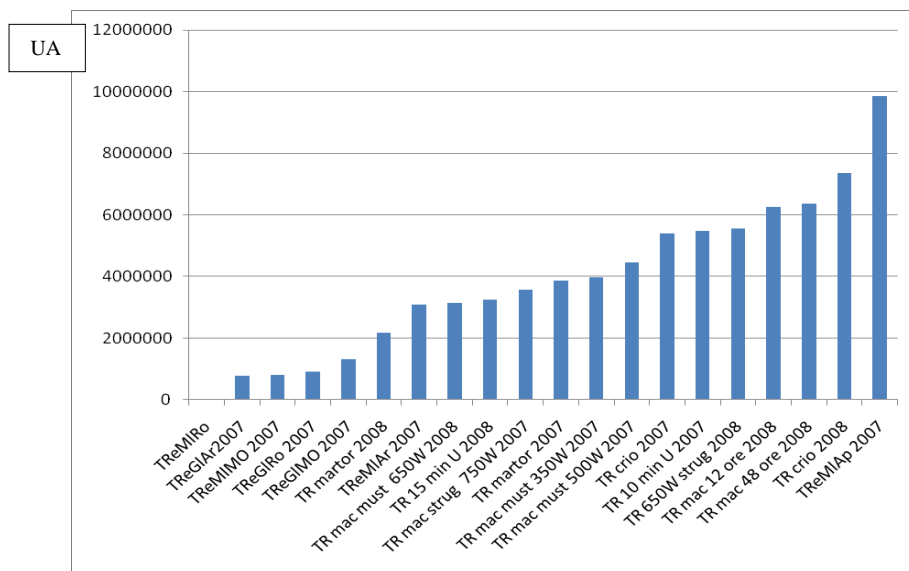


Fig. 1 - Variation of linalool in Tămăioasă românească wines processed through different maceration technologies

The highest quantities are found in wine samples processed with Zymoclaire M[®] and Fermactive Ap[®], but also Fermactive Aromatic[®]. In the sample that was obtained by adding the yeast Grand Rouge Nature[®] linalool was beyond detection levels. The highest quantity of linalool among all the samples obtained by microwave maceration was found in the wine variant processed through irradiation of the garpe berries at 650W. Classical skin contact maceration for 48 hours does not extract more linalool than the 12 hours skin contact variant.

The highest quantity of hexanoic acid (compound with a fould odour, of stables and goats) is found in Tămâioasă românească wines obtained by enzymatic maceration with Zymoclaire M[®] and Fermactive Ap[®] as well as in Tămâioasă românească processed through cryomaceration. Average quantities of hexanoic acid are identified in wines processed by enzymatic treatments with Fermol Aromatic[®], Fermactive Muscat[®] and Fermol Grand Rouge Nature[®], as well as in samples obtained through ultrasounds for 10, respectively 15 minutes, and, finally, in the control sample from 2008. In the rest of the wine samples, hexanoic acid decreases, being under the detection limit in TreMIAr (fig. 2).

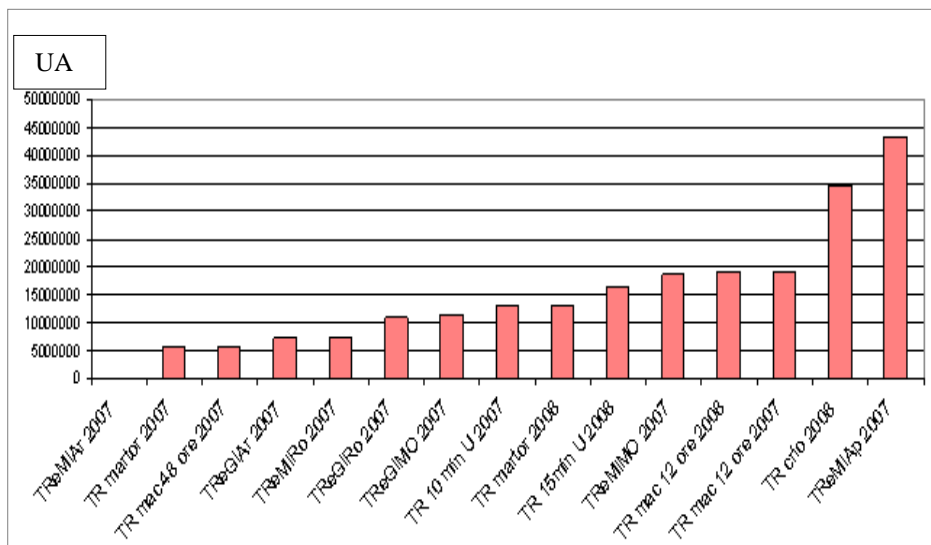


Fig. 2 - Variation of hexanoic acid in Tămâioasă românească wines processed through different maceration technologies

Phenylethylalcohol, a compound smelling of roses, identified in essential oils of roses and neroli flowers (*Citrus aurantium*) has been found in maximum amounts in the Tămâioasă românească sample obtained through enzymatic maceration with enzyme Zymoclaire M[®] and Fermactive Ap[®] yeast. The lowest results are registered in the samples treated with Zymarome G[®] and yeasts Fermol Aromatic[®], Fermol Grand Rouge Nature[®] as well as Fermactive Muscat[®]. Average quantities of phenylethyl alcohol are registered in control samples, cryomaceration samples and microwave maceration too (fig. 3).

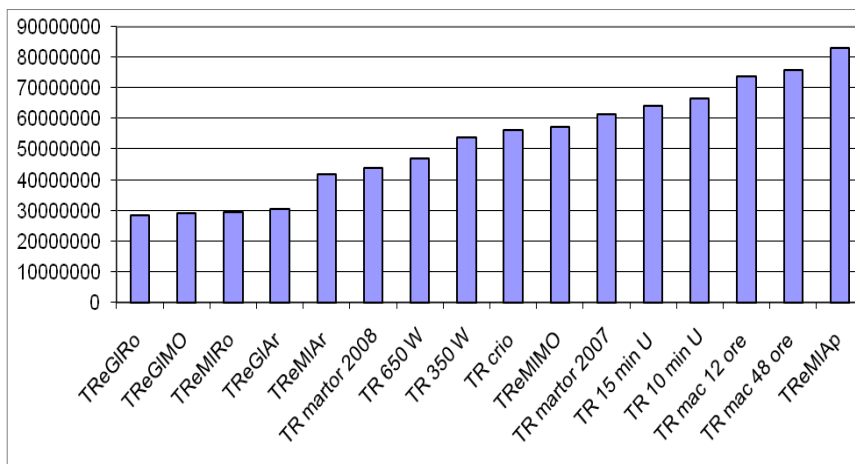


Fig. 3 - Variation of phenylethyl alcohol in Tămâioasă românească wines processed through different maceration technologies

Isoamylac acetate, with its powerful banana aroma is well represented in Tămâioasă românească wines obtained by different maceration methods. The highest quantity is found in the sample processed through criomacerație and the variant treated with the enzyme Zymoclaire Muscat® and the yeast Fermactive Ap®. Small quantities were found in control samples and the wine samples processed through ultrasounds macerație for 10 minutes and skin contact macerație for 48 hours (fig. 4).

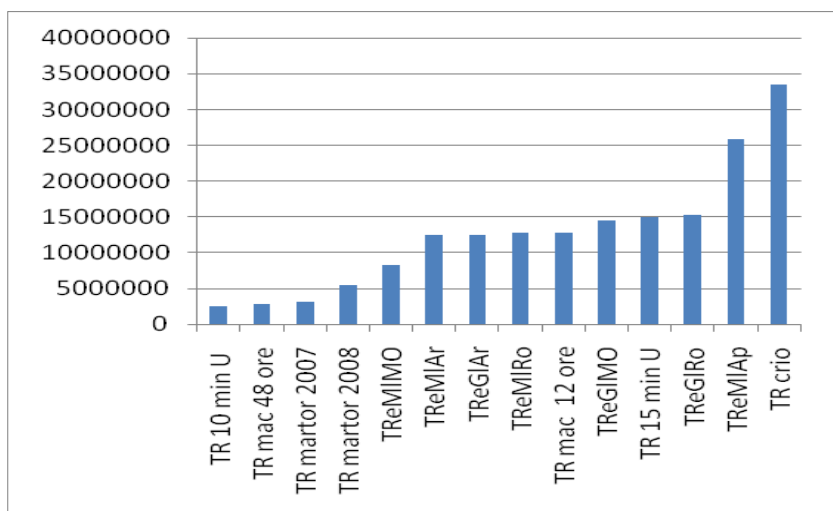


Fig. 4 - Variation of isoamylac acetate in Tămâioasă românească wines processed through different maceration technologies

CONCLUSIONS

1. In Tămâioasă românească wine samples processed through cryomaceration and enzymatic maceration are registered the highest amounts of linalool.

2. Phenylethyl alcohol was identified in maximum quantity in the Tămâioasă românească sample obtained by enzymatic maceration with Zymoclaire M[®] and yeast Fermactive Ap[®].

3. The highest amount of hexanoic acid was identified in the Tămâioasă românească wine sample processed with Zymoclaire M[®] and Fermactive Ap[®] and the sample obtained through cryomaceration.

4. Classical skin contact maceration leads to the formation of a reduced number of esters, while cryomaceration favours the increase in esters' number. During ultrasounds maceration, the identified esters decrease in number and quantity.

5. The results of this study represent the first scientific based steps of creating methods for modulating the sensorial characteristics of wine, through the maceration phase.

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CONSIDERATIONS REGARDING THE OPTIMIZATION OF THE TECHNOLOGY FOR THE OBTAINING OF BĂBEASCĂ NEAGRĂ RED WINES

CONSIDERAȚII CU PRIVIRE LA OPTIMIZAREA TEHNOLOGIEI DE OBȚINERE A VINURILOR ROȘII DE BĂBEASCĂ NEAGRĂ

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Abstract. *This study focuses on the optimization of the processing technologies for black grapes from Băbească neagră variety harvested from Odobești vineyard in 2010. The paper intends to establish the level of influence of the maceration-fermentation technology on the characteristics of obtained wines and the comparison of wines in order to highlight the oenological potential of the variety. The wines were obtained using the different procedures of maceration-fermentation (classical maceration as a blank test, maceration in rotating cisterns, thermal maceration, carbonic maceration, the variant of concentration of color intensity, maceration by means of ultrasounds and maceration by means of microwaves). The results of tests run showed that the process of maceration-fermentation influence the composition characteristics of wines. All maceration-fermentation variants produced wines superior to the black test. The variant by thermal maceration and the maceration by microwaves stood out in the global evaluation.*

Key words: Băbească neagră, maceration fermentation, chromatic parameters, optimization of technology.

Rezumat. *Studiul de față urmărește să optimizeze tehnologiile de prelucrare a strugurilor negri din soiul Băbească neagră, recoltați din podgoria Odobești, producția anului 2010. Lucrarea se axează pe stabilirea gradului de influență a tehnologiei de macerare-fermentare asupra caracteristicilor vinurilor obținute și compararea vinurilor în vederea evidențierii potențialului oenologic al soiului. Vinurile au fost obținute folosind diferite procedee de macerare-fermentare (macerare clasică ca variantă martor, macerare în cisterne rotative, termomacerație, macerație carbonică, varianta de concentrare a intensității colorante, macerare cu ajutorul ultrasunetelor și macerare cu ajutorul microundelor). Rezultatele analizelor efectuate au arătat că procedeele de macerare-fermentare influențează caracteristicile de compoziție ale vinurilor. Toate variantele de macerare-fermentare au dat vinuri superioare martorului. La o evaluare globală, între acestea se evidențiază varianta termomacerației și cea de macerare cu ajutorul microundelor.*

Cuvinte cheie: Băbească neagră, macerare fermentare, parametri cromatici, optimizarea tehnologiei.

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INTRODUCTION

The physical-chemical parameters of wines vary very much depending on the composition characteristics of grapes when harvested and the technology used.

For this purpose, in order to maximally turn the characteristics of the variety to good use (potential of sugars accumulation, adaptation to the ecopedoclimatic conditions of Moldavian vineyards, productivity), it is necessary to optimize technology to obtain red wines of a constant quality every year.

MATERIAL AND METHOD

In the elaboration of this study, we used black grapes from the Romanian variety Băbească neagră harvested from Odobești vineyard (Cotea D.V. et al., 2000), the viticultural center of Odobești, year of production 2010, having the following composition characteristics: 201.82 g/L reducing sugars and a total acidity expressed in g/L $C_4H_6O_6$, of 9.03 g/L. Harvesting was made manually and the grapes were put in wooden cases. The grapes were then transported and processed at the pilot Station for vinification of the Faculty of Horticulture, Iași.

Grapes were mashed and detached from bunches and the obtained must was homogenized and processed differently, as follows:

In case of the **maceration-fermentation technology – the blank test** - the must was inoculated with selected yeasts of *Saccharomyces cerevisiae*, in proportion of 30 g/100 kg, must and pectolitic enzymes in proportion of 1.5 g/100 kg of mashed grapes. Maceration-fermentation was made in stainless steel cisterns for 120 hours with the refitting of must four times a day for 30 minutes. After the process of maceration-fermentation stopped, the mashed grapes were pressed by means of a hydraulic press and the must obtained was put into stainless steel containers where it finished the alcoholic and malolactic fermentation. After the malolactic fermentation ended, the wine was drawn off from its lees and conditioned according to its quality category. Bottling was made after the preliminary filtering by means of a plate filter.

The variant of **concentration of the coloring intensity** (improvement of chromatic parameters) was made through the extraction of 10% from the must obtained without pressing the grapes, but subsequently the technological operations were identical to the ones from the classical maceration-fermentation.

As for the technology of **maceration-fermentation in rotating cisterns**, after having obtained the mashed grapes they were put into stainless steel containers for 72 hours and homogenization took place by rotation for six times a day, every rotation lasting for 20 minutes. After this process, the mashed grapes followed the same method as in the case of classical vinification variant.

Thermal maceration was made by heating the partially sieved mashed grapes at 70°C for 30 minutes and its mixing with the non-heated previously separated must. After cooling at 20°C, insemination took place and the technological flow was almost identical as for the blank test variant.

Experiments showed and reality confirmed that heating the mashed grapes at 70°C for 15-30 minutes makes the extraction of anthocianins easy and oxidases are inactivated (Cotea V. D., 1985).

The technological variant of **carbonic maceration** was carried out without smashing the grapes or detaching them from bunches. Thus, the whole and good grapes were put into a closed container provided in its lower part with a grid situated at a 20 cm distance from the bottom of the vessel. Under the grid we put Băbească neagră must inoculated with yeast and in full alcoholic fermentation to provide the CO_2 atmosphere

necessary for the good unfolding of the carbonic maceration process. The carbonic maceration process was considered as finished when the grapes had a brick-like colour (Cotea V.V. and Cotea D.V., 2006), the skins of grapes were partially or totally discolored and grapes could be easily mashed. At that moment, the resulted mashed grapes were processed in a manner similar to the blank test. We must mention that the process took place at a temperature of 28-30°C for 12 days.

In case of the **maceration technology by means of ultrasounds**, we used the power of 2000 W and the frequency of 35 kHz for 15 minutes. Then, the mashed grapes followed the same technologic flow as in the case of classical vinification technology.

In case of the **maceration technology by means of microwaves**, the mashed grapes were subjected to the irradiation energy of 750 W for 15 minutes. After 30 minutes, the mashed grapes were brought to the temperature of 20°C, and a third of the mashed grapes were not heated. The subsequent operations were identical as in the case of the technology of classical maceration fermentation.

The physical-chemical tests were run on the basis of the methods indicated by the international and state standards and the specialized literature as well. We determined the alcoholic concentration, the reducing sugars, total acidity, volatile acidity, the relative density, total dry extract and non-reducing extract for the variants of wines obtained. We also calculated the values of the chromatic parameters, the content in total phenolic compounds and anthocians. In this paper we used the following abbreviations: classical maceration-fermentation – M – blank test, variant of concentration of the coloring intensity (improvement of chromatic parameters) – V1; maceration-fermentation in rotating cisterns – variant V2; thermal maceration – variant V3; carbonic maceration – variant V4; maceration by ultrasounds – variant V5; maceration by microwaves – variant V6.

RESULTS AND DISCUSSIONS

The main composition characteristics of the wines obtained from Băbească neagră variety by different maceration-fermentation technologies are presented in table 1. The alcoholic concentration of wines varied from the minimal value of 10.6% vol. for V3 to the maximal value of 12.24% vol. for V6 (tab.1). From the viewpoint of content in reducing sugars, wines fall into the category of dry wines having a maximum content of 4g/L. as for the non-reducing extract of wines, this parameter is superior for the blank test, except V3, the highest value being registered by V6 – 23.05 g/L. By comparing the maceration-fermentation technologies, in terms of total acidity of wines expressed in g/L $C_4H_6O_6$, we might notice that the lowest value was registered by the wine obtained through carbonic maceration technology (V3) - 5.56 g/L and to the opposite pole was the wine obtained by classical maceration fermentation (M) – 7.08 g/L; as for the other technologies, the values obtained were relatively close. We may also notice that for pH, the highest value was registered by V3, a sample obtained by carbonic maceration.

L clarity, a colour component measured through CIE Lab 76 method (tab. 2), characterizes the visual aspect more or less “bright” of wine colour and it may range between zero for a black-opaque sample and 100 for transparent colourless samples. In our case, it varied between 36.89 for V6 and 78.35 for V3. If we compare technologies among them, we may notice that, except for the carbonic maceration, variants V2, V4 and V6 had close values showing the efficiency of these maceration-fermentation technologies in the obtaining of more intensely colored wines.

Table 1

Compositional characteristics of red wines

No	Technological variant	Alcohol conc. (% vol.)	Reductive sugars (g/L)	Relative density at 20°C	Total dry extract (g/L)	Non reductive extract (g/L)	Total acidity g/L C ₄ H ₆ O ₆	Volatile acidity g/L C ₂ H ₄ O ₂	pH	SO ₂ free (mg/L)	SO ₂ total (mg/L)
1	M	11,92	3,23	0,9938	24,8	21,57	7,08	0,18	3,42	14,25	45,83
2	V 1	12,1	2,56	0,9938	25,3	22,74	6,57	0,16	3,56	13,16	38,12
3	V 2	12,19	3,29	0,9941	26,1	22,81	6,19	0,32	3,64	14,84	45,36
4	V 3	10,6	1,43	0,9927	17,7	16,27	5,56	0,64	3,71	12,54	49,21
5	V 4	12,05	2,19	0,9938	25	22,81	6,63	0,20	3,52	15,31	48,14
6	V 5	12,03	2,87	0,9938	25	22,13	6,42	0,29	3,47	14,28	44,85
7	V 6	12,24	3,25	0,9940	26,3	23,05	6,24	0,31	3,61	10,72	32,16

Table 2

Values of the chromatic parameters of red wines obtained from Băbească neagră

No	Technological variant	Clarity L	Color coordinates		Saturation C	Tonality H	Luminosity	Hue
			a red(+) - green(-)	a red(+) - green(-)				
1.	M	64.07	59.28	20.51	56.93	13.85	1.85	0.84
2.	V 1	51.30	40.62	10.97	42.08	15.12	2.48	0.76
3.	V 2	38.89	56.47	15.63	59.54	18.49	3.30	0.63
4.	V 3	78.35	21.79	34.81	24.19	31.56	0.96	0.89
5.	V 4	43.14	48.45	16.14	51.07	18.43	2.79	0.71
6.	V 5	52.95	52.11	15.39	54.33	16.46	2.46	0.77
7.	V 6	40.61	52.85	16.52	55.37	17.36	2.87	0.65

As for the content in anthocyanins (tab. 3) of Băbească neagră wines obtained by different maceration-fermentation methods, we may notice that the highest values of anthocyanins were registered by variants V2 (321.16 mg/L), V6 (317.95 mg/L) V4 (308.83 mg/L), V1 (299.34), V5 (297.41) and M (278.75 mg/L). Carbonic maceration (V3) registered the lowest value of 171.29 mg/L for the content in anthocyanins meaning that this maceration-fermentation variant does not favor the extraction of colour compounds and so we may obtain low alcohol poorly extractive wines having a low coloring density (Cotea D.V. et al, 2009).

In case of the content of total phenolic compounds (tab. 4), expressed both quantitatively in mg/L and by characteristic indices (D280, IFC), one may notice the same order for the content in anthocyanins since the maximum value was 2324.48 for V2, and the minimum value was 1495.53 for V3.

Table 3

Anthocyanins content

No	Technological variant	Anthocyanins mg/L
1.	M	278.75
2.	V 1	299.34
3.	V 2	321.16
4.	V 3	171.29
5.	V 4	308.83
6.	V 5	297.41
7.	V 6	317.95

Table 4

Phenolic compounds content in obtained wines

No	Technological variant	CFT mg/L	D ₂₈₀	IFc
1.	M	2183.24	21.12	15.09
2.	V 1	2226.17	21.37	15.26
3.	V 2	2324.48	21.97	15.69
4.	V 3	1495.53	14.86	10.61
5.	V 4	2257.93	21.54	15.39
6.	V 5	2213.45	21.35	15.25
7.	V 6	2291.62	21.93	15.66

CONCLUSIONS

1. There is a technological advantage related to the accumulation of colour compounds for the more severe maceration and extraction methods: thermal maceration, maceration by microwaves and concentration of coloring intensity.

2. The results for the maceration-fermentation variants are superior to the blank test, and V2 (thermal maceration) and V6 (maceration by microwaves) exceptionally stood out.

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TESTING NEW GRANULAR YEAST STRAINS IN SECONDARY FERMENTATION BOTTLES FOR OBTAINING SPARKLING WINES

TESTAREA UNOR SUȘE NOI DE LEVURI GRANULARE ÎN FERMENTAȚIA ADOUA ÎN BUTELII PENTRU OBȚINEREA VINURILOR SPUMANTE

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Abstract. During the secondary fermentation in bottles six granular yeast strains were tested which were isolated from Iași vineyard –Copou wine center. The aim of the study was to select the yeast strains with most suitable fermentation features for making high-quality wines. To achieve this objective, the same dosage was used in the trial, the variable parameter being only the biological agent, respectively leavens obtained from the tested yeast strains. After mixing the dosage (raw wine, yeasts, liqueur de tirage) we carried out physical-chemical tests and the information obtained was used for the dynamic survey of changes occurring in the secondary fermentation in bottles. Based on the dynamic results of some physical – chemical parameters and of the organoleptic features of sparkling wines made, we drew the conclusion that from the six tested yeasts, four may be considered suitable for making sparkling wines.

Key words: sparkling wine, secondary fermentation, yeasts

Rezumat. În fermentația a doua în butelii au fost testate șase sușe de levuri granulare noi izolate din podgoria Iași – centrul viticol Copou. Scopul lucrării a fost de a selecta din acest lot sușele de levuri cu proprietăți fermentative optime în procesul de obținere a vinurilor spumante de calitate. Pentru realizarea acestui obiectiv, în experiment s-a folosit același amestec de tiraj, parametrul variabil fiind doar agentul biologic, respectiv maielele obținute din sușele de levuri testate. După omogenizarea amestecului de tiraj (vin materie primă, levuri, licoarea de tiraj) s-au efectuat analizele fizico – chimice, datele obținute fiind utilizate pentru urmărirea în dinamică a modificărilor survenite în timpul celei de a doua fermentații în butelii. Pe baza rezultatelor în dinamică a unor parametri fizico-chimice și a caracterizării organoleptice a vinurilor spumante obținute, s-a constatat că din cele șase sușe de levuri testate, patru pot fi considerate performante în tehnologia de obținere a vinurilor spumante.

Cuvinte cheie: vin spumant, fermentatia a doua, sușe levuri

INTRODUCTION

Two categories of yeasts are involved in the technology of making sparkling wines, namely yeast strains with fermentation features for making the

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basic wine and the yeasts triggering the second alcoholic fermentation in high pressure bottles and stainless steel bottles.

The significant role of yeasts used in the second alcoholic fermentation is highlighted in many papers which approached various study directions. Thus, Roșu Cornelia et.al. (1997) studied the influence of yeast strains on the volatile complex. The correlation between the autolytic capacity of yeast strains and the quality of sparkling wines has been studied by authors Todd B.E.N. et.al.(2000), Martinez-Rodrigue A. et al.(2002), Cebollero E. (2005, 2006). Information on the modality of using yeast strains (free cells or immobilized preparations) is found in the papers of Cotea V.V. (2005), Tița O.I. (2005) and Țârdea C. (2010). In addition to these study directions it is necessary to pursue the activity of isolating new yeast strains for obtaining quality sparkling wines.

In this paper we studied, under the conditions of second fermentation in bottles, six new yeast strains isolated from the plantations of Copou Viticulture Center, Iași, which were given the following codes: MNF4, MNF8, MNF11, MNF9, MNC9 and MNC12

The objective of the study was the selection of yeast strains with the best fermentation characteristics for making high quality sparkling wines. After analyzing the results regarding the behavior of yeast strains in the second alcoholic fermentation at high pressure and high alcohol content, we selected from the entire lot of yeasts the strains MNF4, MNF8, MNF11 and MNF9, which determined the making of dry sparkling wines, appreciated from organoleptic point of view.

MATERIAL AND METHOD

In the trials conducted we created approximately identical conditions for testing the six yeast strains. Therefore, for the preparation of the blended wine we used the same wine as raw material and the same dosage of liqueur. The variable constituent of the blended wine was the yeast obtained from the tested strains. The blended wines were analyzed from physical-chemical point of view, determining by OIV methods the alcohol (vol %), sugars (g/L), total acidity (g sulfuric acid /L), volatile acidity (g acetic acid /L), SO₂ free (mg/L), SO₂ total (mg/L) and pH.

The blends were poured into 150 bottles grouped into six lots, with 25 bottles for each yeast strain tested. For practical reasons, a control aphrometer was attached to one bottle from each lot, to measure the inside pressure every three days. Moreover, at the same time interval, a bottle was taken out from the trial in order to make chemical determinations regarding sugar consumption. At the end of the trial the sparkling wines obtained were analyzed from organoleptic and physical-chemical point of view

RESULTS AND DISCUSSIONS

The selection of the best yeast strains for sparkling wine making is a difficult process which involves a progressive selection according to their fermentation features. After the preliminary tests which allowed the selection of yeasts which are non-foaming, alcoholigenic, nonadhesive to the walls of the

bottles and which make compact, stable or granular deposits, a new testing stage was necessary, in particular the assessment of their ability to trigger and finish alcoholic fermentation in the bottles, in conditions of pressure and high alcohol content.

For the trials we used a raw material wine whose physical-chemical features are shown in table 1.

Table 1

Physical –chemical features of the raw material wine

Variety	Alcohol (vol %)	Total acidity (g/L H ₂ SO ₄)	Volatile acidity (g/L CH ₃ COOH)	SO ₂ free (mg/L)	total SO ₂ (mg/L)	pH
Fetească regală	10,6	4,5	0,32	26	78	3,41

The blends which were obtained from the same amount of wine – raw material, liqueur and yeasts had a slightly different chemical composition. This aspect is suggested by the data shown in table 2.

Table 2

Physical –chemical features of blends

No.	Yeast strain	Alcohol (vol %)	Sugars (g/L)	Total acidity (g/L H ₂ SO ₄)	Volatile acidity (g/L CH ₃ COOH)	SO ₂ free (mg/L)	SO ₂ total (mg/L)	pH
1	MNF4	10,4	24	5,2	0,30	25	76	3,30
2	MNF8	10,3	24	5,1	0,29	24	73	3,22
3	MNF11	10,4	24	5,2	0,30	25	75	3,35
4	MNF9	10,4	24	5,2	0,30	23	72	3,30
5	MNC9	10,3	24	5,2	0,30	24	74	3,30
6	MNC12	10,4	24	5,1	0,30	23	75	3,32

After the distribution of blended mixes and the performance of corking and capping, the bottles were stored in a special room at 16-18 °C.

Since the third day of the trial we monitored the accumulation of carbon dioxide in bottles, tracking the pressure by means of aphrometers, and sugar consumption was determined through chemical analysis.

In the graphical representation of data, in figures 1 - 6, we noticed that four yeast strains tested, namely MNF4, MNF8, MNF11 and MNF9, had a similar behavior in the second fermentation in bottles.

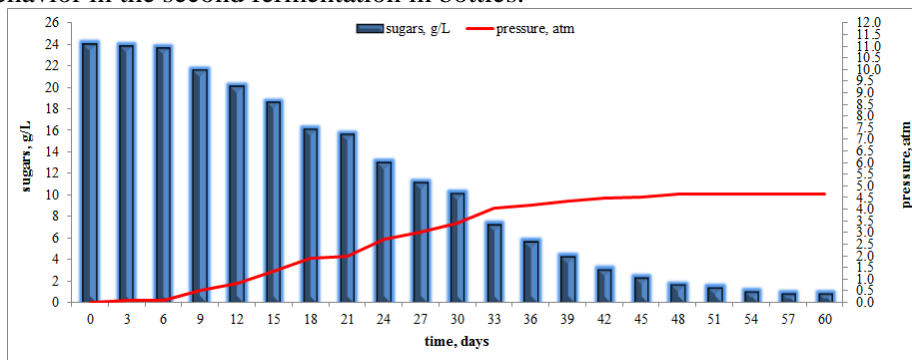


Fig. 1 - Dynamics of reducing sugar consumption and the increase of pressure inside bottles in the second fermentation with MNF4 yeast strain

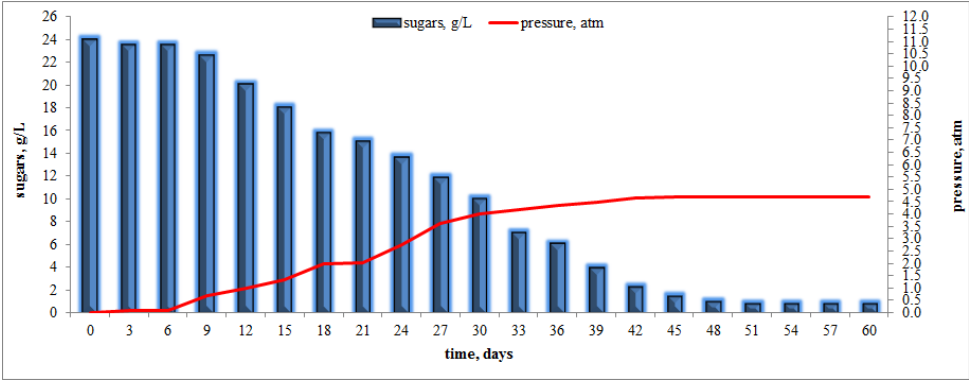


Fig. 2 - Dynamics of reducing sugar consumption and the increase of pressure inside bottles in the second fermentation with MNF8 yeast strain

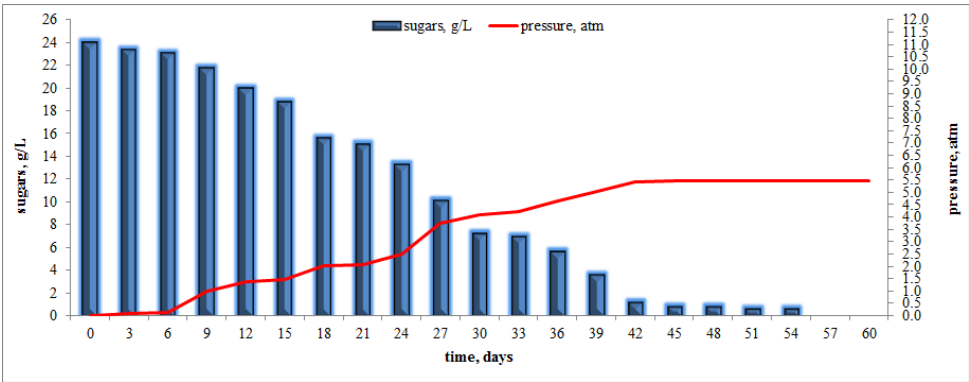


Fig. 3 - Dynamics of reducing sugar consumption and the increase of pressure inside bottles in the second fermentation with MNF11 yeast strain

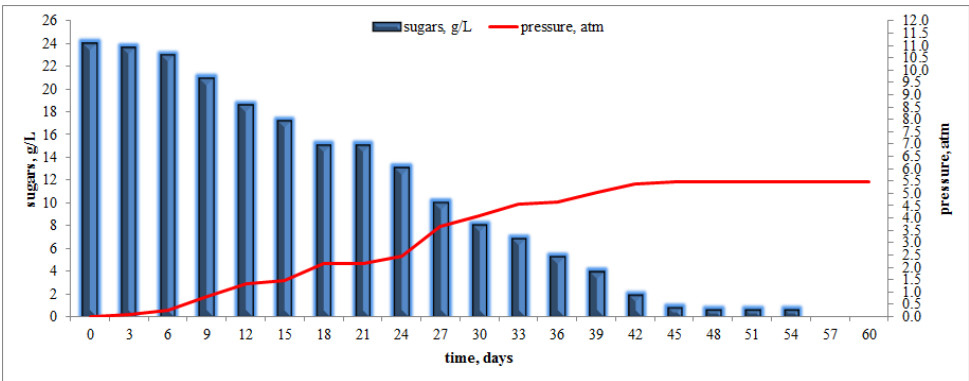


Fig. 4 - Dynamics of reducing sugar consumption and the increase of pressure inside bottles in the second fermentation with MNF9 yeast strain

Pressure growth was noticeable after 6 days, the maximum pressure inside bottles varying according to the yeast strain. Therefore, values of 4.65 bar and 4.70 bar were recorded after 45 and respectively 48 days in the case of MNF4, MNF8 strains and 5.45 bar after 42 and respectively 45 days, for MNF11 and MNF9 strains. Knowing maximum pressure inside bottles and the number of days

to reach that level, we were able to calculate the average value of daily pressure increase inside bottles for each yeast strain tested. Thus, the highest daily average values of the pressure were recorded during the second fermentation of MNF11 and MNF9 yeast strain, in particular 0.151 bar respectively 0.139 bar. These values corresponded to the values of the average daily consumption of reducing sugars namely of 0.63 and 0.59 g/L. MNF4 and MNF8 yeast strains had a lower value of the average daily pressure growth inside bottles that is 0.110 bar and 0.120 bar, also in accordance with the average daily consumption of reducing sugars namely of 0.53 and 0.55 g/L.

At the end of the alcoholic fermentation, the four yeast strains made dry sparkling wines whose volatile acidity did not grow according to the blended wine, the alcohol content ranging between 11.5 and 11.6% vol. Moreover, the lees resulted after the alcoholic fermentation in bottles had a granular aspect being extremely stable during bottle transportation in the pre-disgorging stage or during their handling for disgorging. For these reasons we selected these yeast strains for making sparkling wines.

MNC9 and MNC12 yeast strains, figures 5 and 6, triggered second fermentation in bottles after 15 days.

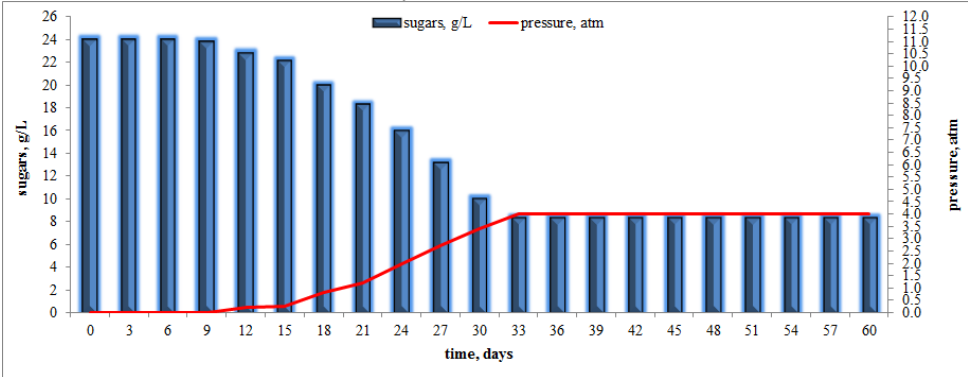


Fig. 5 -Dynamics of reducing sugar consumption and the increase of pressure inside bottles in the second fermentation with MNC9 yeast strain

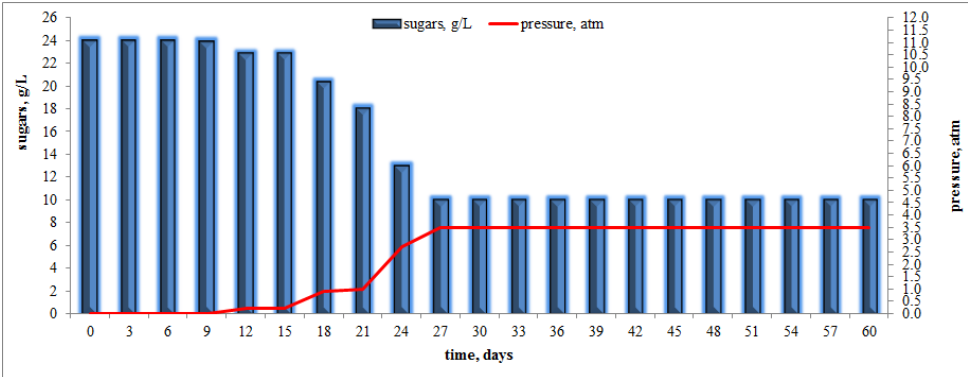


Fig. 6 -Dynamics of reducing sugar consumption and the increase of pressure inside bottles in the second fermentation with MNC12 yeast strain

Pressure was determined since the 18th days of the alcoholic fermentation start. Both yeast strains did reach the end of second fermentation in bottles, coming to a halt when they reached pressures of 4.0 bar and 3.5 bar respectively.

The four strains selected namely MNF4, MNF8, MNF11 and MNF9 shall be studied in trials on variants of blended wines using different wines as raw material. We shall also test the capacity of these strains to trigger and finish the second fermentation in bottles at a temperature of 10-12°C.

The further study of the four selected strains is justified by the organoleptic features of sparkling wines obtained as well as by the fineness of bubbles accompanied by a longer length of the perlage.

The results obtained after these trials shall finally allow us to name new high quality yeast strains for the technology of sparkling wine making.

CONCLUSIONS

1. The data presented point out the fact that MNF4, MNF8, MNF11 and MNF9 yeast strains are able to make alcoholic fermentation at high pressure and with high alcohol content, making in the end dry sparkling wine.

2. MNC9 and MNC12 strains proved not to be able to finish alcoholic fermentation at high pressure, even though in the preliminary selection test they showed fermentative features favoring second fermentation in bottles.

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GENERAL ISSUES CONCERNING THE WAYS OF CONTAMINATION ON TECHNOLOGICAL FLOW OF PROCESSED HORTICULTURAL PRODUCTS UNDER PROCESSING

ASPECTE GENERALE PRIVIND CĂILE ȘI MODUL DE CONTAMINARE PE FLUXUL TEHNOLOGIC A PRODUSELOR HORTICOLE ÎN CURS DE PRELUCRARE

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Abstract. *One of the main functions of the contaminated food is the innocuity. This implies that food is free of harmful microorganisms, heavy metals and other chemicals for the human consumption. For that, it takes into account both the degree of raw material hygiene and the proper way to process the aliments. In processed products made from horticultural raw materials, appear specific sources of pollution and contamination, which depend on the nature and type of equipment or process lines applied, food additives and packaging technologies or implemented framework. Food preservation prevents their degradation in time, stopping the loss of nutritional and organoleptic qualities. For total elimination of biodegradation germs, the industry appeals to: physical treatment (thermal, irradiations) or the use of chemicals which can have negative effects, their residues being present in finished food.*

Key words: horticultural products, contaminants, conservation.

Rezumat. *Una din funcțiile principale ale alimentelor contaminate este reprezentată de inocuitate. Aceasta presupune ca alimentul să fie lipsit de microorganisme dăunătoare, metale grele și alți compuși chimici improprii consumului uman. Pentru aceasta se are în vedere atât gradul de igienă a materie prime cât și modalitatea corectă de procesare a alimentelor. În produsele prelucrate, realizate din materii prime horticole apar surse specifice de poluare și contaminare, care depind de natura și tipul utilajelor sau liniilor tehnologice folosite, aditivii alimentari și ambalajele utilizate. Conservarea alimentelor previne degradarea acestora în timp, împiedicând pierderea calităților nutritive și organoleptice. Pentru eliminarea totală a germenilor biodegradării, se apelează la: tratamente fizice (termice, iradieri) sau la utilizarea unor produse chimice care însă au și efecte negative prin prezența reziduurilor acestora în alimentele finite.*

Cuvinte cheie: produse horticole, contaminanți, conservare

INTRODUCTION

In order to provide consumers with processed horticultural products having a high level of innocuity, it is necessary to find the most adequate technological methods for the inactivation or removal of the substances having an antinutritive

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character that may be frequently found in the horticultural raw materials or that may form during preservation or processing. A special attention must be paid to those processing methods that inhibit the development of alteration or pathogen microorganisms or those that ensure the destruction of these microorganisms.

The processing of the raw materials and the different processing methods of food products may lead to the penetration of certain toxic substances for the body (nitrosamines, polymers of thermal oxidization etc) besides the fact that they may lead to the reduction of quality of such products.

Since the processing of food raw materials into finite products triggers in certain cases a diminution of the nutritive value, it is necessary to take actions to improve these products through the addition of vitamins, mineral salts and proteins (Banu C. et al., 1982).

MATERIAL AND METHOD

In addition to studying specialized literature I have consulted various websites of non-governmental agencies in our country, which have as main activity the study of contaminants in the finished product.

RESULTS AND DISCUSSIONS

In the processed products obtained from horticultural raw materials there are specific sources of pollution and contamination.

Besides the possible impact, which may be avoided, of the contaminants from the fresh products, here appear specific sources of pollution and contamination depending on the nature and type of equipment or technological lines used, the food additives and packing used or the technologies applied (Beceanu D., 2009).

The manipulation and transport of horticultural products to the packing and processing location is often made in specific containers. These may be often sources of microorganisms that contaminate products. A good example is the fungus *Geothricum candidum* also known as tool mould that may be found on the harvest and processing equipment which was improperly cleaned.

The storage of vegetables and fruits after harvest in inadequate conditions favoring the development of degradation microorganisms may lead to the accumulation of large quantities of nitrites through the reduction of nitrates.

Down-times in the technological flow for the manufacture of processed products from fruits and vegetables are also cases for the conversion of nitrates into nitrites.

The vegetables characterized by strong reducing systems such as spinach, asparagus and lettuce, which quickly turn nitrates into nitrites, will be stored only for short time periods before processing.

In the processing method they must choose those procedures that ensure the decrease of nitrates. Thus, the washing of vegetables with large quantities of water and their boiling for a short period of time and the throwing away of water may reduce nitrates up to 30% from the initial quantity.

As for the preparation of the raw material, they must ensure a maximum reduction of the content in microorganisms since the effect of sterilization process depends on the initial number of microorganisms. The effect of sterilization is much more certain if the number of microorganisms was reduced before sterilization.

To prevent contamination with pesticide residues, they will use certified raw materials in the manufacture process, materials that may comply with the sanitary regulations in force for such category of contaminants.

The processing of fruits and vegetables, the correct preparation of the raw material may lead to an important reduction of the pesticide content. Thus, during washing, between 10 and 50% of the insecticide residues are eliminated depending on the type of insecticide and the nature of the product.

Peeling fruits and vegetables reduces pesticide residues by 90-94%.

By pasteurization and sterilization of the products processed from vegetables and fruits, the pesticide content may be considerably reduced.

For the fruits and vegetables preserved by freezing and dehydration, the quantities of pesticides are high.

The contamination with patulin of processed products from vegetables and fruits occurs through the use of some raw materials inadequate from the qualitative viewpoint in the manufacture process, materials that are attacked by molds: *Penicillium patulum*, *Penicillium expansum*, *Penicillium urticae*, *Penicillium claviforme*, *Aspergillus clavatus*.

Due to the potential risks for health, the Food and Drug Administration limits patulin to 50 µg/l in fruit juices and in apple juices obtained from concentrated apple juice. This limitation only for the apple juices and concentrated apple juices relied on the fact that in time they could find natural contamination only in the apple juice and cider and they are the major source of patulin for the human consumption. Wine and vinegar do not contain patulin because it cannot survive the alcoholic fermentation (Dumitru V., 2008; Tomás-Barberán F.A., Robins R.J., 1997).

Alcoholic fermentation of fruit juices destroys patulin and, consequently, the fermented products such as apple and pear cider do not contain patulin. Despite all these, patulin was found in fermented products to which they added apple juice for different corrections after fermentation. Patulin is relatively thermostable, especially to an acid pH. It has been proven that the short term treatment at high temperatures (150°C) leads to a reduction by 20% of patulin concentration. Despite all these, only the thermal processing is not enough to obtain a patulin-free product. Sugar has a protective effect for mycotoxins, this is the reason why patulin may be found in sugar concentrated products.

When processing fruits and vegetables as canned food there may appear microorganisms causing their microbiologic alteration. The microbiological alteration of canned vegetable may appear under diverse forms depending on the product assortment and the characteristics of such microflora: “bulging” and “non-bulging”.

To totally eliminate the germs of biodegradation, they resort to the use of chemical products which also have negative effects through the presence of their residues in the finished foods (Derache R., 1986; Diaconescu I., 2007; Dumitru V., 2008).

Another source of contamination of industrialized products from vegetable and fruits is the addition of food additives to prevent the occurrence of some unwanted processes (antioxidants, antiseptic, acidulants, sequestrers) and to give superior qualities to the finished product (sweeteners, flavor enhancers, colorants etc).

Some of the conditions that additives must meet are: the lack of acute or chronic toxicity, lack of interaction with different compounds of the product, the lack of toxic compounds after administration, the reduced active intake etc. food colorants represent a category of additives highly criticized since their addition to foods is not always necessary. Monosodic glutamate (a flavor enhancer) is forbidden in children's food because it has been shown that it destroys the nervous cells in the developing animals.

At the same time, nitrites are used in foods to maintain colour or to prevent the growing of bacteria, but they are dangerous because they may form nitrosamines.

Sulphur dioxide very largely used in the wine industry has been recently limited due to the possibility of causing allergic reactions in certain individuals.

The contamination of foods with heavy metals and microorganisms or the formation of some toxic compounds may occur frequently during manufacture and subsequent storage of the finished product. The formation of nitrosamines in food products (exogenous origin) occurs depending on the processing temperature (frying, smoking) or their storage, the storage period, the pH of product or the presence of inhibiting compounds (ascorbic acid).

The high concentration of heavy metals existing in food produces organoleptic modifications (taste, smell), changes colour and diminishes the nutritive value through the degradation of proteins, vitamins or by reducing their absorption through the formation of non-absorbable compounds that accumulate in the body. By processing, preservation and packing, food may be contaminated by heavy metals.

An important source of contamination of foods with heavy metals may be the contact with the processing machines, the storage in metal cans, the use of containers made from heavy metal alloys (lead, iron, chromium, aluminum, copper, zinc, tin, arsenic) inadequately insulated (Beceanu D., 2009).

The fruit juices, the tomato sauce, marmalades, jams, pickles, wine represent a major source of lead in nutrition because food acids may dissolve the soldering lead (the lead used to solder the metal parts) especially when high temperatures are also used in the process (Savu C., 2004).

The presence of tin in food products is the consequence of its retentivity in the raw materials following the use of fungicides in whose composition tin is present and due to the corrosion of containers in which products are packed. For the protection of the container against corrosion, they resort to lacquering that

preserves food from 12 to 36 months depending on the pH of product and the storage temperature.

The content in tin was found in cherry, plum and apricot compotes, in the tomato juice and the bean cans during their storage.

Different vegetables such as peas, spinach, and asparagus exhibit a particular effect of “de-tinning” of cans favoring the solubilization of tin formed in the product.

The content of elements is regulated by the national legislation and, thus, according to Order no. 975/1998 of the Romanian Ministry for Public Health, they have established maximum limits for the heavy metals accepted in the finished products (table 1).

Table 1

Maximum allowable limits of arsenic and heavy metals in vegetables and fruit processed according to the MHO no.975/1998 (expressed in mg / kg of product)

Produce	As	Cd	Pb	Zn	Cu	Sn	Hg
Canned vegetables in water	0,5	0,1	0,5	15	5,0	150	0,03
Canned vegetables in vinegar, oil, broth	0,5	0,1	0,5	20	7,0	150	0,05
Tomato Juice	0,1	0,2	0,05	10	3,0	150	0,5
Tomato juice, spicy juices	0,15	0,3	1,0	20	10,0	150	0,05
Tomato paste (U.S. 28-30%)	0,2	0,3	1,5	30	15,0	150	0,05
Canned beans	0,15	0,3	1,0	40	10,0	100	
Stewed fruit, nectar, pasteurized fruit juice	0,5	0,05	0,5	-	5,0	150	0,05
Marmalade, jam, syrup	0,5	0,05	1,0	5	10,0	-	0,05
Concentrated fruit juice, fruit pulp and fruit concentrate	3,0	0,3	3,0	30	30,0	-	0,3
Grape juice	0,1	0,01	0,5	10	10	-	-
Concentrated grape juice	0,2	0,01	1,0	20	25	-	-

Though we may know the initial composition of any packing, the behavior of its constituents coming into contact with food may vary. The rate of migration of contaminants depends on several factors:

- concentration of the contaminant or its residues in the container;
- the degree in which it is bound or mobile within the material matrix;
- the thickness of the packing material;
- nature of food with which the material come into contact (dry, watery, acid, lipidic, alcoholic etc.);
- solubility of the contaminant in the food;
- contact period and temperature.

High quality glass releases lead into a concentration up to 30% lead oxide. The lead content of wines and alcoholic drinks kept in this type of containers increases in time up to 1-2 mg/L after 3-4 months or even up to 21 mg/l after several years of storage (Dumitru V., 2008; Deshpande S.S., 2002).

Ceramic coming into contact with acid drinks (fruit juices) causes the release of lead and cadmium from enamel.

Aluminum vessels used for the preparation of food (especially in case of acid foods) may bring the highest daily intake of aluminum, except the drinking water.

The plastic contaminants maybe polymerization residues, catalysts (metal salts, organic peroxides), solvents, emulsifiers, inhibitors, products from decomposition and secondary reactions, antioxidants, antistatic agents, heat and light stabilizers, lubricants, pigments and fungicides.

The use of cleaning materials for the equipment, production spaces, the packing from the industry for the processing of fruits and vegetables may have toxic or allergen effects on the consumer. These may penetrate the products following the incorrect handling, the insufficient washing after disinfecting the equipment and vessels (Dumitru V., 2008).

CONCLUSIONS

1. During the processes of food processing, must be taken into account the innocuity of raw material, auxiliary materials, water and food additives used and also the risks of microbiological contamination or any other type of contamination.

2. Horticultural products are relatively frequently contaminated with various agents that may endanger, the health of certain categories of consumers.

3. Different phases of the process flow for obtaining canned vegetables and fruits may influence not only for increasing but also for decreasing the content of contaminants in the finished product.

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GENERAL ISSUES CONCERNING CONTENT OF ASCORBIC ACID IN PROCESSED HORTICULTURAL PRODUCTS

ASPECTE GENERALE PRIVIND CONȚINUTUL ÎN ACID ASCORBIC LA PRODUSELE HORTICOLE PRELUCRATE

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Abstract. *Product processing causes loss of C vitamin, depending on the methods used. Prolonged washing, air and lighting exposure, fragmentation, boiling, drying, freezing of the products lead to a significant decrease in C vitamin content. The lactic fermentation stores the C vitamin in the product, but 50% goes into the liquid coating. The losses can be lowered by scalding steam, shortened high-temperature sterilization, vacuum closure or by using different preservatives. The usage as a food additive (ascorbic acid - E300) is due to its antioxidant properties. It exhibits as acicular colorless crystals, foils or white crystalline powder. It is used in beverages, canned food, oils and non-emulsified fats, as stabilizing agent etc. Ascorbic acid has many derivatives are also used as antioxidants: sodium ascorbate, ascorbyl palmitate, iso-ascorbic acid and iso-ascorbats.*

Key words: processing, loss, use

Rezumat. *Prelucrarea produselor determină pierderi de vitamină C, în funcție de metodele utilizate. Spălarea îndelungată, expunerea la aer și lumină, fragmentarea, fierberea, deshidratarea, congelarea duc la diminuarea semnificativă a conținutului în vitamină C. Fermentația lactică păstrează vitamina C, dar în proporție de 50 % trece în lichidul de acoperire. Pierderile pot fi micșorate prin opărire cu abur, termosterilizare la temperaturi înalte pe durată redusă, închiderea sub vid, folosirea diferiților conservanți. Utilizarea ca aditiv alimentar (acidul ascorbic – E300) se datorează proprietăților sale antioxidative. Se utilizează în băuturi, conserve, uleiuri, grăsimi neemulsionate, ca agent de stabilizare etc. Prezintă mai mulți derivați utilizați tot ca antioxidanți: ascorbatul de sodiu, ascorbil palmitatul, acidul izoascorbic și izoascorbații.*

Cuvinte cheie: prelucrare, pierderi, utilizare

MATERIAL AND METHOD

Besides the study of specialized literature represented by scientific work, treatises, and books, I consulted various websites of foreign non-governmental agencies dealing with research in the public nutrition field.

RESULTS AND DISCUSSIONS

Food preservation represents the way in which human beings intervene to maintain unchanged the organoleptic properties and nutritive value of food as long as possible.

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Influence of technological phases on ascorbic acid content of processed products:

- *prolonged washing, thick skin peeling, boiling in uncovered vessels and in a large quantity of water or repeated heating* determine the significant diminution of ascorbic acid from the horticultural raw materials;

- *cutting into fragments, chopping, mincing* affect tissues, releases specific enzymes and increase the contact surface with atmospheric oxygen; the size and shape of fragments, besides their exposure to air, directly influence the loss level through oxidization of some useful substances (table 1);

Table 1

Losses of vitamin C of peeled peaches, depending on the duration of exposure to air and during fragmentation (as Maria Olaru, 1976)

Time of exposure to air	Losses in vitamin C (%)	
	Peach halves	Peach slices
30 minutes	29	42
60 minutes	34	52
90 minutes (max)	45 (max)	58 (max)

- *boiling (bleaching)* – the loss level of ascorbic acid depends on the type and duration of treatment; losses may be obtained by dissolution and oxidization; these losses may be limited by the inactivation of oxidases;

Smaller losses are registered through steaming rather than by water boiling. High temperature thermal sterilization and for a short time protects the ascorbic acid content of canned food and so does the vacuuming of containers (Beceanu D. 2009).

- water bleaching of fruits and vegetables leads to the decrease of vitamin C content by 10 ÷ 50% (table 2);

- steam bleaching has losses of only 10 ÷ 30%.

Table 2

Loss of water soluble vitamin content of vegetables, after scalding (as Maria Olaru, 1976)

Product	Percentage loss in water soluble vitamins			
	Vitamin C	Vitamin B ₁	Vitamin B ₂	Vitamin PP
Garden Beans	10-50	0-18	0-30	0-40
Peas	10-30	0-37	13-33	4-41
Spinach	1-94	0-33	0-22	0-37

Potatoes that may bring in the human nutrition a significant share of vitamin C may lose up to 50% of vitamin after peeling and water boiling; the loss is two times smaller by baking them into the oven without peeling (Cuciureanu Rodica, 2002).

Influence of different preservation methods of horticultural products:

- *dehydration* – the factors influencing the destruction of vitamin C in dehydrated products are the nature of the horticultural product, the level of dehydration, the storage temperature and the chemical composition of the environment where storage occurs (table 3).

For example, dehydrated cabbage kept at 32°C for 16 weeks loses 33% of vitamin C if it is stored after dehydration in a moist atmosphere of 3.6% and 90% if air moisture is 8.2% (Cuciureanu Rodica, 2010).

Table 3

Vitamin content (mg%) of dehydrated products (after Mincu, 1976-1984)

Dehydrated product name	Vitamins				
	A (β – carotene)	B ₁ (thiamine)	B ₂ (riboflavin)	PP (nicotinamide)	C (ascorbic acid)
apricots	5	0,01	0,16	3,3	-
apples	0,06	0,05	0,08	0,5	1
pears	0,07	0,04	0,06	0,3	1
peaches	2	0,12	0,11	1,6	1
plums	1,25	0,18	0,5	1,7	2
paprika	17-350,01	0,1-0,3	0,08	1-5	95-180

- *lacto fermentation* – allows the preservation of vitamin C but this passes into the fermentation liquid in proportion of 50% (Jamba A., Carabulea B., 2002);

- *microwaves* – the use of microwaves in food technology does not trigger specific modifications;

- *ionizing treatment* – the reduction of the ascorbic acid content of a freshly irradiated fruit with 2kGy is smaller than that of the untreated product after the same storage period in identical conditions (Cuciureanu Rodica, 2002);

- *freezing* – ascorbic acid is preserved relatively well, although there may occur important losses by oxidization if the freezing speed favors the destruction of the vegetal tissues favoring the contact of oxidizing cellular enzymes with ascorbic acid (fig.1, table 4).

Important losses may be found in an incorrect de-freezing; the frozen fruit diminish their ascorbic acid content depending on the temperature and period of preservation; at -8.5°C losses reach 70 ÷ 80% within 6÷8 months (Beceanu D. et al., 2011).

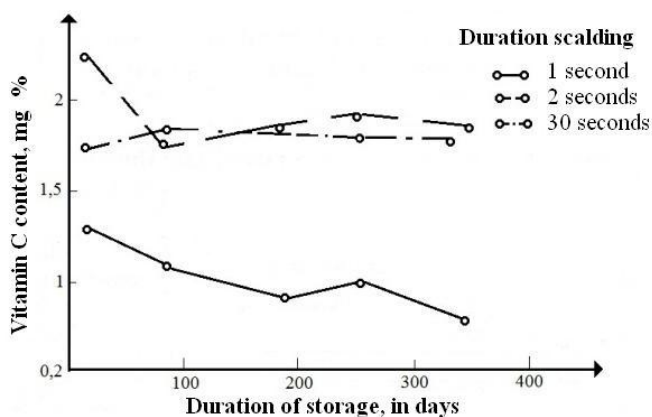


Fig. 1 - The decrease in vitamin C content of frozen peas in conjunction with technological parameters (mode and duration of storage scalding)

Table 4

Losses of vitamin C recorded in several species of vegetables, depending on the duration and temperature of freezing (after Maria Olaru, 1976)

Product	Baseline (mg%)	Freezing (months)	Losses%		
			-12	-18	-30
cauliflower	78	4	30	5	-
		8	70	45	20
		12	80	50	20
beans	14	4	55	15	-
		8	70	18	-
		12	95	30	-
peas	17	4	25	-	-
		8	42	5	-
		12	79	11	2
spinach	31	4	55	15	-
		8	85	50	10
		12	90	55	15

According to Dumitrescu C. (1987), following the processing by *thermal sterilization*, vegetables diminish their vitamin C content, but preserve better the quantity of vitamins A and B.

The industrial preparation of sterilized cans carried out in the absence of air keeps a quite high level of C vitamin (tables 5 and 6).

Table 5

Vitamin C content of some sterilized products (after Mincu, 1974 - 1984)

Product name	Vitamin C (mg/100g produs)
Courgettes in water	10
Okra in tomato sauce	5,5
Pot in broth	7
Tomato broth	18
Eggplant in tomato sauce	4
Vegetable stew	30
Okra in Oil	3,5
Oil Pot	7

Table 6

Vitamin C content of fruit products concentrated with sugar (after Mincu, 1976-1984)

Product name	Vitamin C (mg/100g produs)
syrup cherry / raspberry	5,2
apricot jam	4,2
peach jam	3,1
plum jam	4,2
cherry jam	2,1
strawberry jam	15,4
quince jam	2,2
walnut jam	181
rose jam	3,6
marmalade	4,7
extra marmalade	5,8

The sterilization process causes variable losses of vitamin C content; they reach 20 ÷ 50% if we take into account the entire content of the container in which sterilization is made and 50 ÷ 70% if we take into account only the solid content of the container; if we also consume the liquid part of the food, the level of maintenance of vitamin C is superior to that retained by culinary processing of the product (table 7) (Beceanu D., 2009).

Table 7

Vitamin C content in juices prepared of several species of fruit
(after Mincu, 1976-1984)

Product name	Ascorbic Acid (mg/100g product)
Cranberry juice	6,8
Apple juice	7
Prune juice	3,5
Grape juice	4

By storing sterilized cans, the losses of vitamin C depend more on temperature than on the period of storage. The vitamin C losses especially occur in the first days of storage and are due to its oxidization by the oxygen existing in the residual air from the container. Tinned metal containers protect vitamin C.

Reheating of sterilized cans for consumption may produce new losses of vitamin C; to reduce the vitamin C losses in the products consumed after heating, we recommend:

- first to concentrate the liquid part and heat the solid part of the food, thus the vitamin C losses are minimal;
- if one eats the solid part of the food, this will be heated entirely by removing then the liquid part; this way the losses are quite significant since the liquid contains between 33 – 54% of vitamin C present in the initial product.

Other factors influencing the ascorbic acid content in the processed products

The ascorbic acid content of vegetables and fruits transformed may be destroyed by:

- *oxidization or solubilization in water*. Oxidization is favored by the neutral or alkaline pH being catalyzed by light and the copper cations.
- *ascorbatoxidase and peroxidases* intensify the level of these losses.
- *preservation in SO₂* or the presence of sulphur amino acids provides the antioxidant protection of vitamin C.
- *processing equipment* enameled or made from stainless materials prevents the inactivation of this vitamin in the presence of iron or copper ions (Cuciureanu Rodica, 2010).

Vitamin C as a food additive used in the food industry

Food additives are substances added to the food products to prevent the appearance of undesired processes: antioxidants, antiseptic, acidulants) and to give superior qualities to the finished product (colour, colorants, and flavor enhancers). The names of the relevant European food additives are: E300 acid

ascorbic, E301 sodium ascorbate, E302 calcium ascorbate, E303 potassium ascorbate, E304 esters of ascorbic acid with fat acids: ascorbyl palmitate and ascorbyl stearate.

According legislative act OMS/2002, in our country the ascorbic acid is used in doses "qs" for the following products: in fruit juices and nectars in extra jams and extra jellies, raw fruits and vegetables, chilled, frozen and packed, unprocessed and peeled potatoes, processed; in emulsified oils and fats (except virgin oils and olive) for boiling, roasting, or for preparing sauces, canned vegetables and fruit, bread prepared exclusively from wheat flour, water, yeast or leaven, salt, in specialties "Pain courant français", the fresh pasta and beer.

In pineapple juice and nectar and passion fruit is added 3g / L ascorbic acid. It is also added to foods for infants and young children, healthy, such as drinks, juices, baby foods from fruit and vegetables (separately or in combination with L-ascorbate and sodium ascorbate Calcium L-) in the dose 0.3 g / kg expressed as ascorbic acid, in cereal-based foods containing fat, including biscuits and rusks, a dose of 0.2 g / kg (expressed as ascorbic acid) (Elena Orănescu, 2008).

CONCLUSIONS

Different treatments of horticultural products cause greater losses or lower after the application as follows:

- steam bleaching produce minimal loss;
- water bleaching leads to significant loss of vitamin C;
- sulfitation ensure the maintenance of a larger amount of vitamin C;
- lactic fermentation preserves the biological activity of ascorbic acid.

Technological flow of production phases of canned fruit and vegetables may influence both the upside (added ascorbic acid - food additive) and the decrease in ascorbic acid content of the finished product (technological stages: washing, fragmentation, cleaning layer thick, bleaching and technological processes: concentration, dehydration, freezing, sterilization).

By treating horticultural products with X-ray and microwave, did not reveal specific effects on vitamin C. The ascorbic acid is used as an antioxidant to obtain: beverage cans, oils, fats emulsified, as stabilizing agents.

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SOLID-LIQUID EXTRACTIONS EFFICIENCY IN DETERMINATION OF ANTHOCYANIN CONTENT OF THE OENOLOGICAL DEPLETED MATERIAL

RANDAMENTUL EXTRAȚIILOR SOLID-LICHID ÎN DETERMINAREA CONȚINUTULUI ÎN ANTOCIANI DIN MATERIAL OENOLOGIC EPUIZAT

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Abstract. *The study aims to determine anthocyanin content of alcoholic extracts obtained by treating dried pomace resulted in the process of winemaking from the local variety of black grapes, Vulpea. Were conducted a total of 17 stages of extraction, the ratio between the plant material and solvent initially was 1:10, then dropping to 1:5 (extractions 2-17). Was determined spectrophotometrically, total content of anthocyanins and polyphenols, associated with each phase of extraction (392.89 mg/100g, in the first stage of extraction), up to a theoretical yield of 99.80% recovery (distribution coefficient which is considered as total yield of extraction), corresponding to the 9th phase of extraction. After the 17 extractions plant material was considered depleted, theoretically yield of recovery being 99.99% (5.62 mg/100 g in last phase of extraction).*

Key words: yield, anthocyanins, polyphenols, dried pomace

Rezumat. *Studiul are ca scop determinarea conținutului în antociani din extractele alcoolice obținute prin tratarea tescovinei uscate rezultate în urma procesului de vinificație a soiului autohton de struguri negri, Vulpea. Au fost realizate un număr de 17 etape de extracție, raportul dintre materialul vegetal și solvent fiind inițial 1:10, apoi scăzând la 1:5 (extracțiile 2-17). A fost determinat spectrofotometric conținutul total în antociani și polifenoli corespunzător fiecărei etape de extracție (392,89 mg/100g, în prima etapă de extracție), până la obținerea unui randament de recuperare teoretic de 99,80% (coeficient de repartiție la care se consideră un randament total de extracție), corespunzător celei de a 9-a etape de extracție. După cele 17 extracții, materialul vegetal a fost considerat epuizat, randamentul teoretic de recuperare fiind de 99,99% (5,62 mg/100 g, în ultima etapă de extracție).*

Cuvinte cheie: randament, antociani, polifenoli, tescovina uscată

INTRODUCTION

Annually, worldwide are produced between 5 and 9 million tons of grape pomace (Oreopoulou V., Russ W., 2007). Of all the recoverable compounds from grape pomace, phenolic compounds are the most valuable. These include

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anthocyanin pigments, flavonoids, tannins, phenolic acids, which can be used as antioxidants or functional food components.

Anthocyanin pigments, have a special significance in current research in oenology and food industry (obtaining natural food colorants, functional foods). They are present, in black grapes, in quantities ranging from 30 to 888 mg/100g (Horbowicz M. *et al.*, 2008, Gould K., 2009). Located, usually in the skin of black grapes, anthocyanins are extracted only partially (30-40%) by the winemaking process, so the pomace resulting from the production of red wines, contains significant amounts of these phenolic compounds (Câmpeanu R. *et al.*, 1989). If the pomace is dried, the percentage of extracted anthocyanins is lower, influenced by physico-chemical degradation processes of some compounds (Rein Maarit, 2005).

Over 10 thousand tonnes of skins are processed annually in Europe, resulting in about 50 tonnes of anthocyanin colorant, and these numbers are in an upward trend (Davies K., 2004). In Romania, the production of wine grapes was, in 2009, 915.8 thousand tonnes (Monthly Statistical Bulletin, 9/2009). Extraction of anthocyanin pigments is the first step in the experiments concerning their total or individual determination. A suitable extraction procedure should maximize the recovery of anthocyanins, with minimal intervention and minimal degradation or alteration of their natural form (*in vivo*) (Brouillard R. and Dangles O., 1994).

MATERIAL AND METHOD

The study aimed to determine total monomeric anthocyanins (AC) and phenolic compounds content (TPC) of dried pomace, obtained from local black grapes variety, Vulpea. Sampling was carried out in September 2009, from the Ampelographic Collection of the Faculty of Horticulture Iasi, V. Adamachi farm, viticultural center Copou, Iasi. Wine technology applied to the grapes was classic, with crushing and de-clustering. Maceration took place in static plastic vessels, for 72 hours, followed by pressing (pneumatic press). After 3 weeks of storage at ambient temperature ($14 \pm 2^\circ\text{C}$) and dark, pomace was considered dried.

Were conducted several extraction stages of phenolic compounds from the plant material, to depletion. Extraction was performed with ethanol:HCl:water system (96:1:3), resulting a pH = 1.5, in which, the chemical composition of anthocyanins is stable. Acids are very important in maintaining stability of anthocyanins, being necessary in the formation of flavylium cation, the most stable form (at pH 1.5 - 2) and to improve the extraction efficiency (Socaciu Carmen, 2008). The ratio of plant material and solvent was initially (first extraction) 1:10 (w/v), then decreased to 1:5 (w/v). Appearing the need to obtain extracts for food use, which should not contain toxic reagents (methanol, acetone), was preferred the extraction system with ethanol, although recoveries are not as important as those obtained by extraction with methanol (methanol is 20% more effective than ethanol and 73%, than water) (Socaciu, Carmen, 2008).

The containers were stored at low temperature and dark ($6 \pm 1^\circ\text{C}$). Before the last filtering, was applied, a treatment with ultrasound, as a means of increasing the property transfer process and desorption.

In acidic medium, there is a balance between the colored and colorless forms of anthocyanins. This balance is in function of pH (Lee J. *et al.*, 2008). Was chosen pH 0.6 and pH 3.5, and measured the absorbance (optical density), at 520 nm wavelength, spectrophotometrically. Coloring intensity variation between the two pH

values, is proportional to the anthocyanin content. Measurements were made by means of a UV-VIS spectrometer Analytik Jena Specord 200, being measured also the absorbance at wavelength 750 nm, for the Folin-Ciocalteu colorimetric method (Of. J. of EU, 2010). Expression of anthocyanin content was made in mg/100 g dried pomace and phenolic compounds, in grams gallic acid equivalents (g GAE)/100 g plant material.

RESULTS AND DISCUSSIONS

Grape pomace moisture content, after the storage period, was 7.5 %, determined by the oven drying method, four hours at 105°C (Afusoae Iulia *et al.*, 1988). Sugars in the grape must, refractometrically determined at 20°C, had an average value of 22°Bx (211 g/L).

In the grape skins, predominate simple forms of anthocyanins (Zănoagă C. *et al.*, 2010), which can be extracted in the first stages of extraction, while acylated anthocyanins can be gradually extracted (Țârdea C. *et al.*, 2007). This extraction took place in several stages, up to a theoretical extraction coefficient of 99.99 %, resulting, in the final, 17 stages of extraction. AC and TPC values of the 17 extractions realised, were summarized in table 1.

Table 1

AC and TPC values at Vulpea variety

Number of extraction	AC (mg/100g)	TPC (mg GAE/100g)
1	392.89	1280.17
2	158.21	588.52
3	73.64	258.83
4	65.05	166.49
5	64.09	149.68
6	25.57	110.03
7	16.76	60.19
8	15.81	44.04
9	13.47	38.68
10	9.33	27.16
11	8.05	26.76
12	4.13	19.81
13	15.06	20.41
14	9.01	15.31
15	7.52	12.80
16	6.04	12.20
17	5.62	11.47
Total	890.32	2842.63

At first extraction, the AC value was maximum, 392.89 mg/100g, followed at the next steps by a decrease of this value, reaching, at the ninth extraction, 13.47 mg/100g. Theoretical yield of recovery, according to the ninth stage of extraction was calculated as 99.80%, coefficient of distribution considered as a total yield of extraction. Thereafter, further extractions are no longer effective,

economically speaking, due to very small quantities of anthocyanins extracted, reported to the amount of solvent used.

To deplete effectively the oenological material, we realized another eight rounds of extraction, performed by resuming solid part with solvent. In the last phase of extraction, anthocyanin content was 5.62 mg/100g.

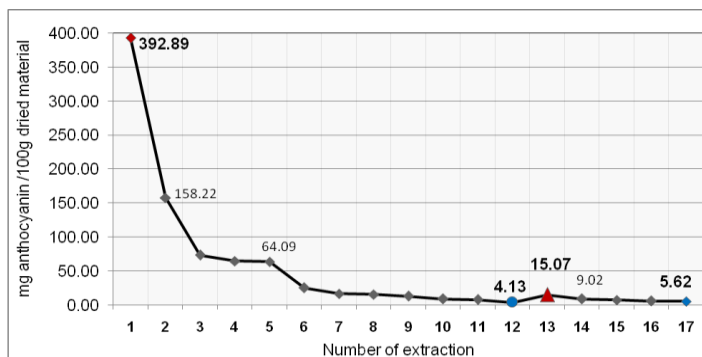


Fig. 1 - AC values trend during extractions

The general trend of AC amount was to decreasing. The twelfth stage of extraction, had the lowest values of the entire experience (4.13 mg/100g), at the next step, anthocyanin content increasing again (15.06 mg/100g), and then tend to decrease until the end (fig. 1). This increase of the AC values was possible due to the long progress of experience and the occurrence of acid hydrolysis, which takes place in a weak acid medium and at warm (Adams J.B., 1973). Proanthocyanidins have a higher trend of polymerization (in the presence of oxygen), the polymers formed are insoluble in water. In acidic medium, dimers (polymers) become anthocyanidins, single or accompanied by catechins (Cercasov Cornelia *et al.*, 2005) (fig. 2).

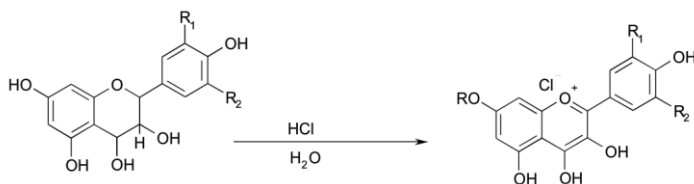


Fig. 2 - Transformation reaction of proanthocyanidins in anthocyanidins

The content of phenolic compounds, had also a decreasing trend during the extraction, with maximum value at the first stage of extraction (1280.17 GAE/100g mg) and a minimum at a last stage (11.47 mg GAE/100g). TPC values fluctuation, at the twelfth and thirteenth stages of extraction, was not as intense as at AC, here maintaining very close values (19.81 and 20.41 mg GAE/100g).

The percentage of anthocyanins, from total phenolic compounds, was maintained between 23 and 42 % at first nine extractions, considered sufficient to

depletion of dried pomace (fig. 3). At the thirteenth stage, the proportion of anthocyanins increase massively to 73.8%, confirming the assumptions regarding the transformation of phenolic compounds by polymerization reactions and the occurrence of acid hydrolysis, which converts a part of proanthocyanidins in anthocyanidins. The TPC values were not affected, but was an increase in the percentage of anthocyanins, spectrophotometrically detected.

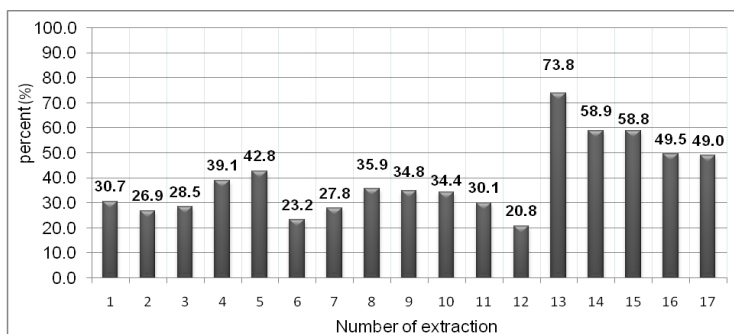


Fig. 3 - The percentage of anthocyanins from total phenolic compounds

Total AC and TPC values at the first nine extractions, when the yield was considered optimal, was 825.53 mg/100g, respectively 2696.63 mg GAE/100g, finally AC reaching the total amount of 890.32 mg/100g and TPC, 2842.63 mg GAE/100g, values equivalents to a completely dry extract. Percentage of anthocyanins, from total phenolic compounds, was, at the total quantities, 31%.

CONCLUSIONS

1. Dry pomace of local grapevine variety, Vulpea, was subjected to repeated extractions, using acidified ethanol, being determined the content of anthocyanins (AC) and total phenolic compounds (TPC), at the seventeen stages of extraction, realised to depletion of plant material.

2. The highest values of AC and TPC were determined in the first round of extraction, 392.89 mg/100g, respectively 1280.17 mg GAE/100g, at the second stage, the quantities being less than half of the initial values.

3. At the ninth stage of the extraction, theoretical recovery yield was 99.80 %, considered as a total yield of extraction, the AC value obtained at this stage being 13.47 mg/100g.

4. The general trend of TPC and AC values has been decreasing, with a growth in the thirteenth step of extraction, from 4.13 to 15.6 mg/100g, due to the conversion of colorless proanthocyanidins, in colored anthocyanidins, simple or accompanied by catechins, trough acidic hydrolysis, in the last step resulting 5.62 mg anthocyanins/100 g of dried pomace.

5. The total amount of anthocyanins at dried pomace of Vulpea variety was 890.32 mg/100g, representing an average of 31% from total phenolic compounds, amounts equivalent for a completely dried extract.

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EVALUATION OF THE ANTIRADICAL POTENTIAL OF DIFFERENT CABBAGE VARIETIES

EVALUAREA POTENȚIALULUI ANTIRADICALIC A DIFERITE SOIURI DE VARZĂ

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Abstract. External and internal leaves extracts of white and red cabbage were analyzed for antiradical potential and total phenolics content. The antocyanins content of red cabbage was also determined. Total phenolics content ranged from 42.75±0.17 mg gallic acid/100 g fresh weight, found in white cabbage – external leaves, to 245.16±0.37 mg gallic acid/100 g fresh weight, found in red cabbage – external leaves. Red cabbage exhibit high antiradical activity than white cabbage. No significant differences were recorded between antiradical activity of external and internal leaves of cabbage varieties studied. Linear regression analysis of the data showed a weak correlation ($R^2=0.671$) between antiradical potential and total phenolics content, implying that cabbage contain another compound with antioxidant potential beside phenolics.

Key words: antiradical activity, cabbage, total phenolics.

Rezumat. Extractele frunzelor exterioare și interioare de la varza albă și de la varza roșie au fost analizate pentru potențialul antiradicalic și conținutul de fenoli totali. La varza roșie s-a determinat și conținutul de antociani. Conținutul de fenoli totali a variat de la 42.75±0.17 mg acid galic/100 g produs proaspăt, înregistrat la varza albă – frunze exterioare, la 245.16±0.37 mg acid galic/100 g produs proaspăt, înregistrat la varza roșie – frunze exterioare. Activitatea antiradicalică găsită la varza roșie este mult mai mare decât cea găsită la varza albă. Nu s-au înregistrat diferențe mari între potențialul antiradicalic al frunzelor exterioare și interioare la ambele soiuri de varză studiate. Analiza regresiei liniare a datelor a arătat o corelație slabă ($R^2=0.671$) între activitatea antiradicalică și conținutul de fenoli totali a probelor analizate, ceea ce înseamnă că varza conține și alți compuși cu rol antioxidant pe lângă fenoli.

Cuvinte cheie: activitate antiradicalică, varză, fenoli totali.

INTRODUCTION

Brassicaceae vegetables are an abundant source of health-promoting substances, which reduce the risk of diseases. Apart from anticarcinogenic glucosinolates, they possess antioxidants of both hydrophilic (vitamin C, polyphenols) and hydrophobic phases (carotenoids, vitamin E), which can neutralize active oxygen species and quench free radicals. Phenolic compounds

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with ascorbic acid are major antioxidants of *Brassicaceae* vegetables, while lipid-soluble antioxidants are responsible for only 20% of the total antiradical capacity (Podsdek A., 2007).

White cabbage is currently the most important vegetable species in Romania in terms of production, exceeding tomatoes almost every year (except only in 2004) during 2000-2008 period. Cabbage production in Romania in 2009 was 1.004 million tonnes. In Romania, the consumption of cabbage represent more than one quarter of total vegetables consumption. White cabbages appears staggered on market: protected crops (March - May, maximum consumption in May), early (months from May to July, maximum consumption in June), summer (July - September, maximum consumption in August) fall to the share of 70% (September to November, with a maximum consumption in October). Red cabbage is produced from June until November, with maximum consumption during November (Beceanu D., 2011).

White and rubra cabbage form were cultivated from ancient times. They have become gradually the most important vegetables from Europe. Some *Brassica* vegetables peculiarities are: they are biennial plants (except cauliflower), are resistant to low temperatures and excess moisture requirements, generally give high yields and good storage capacity of fresh and preserved (Bălașa M., 1980).

Chemical composition of cabbage (table 1) in terms of food value is supplemented by dietary and medicinal properties of these vegetables (Aruoma O., 2003).

Table 1

The average chemical composition of white and red cabbage (Beceanu D., 2011)

Product	Carbohydrates g%	Protids g%	cellulose g%	Fibers g%	Minerals g%	Kcal/kg
White cabbage	3,5-6	1,8-2,1	1,2-1,6	2,8	0,6	330
Red cabbage	3,3-5,6	1,4-1,9	0,7-1,1	3	0,8	230-330

The possibility of a distribution of consumption over a long period of time, both in fresh and industrialized, coupled with high food value, led to the inclusion of vegetable *Brassica* in a rational and balanced nutrition regimen. The rich content in salts and vitamins (table 2) gives them a special value (Bălașa M., 1980).

Table 2

The content of vitamins and minerals of the white and red cabbage (Beceanu D., 2011)

Product	Vit. C mg%	carotene mg%	Vit. B mg%	Vit. PP mg%	Vit. E mg %	K mg %	Mg mg %	P mg %
White cabbage	40-60	0,3-0,5	0,2-0,3	0,30,8	2,4	400	70	60
Red cabbage	50-90	-	0,55	0,38	0,9	250	17	32

Experts claim that cabbage has therapeutic role in over 100 diseases. Active substances varies according to species (Zhenzhen X., 2010).

Research done in the last 20 years have confirmed that a frequent consumption of raw or juice cabbage have a beneficial effect in preventing colon cancer. American Studies at the National Cancer Institute showed that people who eat cruciferous vegetables (especially cabbage) are less exposed to illness of the colon cancer. Similar research was conducted in the U.S., Greece, Norway and Israel universities. White cabbage is a nutritive food, energizing, remineralizing, diuretic, anti-haemorrhagics, antiseptic, healing, antidiabetic and antianemic.

Consumption of cabbage three times a week help to supplement the vitamins and minerals necessary for patients with anemia. In the elderly, cabbage is refreshing and combat premature aging. Consumption of cabbage is also indicated for pregnant women, due to folic acid. Studies have shown that lack of this acid in the diet during pregnancy leads to birth of children with neurological problems. Cabbage speeds up healing of wounds, the sprains and neuralgia (Yu-Ping *et al.*, 2008).

MATERIAL AND METHOD

Two white and red cabbage varieties were analyzed for potential antiradical. Samples were placed in dark plastic bags and stored at -20°C until extract performance (not less than one week).

To prepare cabbage extract 50 g were homogenized and extracted in 200 ml extraction solvent (ethanol: acetone: acetic acid in the ratio 70: 29: 1) for 1 h at 37°C (Guorong *et al.*, 2009). The extract obtained was filtered through Whatman paper no. 41 and then rinsed with 50 ml extraction solvent (ethanol: acetone: acetic acid in the ratio 70: 29: 1). The extraction residue was repeated under the same conditions. The two filtrates were combined and stored at -20°C until use.

Antiradical activity was determined by DPPH method proposed by Brand-Williams *et al.*, 1995. Absorbance was recorded at 517 nm. The antioxidant activity was calculated as the μ mole Trolox equivalent (TE) / 100 g fresh weight with Trolox calibration curve.

Total phenolic compounds of the cabbage extracts were determined with Folin-Ciocalteu method. Absorbance was read at 750 nm, and the results were expressed as mg gallic acid equivalent per 100 g fresh product.

For the determination of anthocyanins from red cabbage pH variation method was used. The extracts were diluted in a pH 0.68 and in a pH 3.5 solutions. Absorbance was measured at 520 and 700 nm. Results were expressed as mg per 100 g fresh product.

Tests were performed in triplicate for each sample. Results were expressed as mean values \pm standard deviation. Statistical correlations were calculated using Microsoft Office Excel.

RESULTS AND DISCUSSIONS

Vegetables are sources of natural antioxidants as vitamins, flavonoids, carotenoids and other phenolic compounds (Ismail *et al.*, 2004, Kim *et al.*, 2007, Good *et al.*, 2008). Consumption of *Brassica* vegetable such as broccoli, cauliflower,

cabbages, which have antioxidant activity, may be useful for human health (Podsędek A., 2007, Sikora E. *et al.*, 2008).

Brussels sprouts, broccoli, red cabbage are considered the vegetables with the most efficient antiradical system (Podsędek A., 2007).

Antiradical activity in red cabbage stand out from the antiradical activity of white cabbage (table 3). Regarding antiradical potential of inner and outer leaves, no differences were recorded in two varieties. The inner leaves of white cabbage showed a greater antiradical potential than outer leaves. We can not say the same thing about red cabbage, where the situation is different, antiradical activity of the outer leaves was greater than antiradical activity of the inner leaves.

Table 3

Antiradical activity (DPPH), total phenols and anthocyanins content extracts of white and red cabbage

Variety	Phenolics compounds (mg GAE/100 g fresh weight)	Anthocyanins content (mg/100 g fresh weight)	Antiradical activity (μM Trolox/100 g fresh weight)
White cabbage			
Outer leaves	42.75 \pm 0.17	-	29.1 \pm 1.37
Inner leaves	54.56 \pm 0.17	-	29.5 \pm 0.93
Red cabbage			
Outer leaves	245.16 \pm 0,35	98.57 \pm 0.34	86.4 \pm 2.38
Inner leaves	108.70 \pm 0.17	29.81 \pm 0.10	83.6 \pm 1.5

The content of anthocyanins in red cabbage ranged from 98.57 \pm 0.34 mg/100 g fresh product of the outer leaves to 29.81 \pm 0.10 mg/100 g fresh product of the inner leaves. It seems that the outer leaves was much richer in anthocyanins than internal ones. Anthocyanins may be located in different plant organs and in different proportions, their distribution varies from species to species, but also between different varieties of the same species (Maarit R., 2005).

Red cabbage contains 36 different types of anthocyanins, a class of flavonoids that have been linked to cancer protection, according to a new study conducted by researchers from the U.S. Department of Agriculture's Agricultural Research Service (ARS). Recently, it has attracted much attention because of its physiological functions and applications. Anthocyanins rich in red cabbage seem to be responsible for those properties (McDougall *et al.*, 2007). Besides giving color to plants, anthocyanins also have an array of health-promoting benefits, as they can protect against a variety of oxidants through a various number of mechanisms (Kong *et al.*, 2003). Health benefits associated with anthocyanins include enhancement of sight acuteness, treatment of various blood circulation disorders resulting from capillary fragility, vaso-protective and anti-inflammatory properties, maintenance of normal vascular permeability, controlling diabetes, anti-neoplastic and chemoprotective agents, radiation-protective agents, and

possibly others due to their diverse action on various enzymes and metabolic processes (Giusti *et al.*, 2003).

Phenolics content of red cabbage showed much higher values than white cabbage. In white cabbage the highest content of total phenols was observed in the inner leaves (54.56 ± 0.17 mg g GAE/100 a fresh weight) and in red cabbage the highest content of phenolics compounds was found in the outer leaves (245.16 ± 0.35 mg GAE / 100 g fresh product).

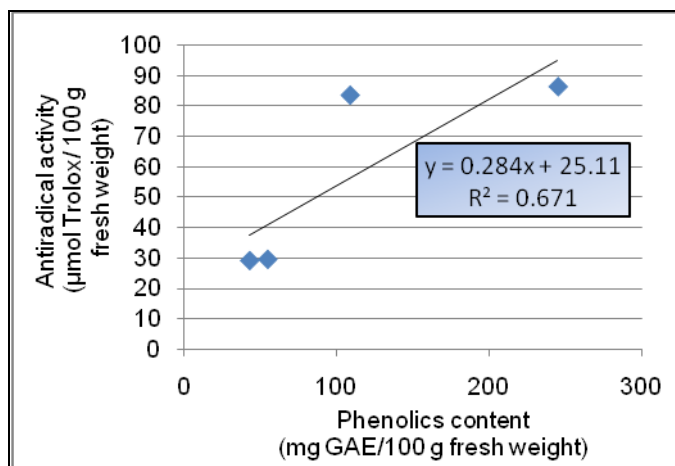


Fig.1 - Correlation between total phenolic content and antiradical potential of the inner and outer leaves of the white and red cabbage

Correlation between antiradical potential and total phenol content of inner and outer leaves from white and red cabbage (fig. 1) is relatively low ($R^2 = 0.671$). Influence of phenolic compounds in antiradical activity is evident in outer leaves of white and red cabbage. Elevated total phenol content recorded correspond to those of antiradical potential. Cruciferous vegetables, including cabbage (*Brassica oleracea* convar. *capitata*), have a high nutritional value and contain organosulphur phytochemicals that increase their antioxidant capacity, which may have anticarcinogenic effect (Kurilich *et al.* 1999; Kim *et al.* 2004).

CONCLUSIONS

1. Cabbage represent an important source of antioxidants, available throughout the year.

2. Antiradical activity found in red cabbage (86.4 ± 2.38 mm Trolox/100 g fresh product) was higher than in white cabbage (29.5 ± 0.93 mm Trolox/100 g fresh product).

3. Differences between antiradical activity of the outer and inner leaves of the two varieties studied was small.

4. Anthocyanin content of the red cabbage outer leaves (98.57 ± 0.34 mg/100 g fresh product) it clearly distinguishable from that existing in the inner leaves (29.81 ± 0.10 mg/100 g fresh product).

5. Correlation between total phenolics content and antiradical potential of both varieties of cabbage was considered low, which suggests that antiradical activity involve other antioxidant compounds.

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BEHAVIOUR OF FETEASCĂ NEAGRĂ, CABERNET SAUVIGNON AND MERLOT VINE VARIETIES IN THE VITICOL CENTER BOHOTIN OF IASI VINEYARD

COMPORTAREA SOIURILOR FETEASCĂ NEAGRĂ, CABERNET SAUVIGNON ȘI MERLOT ÎN CENTRUL VITICOL BOHOTIN, DIN PODGORIA IAȘI

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Abstract. *Viticol center Bohotin is located in an area where the vineyard culture is not recommended for red wine varieties, but because of the warming climate in the last period and in the context of the favorable relief conditions of culture is necessary to test behaviour of the red vine varieties in this viticol center. The experiments were carried out at the SC VINIA SA Iasi, on Fetească neagră, Cabernet Sauvignon and Merlot varieties. To determine the behavior of these varieties were studied: the loss of buds in winter, the amount of wood removed at fruiting cuttings, phenophase conduct of vegetation, fertility and productivity of plants, the quantity and quality of grape production.*

Key words: vine, vineyard, redwines

Rezumat. *Centrul viticol Bohotin nu este amplasat într-un areal viticol în care este recomandată cultura soiurilor pentru vinuri roșii, dar pe fondul încălzirii climatice din ultima perioadă și în contextul unor condiții favorabile de relief este necesară testarea culturii acestor soiuri în centre viticole noi pentru vinuri roșii, cum este centrul viticol Bohotin. Experiențele au fost efectuate la ferma Isaiia a SC VINIA S.A Iași, la soiurile Fetească neagră, Cabernet Sauvignon și Merlot. Pentru determinarea comportării acestor soiuri au fost studiate: pierderile de muguri pe timpul iernii, cantitatea de lemn eliminată la tăierea de fructificare, desfășurarea fenofazelor de vegetație, fertilitatea și productivitatea butucilor, cantitatea și calitatea producției de struguri.*

Cuvinte cheie: viță de vie, podgorie, soiuri pentru vinuri roșii

INTRODUCTION

Increased thermal resources growing areas due to global warming, causes the possibility of extending the culture of vine varieties for red wines to the area north of the country, specializing in crop varieties for white wines. Studies carried out in vineyards such as Husi and Science, showing their suitability for growing vine varieties for red wines (Mursa D., 2004, Irimia L. et al., 2009). This paper is a study on the behavior of vine varieties for wine red wine Bohotin center, in order to diversify its product range varietal.

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MATERIAL AND METHOD

Experiences were made on the farm Isaiia from VINIA SA, in 2008-2009 and were studied following varieties for red wines: Fetească neagră grafted on rootstock Crăciunel Feteasca 71, Cabernet Sauvignon grafted on rootstock Crăciunel 71, Merlot grafted on rootstock Kober 5 BB. Planting distances were 2.2 / 1.2 m, with a density of 3787 vines / ha; the vine were conducted as semiñalt bilateral cordon; cutting of fructification was Cazenave cordon type. To determine the behavior of these varieties were studied: phenophases of vegetation development, growth and maturation of shoots, fertility and productivity of vine, quantity and quality of grape production.

RESULTS AND DISCUSSIONS

Conducting phenophases of vegetation is determined by biological characteristics of the varieties studied. Feteasca neagră variety, watered the cooler climate of the north of Moldova is manifested as a variety with short vegetation, of 161 days, and the phenophases of vegetation begin earlier with 3-8 days to 12 days in grapes ripening compared with Cabernet Sauvignon and Merlot (table 1).

Table 1

Conducting vegetation phenophases of Fetească neagră, Cabernet Sauvignon and Merlot, grown in the vine center Bohotin

Variety	weeping	Unbuding	Flowering	Ripening grapes	During the vegetation (days)
Fetească neagră	27.04	06.05	11.06	05.10	161
Cabernet Sauvignon	24.04	01.05	03.06	17.10	179
Merlot	25.04	01.05	13.06	12.10	174

Parameters of wood elements indicate vine vigor, wood maturation and therefore the ecological adaptability of the variety. The largest number of canes on the vine, 18.6, formed the variety Fetească neagră, fewer canes on the vine of 14.9 and respectively 13.7 Cabernet formed Sauvignon and Merlot. The most vigorous variety was Fetească neagră, with an average length of the cane of 83 cm, immediately followed by Cabernet Sauvignon, with an average cane length of 82 cm. Merlot showed a lower vigor, the average length of the canes was only 69 cm. Wood canes was matured in appropriate proportion, between 75% and 86% Merlot to Cabernet Sauvignon (table 2).

Fertility, expressed in particular by the number of inflorescences formed on the vine, showed significant differences between varieties; the most fertile variety was Merlot with an average of 26.5 inflorescences on the vine, with distinct differences significantly positive to control, the lowest fertility, with an average number of inflorescences on the vine of 20.8 and negative significant differences compared to the control registered Fetească neagră variety. Cabernet Sauvignon variety formed on average of 22.3, inflorescences on the vine, with minor differences to the control (table 3).

Table 2

**Woody elements formed on the block parameters to Feteasca neagră,
Cabernet Sauvignon and Merlot, grown in the viticol center Bohotin**

Variety	Number of canes on vine	Diameter of canes (mm)	Length of canes (cm)	Length sweeping wood (%)
Fetească neagră	18,6	7,7	83	78,1
Cabernet Sauvignon	16,9	7,6	82	86,0
Merlot	22,7	6,7	69	75,0
Media/Control	19,4	7,3	78	79,7

Table 3

**Fertility of Fetească neagră, Cabernet Sauvignon and Merlot
grown in viticol center Bohotin**

Variety	Nr. of shoots on vine	Of which:		Nr. of inflorescences on vine	differences to control	Semnif.
		Fertile	%			
Fetească neagră	21,3	16,0	75,1	20,8	-2,4	00
Cabernet Sauvignon	19,9	14,0	70,3	22,3	-0,9	-
Merlot	24,1	18,0	71,8	26,5	+3,3	xx
Media/Control	19,7	14,3	72,4	23,2		

DL 5%=1,5 infloresc.
DL 1%=2,3 infloresc.
DL 0,1%=4,1 infloresc.

The average number of grapes on the vine trained directly correlated with the number of inflorescences, the largest number of grapes per vine were formed Merlot followed by Cabernet Sauvignon and the lowest number of grapes per vine were formed Feteasca the black variety (table 4).

Table 4

**Productivity of Fetească neagră, Cabernet Sauvignon and Merlot,
grown in viticol center Bohotin**

Variety	Nr. of grapes on vine	The average weight of grapes (g)
Fetească neagră	20,7	104,4
Cabernet Sauvignon	22,4	90,1
Merlot	25,8	100,5
Media/Control	22,9	98,3

Grape production ranged between 7.6 and 9.8 t / ha, the largest production of grapes, 9.8 t / ha, has been the variety Merlot. Positive significant differences

compared to the control and lowest in Cabernet Sauvignon, with significant differences; to the negative control (table 4).

Quality grape production was appropriate to variety potential; the sugar content was over 200 g/l in all varieties studied, the highest sugar content of 221 g/l was found to Feteasca neagră variety (table 5).

Table 5

Grape production and quality of Fetească neagră, Cabernet Sauvignon and Merlot, grown in viticol center Bohotin

Variety	Grape production		Diff. control (t/ha)	Signif.	quality of grapes			
	kg/but	t/ha			Sugar (g/l)	Diff. martor	Signif.	Acidity g/l H ₂ SO ₄
Fetească neagră	2,16	8,2	-0,3	-	221	+11	x	5,70
Cabernet Sauvignon	2,02	7,6	-1,3	0	209	-2	-	7,26
Merlot	2,59	9,8	+1,3	x	203	-8	0	6,75
Media/Control	2,25	8,5			211			6,57

DL 5%=0,8 t/ha
DL 1%=1,1 t/ha
DL 0,1%=2,7 t/ha

DL 5%=7,6 g/l
DL 5%=12,1 g/l
DL 5%=19,5 g/l

CONCLUSIONS

1. Feteasca neagră, Cabernet Sauvignon and Merlot have shown good behavior in the viticol center Bohotin, both in terms of browsing vegetation phenophases, growth and maturation of wood and grape production and quality.

2. Feteasca neagră variety was manifested as a variety with vigorous growth with good ripening of the wood, a faster progresses of vegetation phenophases, an earlier maturation of the grapes and high quality production. Cabernet Sauvignon grew vigorous, very good wood maturation, a late ripening grapes, but good quality production. Merlot showed moderate growth, good wood maturation, and the largest grape and its good quality.

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INFLUENCE OF FERTILIZERS ON THE LEVEL AND QUALITY OF MAIZE

INFLUENȚA ÎNGRĂȘĂMINTELOR ASUPRA NIVELULUI ȘI CALITĂȚII PRODUCȚIEI DE PORUMB

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***Abstract.** Maize is a nitrogen-intensive crop, the largest part of this element is absorbed into the first part of the vegetation, with maximum intensity to the formation of floral organs. Towards maturation of seed, 70% of nitrogen goes from bean leaves, but at this stage of culture needs this element for further enhancing photosynthesis and grain protein content. The many factors that influence the effectiveness of fertilizers creates difficulties in establishing dose more so, since some factors are more difficult to control and taken into account (climatic conditions), increases the production of fertilizers obtained by applying varying from one area to another.*

Key words: fertilizers, effectiveness, climatic conditions

***Rezumat.** Porumbul este o cultură mare consumatoare de azot; cea mai mare parte din acest element îl absoarbe în prima parte a vegetației, cu intensitate maximă la formarea organelor florale. Către maturarea semințelor, 70% din azot trece din frunze în boabe, dar și în această fază cultura are nevoie de acest element pentru continuarea procesului de fotosinteză și pentru sporirea conținutului de proteină în boabe. Multitudinea factorilor care influențează eficacitatea îngrășămintelor creează greutăți în stabilirea dozelor, cu atât mai mult, cu cât unii factori sunt mai greu de controlat și de luat în calcul (condițiile climatice), sporurile de producție obținute prin aplicarea îngrășămintelor oscilând de la o zonă la alta.*

Cuvinte cheie: îngrășămintă, eficacitate, condiții climatice

INTRODUCTION

Recovery depends on the top of the fertilizer application method than theirs. For autumn fertilizer management is less efficient for the economy and energy, spring maize fertilization is recommended, along with sowing (on line). Fertilization level is influenced by pre-plant, so as to reduce nitrogen pulses with 30-40 kg / ha, which means an energy savings of 771-1028 kWh/ha. Corn produces large crops, but with low grain protein content, it will decrease the amount of food and feed. Using nitrogen increases both yield and protein quality of grain. For example, under the Albota at fertilization, grain protein content was 8%, and by application of 200 kg N/ha increased from 10.2% protein. Phosphorus (40-160 kg/ha), by contributing to plant growth

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and development, increased production of protein/ha. In our country's conditions, fertilization increases the protein maize (11-12%), contributing to the genetic potential of cultivated hybrid (Hera Cr. et al., 1987).

MATERIAL AND METHOD

Knowing the effects of chemical fertilizers applied to cereals generally, depending on climatic conditions, the dose ratio of fertilizer and nutrients, allows determining the amounts to be allocated judiciously to achieve optimal economic effect, a higher quality of production and viability in terms of energy crops. (Borlan Z., Hera Cr. et al., 1994; Davidescu D., Davidescu Velicica, 1999).

The results covered by this paper aims to contribute to useful information for economic and energy efficiency (Alecui I. et al., 2001) in the maize crop specific experimental conditions. In this regard, the following are the objectives of the research conducted succinctly:

- Determination of total crop growth and average growth due to unilateral application of compound fertilizers based on phosphorus and nitrogen.
- Effect of NP fertilizers on economic efficiency.
- Effect of NP fertilizers on energy efficiency.

For corn crop came from experimental data Albota and Simnic resorts. Simnic a P₂O₅/ha agrofond 80 kg were studied four options: V1 – 0 kg N / ha, V2 - 80kg N / ha, V3 - 160kg N / ha and V4 - 240 kg N / ha. If Albota resort on a 100 kg agrofond K₂O/ha P₂O₅/ha and 80 kg received a dose of 120 kg N / ha split applied at different times for each experimental variant part.

RESULTS AND DISCUSSIONS

The corn crop to determine the economic and energy efficiency, experimental results were used in institutes and research stations, after 2000, because they are accurately measured - production, fertilizers, water quantity, etc. and can make comparisons between the versions.

In table 1 are made of corn yields in the central area of Oltenia (SCDA Șimnic), the constant fund raising dose of phosphorus and nitrogen.

In the variant fertilized with minimal cost, could achieve a production of 4540 kg / ha. Cost per 1 kg was 0.33 lei profit was 316 lei/ ha and the profit rate is 21.06%. If not using chemical fertilizers, energy consumption is reduced, 1178 kWh / ha, 259 kWh per tonne back. Energy balance is also very favorable, with 19 524 kWh/ ha.

At a minimum power consumption, energy efficiency reached 17.57, ie, energy consumed per unit of energy units is obtained as 17.57 grains of corn (to take into account the primary energy production). Taking into account the energy obtained from the production of straw (4.25 kWh/1 kg straw) means that it can double, because grain production to around 4000 kg / ha, straw production is equivalent to -11. Analyzing the second variant, that are used 80 kg P₂O₅ and 80 kg N / ha, production increased by 24.6%, but this increase is not sufficient to reduce product unit costs in order to reduce production cost and increase profit per hectare.

Table 1

Economic indicators and energy to make corn crop under different doses of nitrogen in the central area of Oltenia (SCDA Şimnic)

Nr. crt.	Specification	U.M.	Unirrigated			
			N-0 P ₂ O ₅ - 0	N-80 P ₂ O ₅ - 80	N-160 P ₂ O ₅ - 80	N-240 P ₂ O ₅ - 80
1.	Average production	kg/ha	4540	5660	6190	6020
2.	Increased production	kg/ha	-	1120	1650	1480
		%	100	124.6	136.3	132.6
3.	Expenditures	lei/ha	985,50	1486,60	1714,82	1832,89
4.	Expenditure on manpower	lei/ha	403,35	411,47	405,57	384,39
5.	Other expenses	lei/ha	111,15	152,13	169,71	177,72
6.	Total production expenses	lei/ha	1500,0	2050,20	2290,10	2395,00
7.	Cost of production	lei/ha	0,33	0,36	0,37	0,39
8.	Profit per kg	lei/ha	0,07	0,04	0,03	0,01
9.	Profit per ha	lei/ha	316,00	213,80	185,90	13,00
10.	Price per kg	lei/ha	0,4	0,4	0,4	0,4
11.	The value of grain	lei/ha	1816,0	2264,00	2476,00	2408,00
12.	Profit rate	%	21,06	10,42	8,11	0,54
13.	Labour productivity	man-day/ha	15.00	16.00	16.00	16.00
		man-hour/t.d.c.	26.43	22.61	20.67	21.26
		mechanic-hour/t	2.99	2.96	2.97	3.05
14.	Consumption of fuel (diesel)	l/ha	61.50	63.80	65.50	65.20
		l/t	13.54	11.27	10.58	10.83
15.	Energy consumption per ha	kWh	1178	3761	5862	7914
16.	Energy consumption per tonne	kWh	259	664	947	1314
17.	Energy obtained (grain production)	kWh /ha	20702	25809	28226	27451
18.	Energy balance (net energy)	kWh /ha	19524	22048	22364	19537
19.	Energy efficiency	obtained/ consumption	17.57	6.86	4.81	3.46
20.	Energy consumption per ha	Mj	4243	13547	21115	28506
21.	Energy consumption per	Mj	934	2393	3411	4735
22.	Energy consumption per ha	Mcal	949	3031	4725	6378
23.	Energy consumption per	Mcal.	209	535	763	1059
Variant 0,6 lei/kg						
8	Profit per kg	lei/kg	0,27	0,24	0,23	0,21
9	Profit per ha	lei/ha	1224,00	1345,80	1423,90	1217,00
10	Price per kg	lei/kg	0,60	0,60	0,60	0,60
11	The value of grain production	lei/ha	2724,00	3396,00	3714,00	3612,00
12	Profit rate	%	81,60	65,64	62,17	50,81

Conversely, the cost increases and profit decreases kg. In terms of energy due to the introduction of fertilizers, consumption kWh / ha reached 3761, and a ton of product consumption is 664 kWh.

Net energy is 22,048 kWh / ha and energy efficiency 6, 86. In the third variant, doubling the amount of N, from 80 to 160 kg/ha, production increased only by 11.7% or 530 kg / ha, which further influenced the increasing cost and reducing profit per hectare.

Energy consumption increased to 5862 kWh / ha, returning 947 kWh /t. The energy produced reaches 28 226 kWh / ha, net energy is 22,364 kWh / ha, while energy efficiency is 4.81. In the fourth variant, the tripling of the amount of nitrogen (240 kg N / ha) decreased from previous production to 170 kg or 3.7%. In these circumstances the cost of production increases and more profit per hectare is reduced and its rate also decreases, reaching 0.54%.

Instead, as a result of tripling the amount of nitrogen, increases energy consumption 7914 kWh/ ha and at 1314 kWh per tonne yield also decreases to 3.46. In this case there are three avenues to be explored to draw a conclusion.

The first way would be getting free fertilizer and irrigated production, so at minimal cost. A second way is to use moderate amounts of fertilizer and maximum effect. This is because the use of 240 kg N/ha, production began to fall from the variant with 160 kg N/ha.

A third way is by providing prices that reward work effort and encourage producers to obtain high yields. So, more production, even with a higher cost, mass higher profit per hectare. In the case presented to the first variant, the third variant, the yield per hectare increased by 199 lei /ha. In the podzolic soils (Arges county) can be obtained by taking the best production of chemical fertilizers.

Thus, the data presented in table 2, experiments conducted at SCDA Albota, that production can be almost doubled. In unfertilised variant could get a production of 4200 kg / ha, with a relatively low income (40 lei / ha), being the profit rate of 2.43%. From this level of crop production is becoming profitable.

In terms of obtaining a price of 0.6 lei / kg, may return to start at 3000 kg / ha up. Productions 2000 - 2500 kg / ha, they get very many farmers - even most - especially in hilly areas or soils with low fertility, are unprofitable. In variants fertilized with nitrogen, applied in different eras, a fund of 100 kg P₂O₅ and 80 kg K₂O / ha given in autumn, it is noted, however, a rebound of production when nitrogen is applied only in spring, even when administered in two stages. Administration of 1/3 N in the autumn has greater effect. From an economic perspective, costs are reduced to variants with partial nitrogen in the fall administration, and profit per hectare than 250 lei / ha. The profit rate is 13.05 and 10.93% to 3.28% for the variant with only nitrogen management in spring.

Table 2

Economic indicators and energy to make corn crop in the area of Arges, with different periods of application of nitrogen (SCDA Albota)

Nr. crt.	Specification	U.M.	Unfertilized	P2O5 100 + K2O 80		
				40 kg N autumn 80 kg N spring	40 kg N spring 80 kg N at 7-8 leaves	40 kg N autumn 40 kg N spring 40 kg N at 7-8 leaves
1.	Average production	kg/ha	4200	6900	6200	6900
2.	Increased production	kg/ha	-	2700	2000	2700
		%	100	164,28	147,61	164,28
3.	Expenditures	lei/ha	1060,42	1814,34	1814,11	1847,09
4.	Expenditure on manpower	lei/ha	458,05	455,77	408,92	456,79
5.	Other expenses	lei/ha	121,53	171,14	178,18	184,12
6.	Total production expenses	lei/ha	1640,00	2441,25	2401,21	2488,00
7.	Cost of production	lei/kg	0,39	0,35	0,38	0,36
8.	Profit per kg	lei/kg	0,01	0,05	0,02	0,04
9.	Profit per ha	lei/ha	40,00	318,75	78,79	272
10.	Price per kg	lei/kg	0,40	0,40	0,40	0,40
11.	The value of grain production	lei/ha	1680,00	2760,00	2480,00	2760,00
12.	Profit rate	%	2,43	13,05	3,28	10,93
13.	Labour productivity	man-day/ha	13,90	19,40	17,80	20,00
		man-hour/t.d.c.	31,77	22,49	20,00	23,18
		mechanic-hour/t	2,75	2,90	2,96	3,13
14.	Consumption of fuel (diesel)	l/ha	46,65		54,80	57,45
		l/t	13,33	8,10	8,83	8,32
15.	Energy consumption per ha	kWh	942	5189	5150	5231
16.	Energy consumption per tonne	kWh	269	752	830	758
17.	Energy obtained (grain production)	kWh /ha	15960	31464	28272	31464
18.	Energy balance (net energy)	kWh /ha	15018	26275	23122	26233
19.	Energy efficiency	obtained/ consumption	16,94	6,06	5,49	6,01
20.	Energy consumption per ha	Mj	3393	18690	18550	18842
21.	Energy consumption per tonne	Mj	969	2708	2992	2730
22.	Energy consumption per ha	Mcal.	759	4182	4151	4216
23.	Energy consumption per tonne	Mcal.	217	606	669	611

CONCLUSIONS

1. In the central area of Oltenia, irrigated corn, increase the maximum production (36.3%) was obtained by application of 160 kg N / ha, 80 kg P₂O₅ fund.

2. Largest profit was made from unfertilised variant (rate of return = 21.06%), whereas costs were lower. The price of 0.6 lei / kg, the rate of return to this variation (unfertilized) reached 81.60%, almost double the version with the highest dose of N (240 kg / ha). Energy efficiency is higher in unfertilised variant (17.57).

3. In the case of podzolic soils, crop production becomes more profitable to 3,000 kg / ha. Thus, the substance of 100 kg P₂O₅ and 80 kg K₂O/ha, applying N in two rounds (40 kg / ha in autumn and 80 kg / ha in spring) results in production of 6900 kg / ha, with a profit rate of 13.05%, the highest. Energy efficiency for variant but remains unfertilized (16.94).

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RESEARCH CONCERNING DESIGN AND TESTING OF A LABORATORY RIG FOR THE STUDY OF THE AGRICULTURAL UNITS ACTIVE PARTS-SOIL INTERACTION

CERCETĂRI PRIVIND PROIECTAREA ȘI EXPERIMENTAREA UNUI STAND PENTRU STUDIUL INTERACȚIUNII ORGANELOR ACTIVE ALE UTILAJELOR AGRICOLE CU SOLUL

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Abstract. *The physical degradation of soil due to the interaction with the active parts of the agricultural units consists mainly in its compaction, but also in the deterioration of its structure. Experimental studies should be carried out in order to establish the values of the working parameters of the active parts leading to soil degradation and to establish the relationships between these parameters and the indices related to soil degradation. In order to solve the above-mentioned problems the Agricultural Machinery Department of the University of Agricultural Sciences and Veterinary Medicine has designed, built and tested a laboratory rig. The rig is composed of a soil channel, the carriage for mounting the studied active part and the carriage traction implement. Tests were carried out in order to validate the design of the rig and the conclusion was that all the imposed requirements were achieved.*

Key words: tillage active part, towing force, soil compaction

Rezumat. *Degradarea fizică a solului cauzată de interacțiunea organelor active ale utilajelor agricole cu acesta, se referă în special la deteriorarea structurii solului dar și la compactarea lui. Este necesar să se facă studii pentru a se stabili la ce parametri de funcționare ai organelor active începe procesul de degradare a solului. Totodată, trebuie să se stabilească corelațiile care există între parametrii de funcționare ai organelor active ale utilajelor și valorile indicilor de degradare ai solului. Pentru rezolvarea acestor probleme, la disciplinele de mecanizare a agriculturii din Universitatea de Științe Agricole și Medicină Veterinară din Iași a fost proiectat, realizat și experimentat un stand de laborator destinat studiilor menționate mai sus. Standul este alcătuit din canalul de sol, căruciorul pe care se fixează organul activ și dispozitivul pentru tractarea căruciorului. Acest stand a fost experimentat pentru a se vedea dacă s-au realizat parametrii constructiv-funcționali ai acestuia stabiliți inițial prin proiectare.*

Cuvinte cheie: organ activ, forță de tracțiune, tasarea solului

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INTRODUCTION

The physical degradation of the soil is caused by the interaction with the active parts of the agricultural equipments and its effects are the degradation of soil structure and soil compaction. Researches are needed in order to evaluate these effects and to establish when soil degradation begins. The connection between the working indices of the tillage tool and the indices related to soil degradation must also be investigated (Căproiu et al., 1982; Căproiu et al., 1973; Jităreanu et al., 2007; Țenu et al., 2010).

In order to solve these problems a laboratory test rig was designed, constructed and tested, aiming to investigate the interaction between the active parts of agricultural equipment and soil.

MATERIAL AND METHOD

The test rig (figure 1) consists of the frame of the soil channel (1), the soil channel (2) and the carriage (3), on which the tillage active part (6) and the compacting roller (7) are mounted. The electric cable drum (4) tows the carriage (3) by the means of a cable (5). The electric cable drum (4) consists of an electric motor (8), a cylindrical gear drive (9), a mechanical coupling and a drum (10).

An electrical control panel and electric cables (11), mounted on the support poles (12), are used in order to feed the test rig with electricity.

Due to its length (10240 mm), the soil channel is composed of five sections, which are jointed with screws.

The carriage (figure 2) is composed of a frame (1), on which all the other parts are mounted. The active part (2) can be any tillage tool (plow body, chisel type tools etc.); the compacting roller (3) is also mounted on the carriage frame. The active part is mounted on the bracket (5), that is clipped on the brackets (4), hinged to carriage frame. The vertical position of the bracket (5) and of the active part is adjusted by the means of the lifting-screw (8), in order to modify the working depth. The screw mechanism (7) is used in order to modify the tilt angle of the tillage tool ($\pm 25^{\circ}$ from the average position).

The compacting roller (3) is used in order to achieve a certain level of soil compaction before tillage. A screw mechanism (9) is used in order to adjust the vertical position of the compacting roller.

Four upper trundles (10) – two in the front and two in the back – and four lower trundles (9) - also two in the front and two in the back - are mounted on the carriage frame; the trundles are rolling on rails, mounted on each side of the soil channel frame.

The towing cable is connected to the carriage by the means of two strain gauge load cells, allowing the measurement of the traction force needed to displace the carriage.

The electrical control panel is used in order to feed the test rig. The electrical motors are controlled by the means of a frequency converter, allowing the adjustment of the rotation speed when the frequency is modified between 3 and 50 Hz. The dynamic braking principle is used in order to stop the carriage at the end of travel. Switches on the control panel allow the selection of the forward or reverse motion of the carriage.

Two strain gauges load cells (1000 daN maximum force) are used in order

to measure the carriage towing force; the load cells are connected to an electronic controller, which displays the averaged value of the traction force.

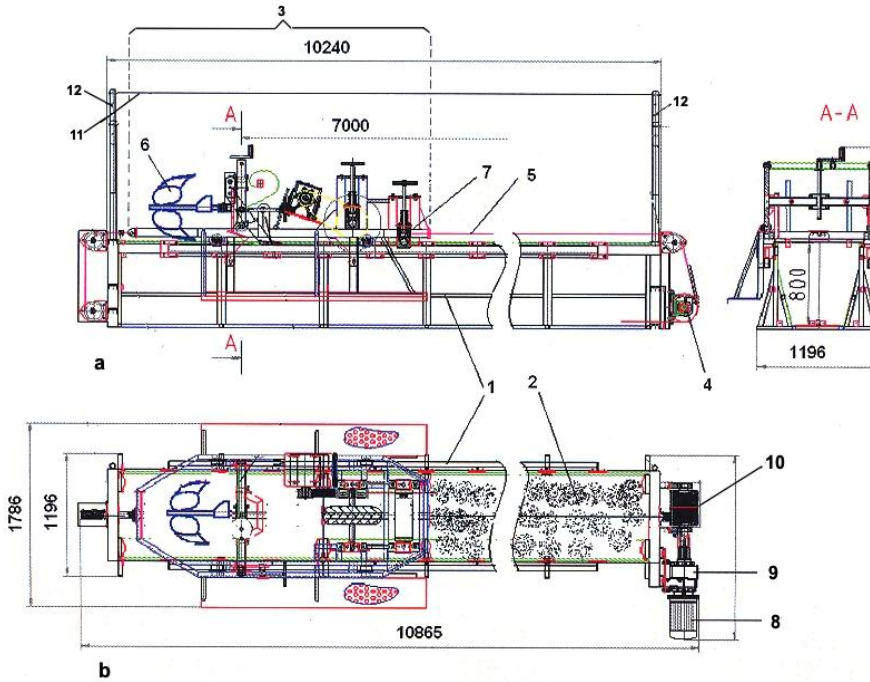


Fig. 1 - Laboratory test rig for the study of active parts-soil interaction:
a – side view; **b** – upper view. 1 – soil channel frame; 2 – soil channel; 3 – carriage; 4 – cable drum; 5 – carriage towing cable; 6 – tillage active part; 7 – compacting roller; 8 – electric motor; 9 – cylindrical gear drive; 10 – drum; 11 – electric cable; 12 – supporting poles.

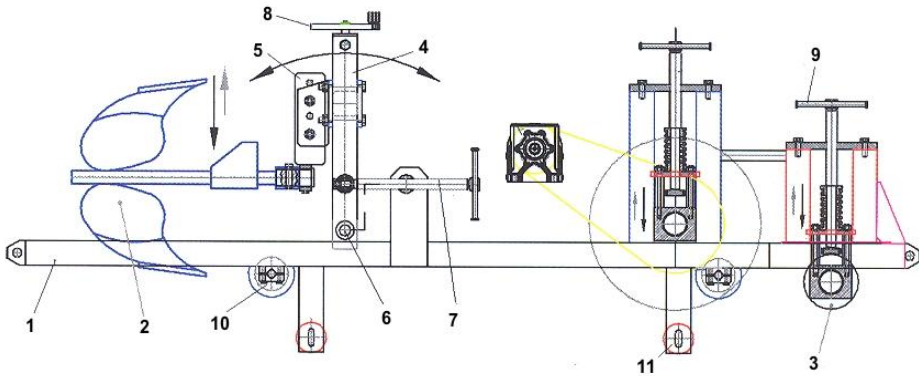


Fig. 2 - Carriage of the test rig:
 1 – carriage frame; 2 – tillage active part; 3 – compacting roller; 4 – brackets for the active part tilt adjustment; 5 – tillage active part bracket; 6 – hinge; 7 – screw mechanism for the active part tilt adjustment; 8 – screw mechanism for the adjustment of the working depth; 9 – screw mechanism for the adjustment of the vertical position of the compaction roller; 10 – upper trundles; 11 – lower trundles.

The laboratory test rig has the following features:

- the carriage towing electric motor: 5.5 kW and 1000 rev/min;
- the carriage travel: 7 m;
- the carriage towing cable: D8 6x19 Seale IWR ISO 2408 (8 mm diameter, with 6 strands, each having 19 threads);
- overall dimensions of the soil channel: 0.8x0.8x10 m (width x height x length);
- overall dimensions of the test rig: 2035 x 10865 x 1764 mm;
- gear ration of the towing mechanism: 24.31;

RESULTS AND DISCUSSIONS

The tests were performed for two values of the soil penetration resistance: 0.2 MPa and 0.4 MPa (Neculăiasa, 1971; Şandru et al., 1983; Nedeff et al., 1997). An electronic penetrometer (Penetrologger, Eijelkamp Holland) was used in order to evaluate the soil penetration resistance.

In the first stage of the tests the working parameters of the test rig were evaluated. As a result, the following parameters were obtained:

- working depth: 0 – 300 mm;
- the setting angle of the tillage tool: $\pm 25^{\circ}$ from the average position;
- maximum vertical load on the compacting roller: 500 daN;
- carriage maximum towing force (at 0.55 m/s): 800 daN;
- carriage maximum towing force (at 1.55 m/s): 280 daN;
- cable breakdown point: 40.83 kN.

It was concluded that there were no significant differences between the design parameters and the achieved ones.

The second stage of the experiments aimed to evaluate the working parameters when a plough body was used as a tillage tool; the effects of the working depth, soil penetration resistance and working speed over the towing force and specific power consumption were evaluated. The results are presented in table 1.

It must be emphasized that the test rig reproduces, in laboratory conditions, the working process of a mould board plow body. The working width of the plow body was 200 mm; only the plow body was mounted on the rig carriage.

The experimental results showed that the towing force and the specific power consumption increased when the working speed increased.

In the meantime an increased soil penetration resistance led to a significant increase of both the towing force and the specific power consumption (Roş, 1978; Roş, 1984).

When considering the third working parameter (the working depth) it was concluded that its increase led to a significant increase of the towing force (Drăgan, 1969; Scripnic et Babiciu, 1979).

Regarding the specific power consumption it was concluded that increasing the working depth from 100 to 150 mm led to the decrease of the specific power consumption; the increase of the working depth from 150 to 200 mm led to the increase of the specific power consumption. These apparent inconsistencies may

be thus explained: for low working depths (below 15 cm), the slice of soil cut by the plow body does not form a furrow (the slice does not undergo an action of torsion and inversion), leading to a lower specific power consumption. For working depths above 15 cm, the torsion and inversion of the furrow are achieved and these actions require additional power, leading to the increase of the specific power consumption.

Table 1

Working parameters of the laboratory test rig

Plow body working depth (mm)	Soil penetration resistance (MPa)	Plow body working speed (m/s)	Towing force (N)	Specific power consumption (W/cm ²)
100	0,2	0,75	705	2,65
		1,00	720	3,60
		1,25	735	4,59
	0,4	0,75	925	3,47
		1,00	940	4,70
		1,25	960	6,00
150	0,2	0,75	1055	2,64
		1,00	1070	3,57
		1,25	1080	4,50
	0,4	0,75	1380	3,45
		1,00	1400	4,67
		1,25	1420	5,92
200	0,2	0,75	1450	2,72
		1,00	1470	3,67
		1,25	1485	4,64
	0,4	0,75	1859	3,47
		1,00	1890	4,72
		1,25	1930	6,03

CONCLUSIONS

The experimental tests confirmed that the working parameters imposed by the design theme were achieved.

Based on the experimental results it was concluded that the effect of increasing the working speed is the increase of the towing force and of the specific power consumption.

It was also concluded that a higher penetration resistance led to a significant increase of the towing force and of the specific power consumption.

The increase of the working depth led to the increase of the towing force. In the meantime, increasing the working depth from 100 to 150 mm led to the decrease of the specific power consumption, while the increase of the working depth from 150 to 200 mm led to the increase of the specific power consumption.

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INFLUENCE OF FERTILIZERS ON THE LEVEL AND QUALITY OF SOYBEAN PRODUCTION

INFLUENȚA ÎNGRĂȘĂMINTELOR ASUPRA NIVELULUI ȘI CALITĂȚII PRODUCȚIEI DE SOIA

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***Abstract.** Scientific research and practice shows that the use of fertilizers, in that condition and influence the level and quality of production is a technological sequence with an important role in intensive technology. Many researches show that the climatic conditions of Romania react very differently to the application of soybean fertilizer and fertilization following problem must be solved and addressed the conditions where the culture.*

Key word: fertilizers, level, quality, technology

***Rezumat.** Cercetarea științifică și practica arată că utilizarea îngrășămintelor, prin faptul că condiționează și influențează nivelul și calitatea producției, devine o secvență tehnologică cu rol deosebit într-o tehnologie intensivă. Numeroase cercetări efectuate arată că în condițiile pedoclimatice ale României, soia reacționează foarte diferit la aplicarea îngrășămintelor și ca urmare problema fertilizării trebuie rezolvată și abordată în funcție de condițiile unde se află cultura.*

Cuvinte cheie: îngrășămintă, nivel, calitate, tehnologie

INTRODUCTION

Soy is a legume crop that can satisfy a necessary part of nitrogen through symbiotic bacteria, however, how fertilization can contribute to raising the quality and quantity of production. Hereinafter referred to facial applied nitrogen is used best when it is incorporated into the soil to the start of flowering plants (Borlan Z., Hera Cr. et al., 1994), with the execution of mechanical breed lines. Research on the influence of nitrogen and phosphorus fertilizers (Davidescu D., Davidescu Velicica, 1999) have on the production of soy have been conducted on a chernozem soil cambic the Romanian Plain (SCDA Teleorman). Other sequences in the technology culture technology has been recommended for growing soybeans.

MATERIAL AND METHOD

For the soybean crop cultivation technology has been respected, the experimental factors as nitrogen and phosphorus. Method of settlement of the experience is two-factor method subdivided parcels in six repetitions, experience and twenty-five variants including the application of nitrogen and phosphorus.

Factor A - PHOSPHORUS (kg P₂O₅/ha): a₁ = 0kg/ha; a₂ = 40kg/ha; a₃ = 80kg/ha; a₄ = 120kg/ha; a₅ = 160kg/ha

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Factor B = NITROGEN (kg N / ha): b1 = 0 kg / ha; b2 = 25 kg / ha; b3 = 50 kg / ha; b4 = 75 kg / ha; b5 = 100 kg / ha.

Were analyzed and interpreted a total of 25 variations on unilateral and increasing doses of nitrogen (V2 - V5), increasing doses of phosphorus (V6 - V9) and combinations of these two factors (V10 - V25) in crop year 2007 Variant V1 was considered unfertilized control variant. Based on technical data recorded by research stations have done in assessing the economic, energy and the various ways and combinations of fertilizers, using an appropriate system of indicators, which allowed broadening interpretation.

RESULTS AND DISCUSSIONS

Under the technical aspect, to witness the unfertilized (V1), increasing doses of nitrogen (25 - 100 kg N as/ha) led to increased production by 10-29% compared to the control, while increasing doses of unilateral action phosphorus resulted in production increases of 10-20% compared to the control. The combined application of both fertilizer production increases ranging from 21% to 48% in V10 and V20, so soy has responded well to the combination of nitrogen and phosphorus fertilizers in 2007, extremely dry year.

Table 1

Influence of nitrogen fertilizer on soybean production and technical and economic consequences – 2007

Specification	U.M.	V1 Mt	V2 N-25	V3 N-50	V4 N-75	V5 N-100
Production	Kg/ha	1560	1720	1880	2010	1930
	%	100	110	121	129	124
Total growth	Kg/ha	-	160	320	450	370
	%	-	10	21	29	24
Average gain	Kg/kg s.a.	-	6,4	6,4	6	3,7
Production value	lei	1404,00	1548,00	1692,00	1809,00	1737,00
Total expenditure	lei	1279,99	1336,96	1456,36	1547,56	1635,42
Chemical fertilizers	lei	0	53	106	159	212
Gross profit	lei	124,01	211,04	235,64	261,44	101,58
Gross profit rate	%	9,68	15,78	16,18	16,89	6,21
Cost of production	lei/kg	0,820	0,777	0,774	0,769	0,847
Estimated price recovery	lei/kg	0,900	0,900	0,900	0,900	0,900

Economically, the use of fertilizers in increasing amounts of technology spending increases. Elevations vary between 1336 and 1635 lei/ha for nitrogen fertilizers applied unilaterally, between 1332 and 1534 lei/ha for phosphorus fertilizers and between 1433 and 1935 lei/ha for N and P combinations analyzed. In the technological expenditure reveals a progressive increase in material costs with higher doses of fertilizers. Technical efficiency of nitrogen and phosphorus (Alecú I. et al., 2001) factors investigated is the average gain per kg to applied to express the

technical conversion of these factors investigated. The unilateral application of nitrogen (table 1) conditions is a reduction of the average gain of 6.4 kg to 3.7 kg soybeans / kg N was applied. If an average gain of phosphorus application (table 2) ranged between 3.8 and 1.6 kg soybean / kg P to applied.

Table 2

Influence of phosphorus fertilizer on soybean production and technical and economic consequences – 2007

Specification	U.M.	V1 Mt	V6 P-40	V7 P-80	V8 P-	V9 P-
Production	Kg/ha	1560	1710	1870	1800	1800
	%	100	110	120	115	115
Total growth	Kg/ha	-	150	310	240	240
	%	-	10	20	15	15
Average gain	Kg/kg s.a.	-	3,7	3,8	2	1,6
Production value	lei	1404	1539	1683	1620	1620
Total expenditure	lei	1279,99	1332,28	1407,15	1472,23	1534,48
Chemical fertilizers	lei	0	58,80	117,60	176,40	235,20
Gross profit	lei	124,01	206,72	275,85	147,77	85,52
Gross profit rate	%	9,68	15,51	19,60	10,03	5,57
Cost of production	lei/kg	0,820	0,779	0,752	0,817	0,852
Estimated price	lei/kg	0,900	0,900	0,900	0,900	0,900

Combinations of nitrogen and phosphorus researched and analyzed average gain is reduced from 5.60 kg to 2.15 kg soy V11 / kg to V25 applied (table 3). Economic efficiency of technological options is fertilized following: reducing the cost of production is recorded in most variants unilaterally fertilized with nitrogen (V2 - V4), the most one-sided variants fertilized with phosphorus (V6 - V8) and the combined fertilized variants except V13, V21, V22, V23, V24 and V25 (bigger even than the production cost recovery). The production cost is higher than in variant V5 version control unilaterally fertilized with nitrogen - 0.847 lei / kg, the V9 variant unilaterally fertilized with phosphorus - 0.852 Euro / kg gross profit ranged from 70.33 lei / ha and variant V21 394 lei / ha in variant V15, has been a net loss of 27.70 V25 lei / ha rate of return ranged from -1.43% to 24.15% for V25 and V15. Energy produced additional increases from 867 kWh / ha in the 4219 V6 kWh / ha in V16, so about 47% more than in unfertilized witness. Extra energy consumption varies between 226 kWh / ha in the V6 and 3474 kWh / ha in V25, an increase of over 15 times. Energy balance is positive except V5 variants (for N 100 kg) and V25 (for P and 160 kg N 100 kg).

Table 3

Influence of nitrogen and phosphorus fertilizer on soybean production and technical and economic consequences – 2007

Specification	U.M.	V1 Mt	V10 P40N25	V11 P40N50	V12 P40N75	V13 P40N100
Production	Kg/ha	1560	1890	2070	2180	2100
	%	100	121	133	140	135
Total growth	Kg/ha	-	330	510	620	540
	%	-	21	33	40	35
Average gain	Kg/kg s.a.	-	5,0	5,6	5,4	3,8
Production value	lei	1404	1701	1863	1962	1890
Total expenditure	lei	1279,99	1433,59	1554,00	1646,65	1734,57
Chemical fertilizers	lei	0	111,8	164,8	217,8	270,8
Gross profit	lei	124,01	267,41	309,00	315,35	155,43
Gross profit rate	%	9,68	18,65	19,88	19,15	8,96
Cost of production	lei/kg	0,820	0,758	0,750	0,755	0,825
Estimated price recovery	lei/kg	0,900	0,900	0,900	0,900	0,900

Table 3 (continuation)

Specification	U.M.	V14 P80N25	V15 P80N50	V16 P80N75	V17 P80N100	V18 P120N25	V19 P120N50
Production	Kg/ha	2000	2250	2290	2220	1990	2150
	%	128	144	147	142	128	138
Total growth	Kg/ha	440	690	730	660	430	590
	%	28	44	47	42	28	38
Average gain	Kg/kg s.a.	4,1	5,3	4,7	3,66	2,96	3,47
Production value	lei	1800	2025	2061	1998	1791	1935
Total expenditure	lei	1509,91	1630,98	1721,95	1811,19	1574,48	1695,77
Chemical fertilizers	lei	170,6	223,6	276,6	329,6	229,4	282,4
Gross profit	lei	290,09	394,02	339,05	186,81	216,52	239,23
Gross profit rate	%	19,21	24,15	19,68	10,31	13,75	14,10
Cost of production	lei/kg	0,754	0,724	0,751	0,815	0,791	0,788
Estimated price recovery	lei/kg	0,900	0,900	0,900	0,900	0,900	0,900

Table 3 (continuation)

Specification	U.M.	V20 P120 N75	V21 P120N100	V22 P160N25	V23 P160N50	V24 P160N75	V25 P160N100
Production	Kg/ha	2240	2160	1980	2110	2140	2120
	%	148	138	127	135	137	136
Total growth	Kg/ha	680	600	420	550	580	560
	%	44	38	27	35	37	36
Average gain	Kg/kg s.a.	3,48	2,72	2,27	2,61	2,46	2,15
Production value	lei	2016	1944	1782	1899	1926	1908
Total expenditure	lei	1786,60	1873,67	1636,73	1765,35	1850,07	1935,70
Chemical fertilizers	lei	335,4	388,4	288,2	341,2	394,2	447,2
Gross profit	lei	229,4	70,33	145,27	133,65	75,93	- 27,70
Gross profit rate	%	12,84	3,75	8,87	7,57	4,10	- 1,43
Cost of production	lei/kg	0,797	0,867	0,826	0,836	0,864	0,913
Estimated price recovery	lei/kg	0,900	0,900	0,900	0,900	0,900	0,900

CONCLUSIONS

1. Given the multiple uses of the soybean plant it is considered the golden future of humanity or plant designed to solve the world protein deficit. Soy protein not only provides good quality but also oil and soybean in the current situation offers improved nitrogen balance, thus soil fertility.

2. Soy is a legume crop that can satisfy a necessary part of nitrogen through symbiotic bacteria, however, how fertilization can contribute to raising the quality and quantity production. The climatic conditions of our country, soybean react differently to the application of fertilizers and fertilization so the problem must be addressed in the conditions where the culture.

3. Research results show that doses P80 and P120 in combination with increasing doses of nitrogen are most suitable for obtaining the background of increased economic and technical efficiency. Influence of nitrogen on substrate P80 is manifested through production to achieve the highest dose was 75 kg N / ha.

4. Regarding the influence of increasing doses of nitrogen on the substrate P120 and P160, there is a decrease in production of 50-150 kg / ha, the highest output is obtained practically the same dose of nitrogen (75 kg N as / ha), as for agro P80. We believe that phosphorus doses P80 and P120 are the most likely to obtain an efficient production in the technical, economic and energy.

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ECO-PEDOLOGICAL AND PEDO-BIOLOGIC DYAGNOSIS OF SOME MEADOWS ECO-SYSTEMS FROM N-E AREA OF ROMANIA

DIAGNOZA ECO-PEDOLOGICĂ ȘI PEDO-BIOLOGICĂ A UNOR ECOSISTEME PRATICOLE DIN NE ROMÂNIEI

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Abstract. *Mollic Gleysols from pasture ecosystem Balta Academiei-Berheci Vaslui has a high fertility and quality that cannot be fully manifested in the ecological context due to the excessively droughty summer season and defective air-water system. Eco-pedological diagnosis of soil effective trophicity pointed out a high trophic potential (76 points) on 0-20 cm depth and a medium trophic potential (57 points) on 20-40 cm depth. The matrix of pedo-biological diagnosis pointed out a good fertility (76 points) on 0-20 cm depth and a medium fertility (46 points) on 20-40 cm depth.*

Key words: pasture ecosystem, eco-pedological diagnosis, pedo-biological diagnosis, effective trophicity, fertility

Rezumat. *Gleiosolul cernic din ecosistemul praticol Balta Academiei-Berheci Vaslui are un potențial de fertilitate și calitate ridicat, care nu se poate manifesta pe deplin în contextul ecologic, datorită sezonului estival excesiv de secetos și regimului aerohidric defectuos. Diagnoza eco-pedologică a troficității efective a solului evidențiază un potențial trofic ridicat (76 puncte) pe adâncimea 0-20 cm și un potențial trofic mijlociu (57 puncte) pe adâncimea 20-40 cm. Matricea diagnozei pedo-biologice evidențiază o fertilitate bună (76 puncte) pe 0-20 cm și mijlocie (46 puncte) pe 20-40 cm.*

Cuvinte cheie: ecosistem praticol, diagnoză eco-pedologică, diagnoză pedo-biologică, troficitate efectivă, fertilitate.

INTRODUCTION

As part of ecosystem, between biotope and biocenosis they achieve reversible and permanent changes of substances, energy and information, which determines the stability or instability of natural and anthropogenic ecosystems (Andrews et al., 2004; Bireescu et al., 2005). Through the soil interconnections with external environmental conditions provides some systemic properties of the soil, completeness and stability, with decisive role on soil microbiota. The ability of ecosystems to produce biomass is the result of active, permanent and reversible interaction of the soil with biocenosis and climatic factors as environmental specific elements (Bireescu, 2001, 2010; Cârstea, 2001, Montanarella, 2008). Soil ecological interpretation defines, from quantitative and qualitative point of view,

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the two objective and important characteristics of the soil: the trophic potential and the ecological specific which the soil can occur completely or limiting. The diagnosis of soil quality and fertility provides an overview on trophic and fertility soil potential with a view the monitoring of its quality and fertility indicators and the environmental status for ecological rehabilitation of soil resources (Mausbach, 1996; Karleen et al., 1997; Bremer et al., 2004; Bireescu et al., 2008, 2010).

MATERIAL AND METHOD

The ecological researches were conducted on gleysol (Hidrisols class, SRTS 2003; Gleysols, WRB, 2006) from pasture ecosystem Balta Academiei-Berheci (Vaslui county), grassland meadow. There have been tests and measurements of soil profile, on the genetic horizons, both in the field and laboratory, on some indicators of quality and fertility, according to the ICPA methodology, 1987. Based on analytical datum were prepared the matrix files of eco-pedological diagnosis of effective trophicity of soil resources (EPDETSR). EPDETSR, as comprehensive ecological indicator of quality soil content was obtained by the sum of gave scores, according to the reliability scale with values from 1 to 10, for each of the 10 main analysed quality indicators, using formula:

$$EPDETSR =$$

$$\sum_1^{10} (Tx + Con + pH + BS + SOM + Nt + P + K + PA + BSI)$$

where: Tx – soil texture; Con – hard soil consistency; pH – soil reaction; BS – base saturation; SOM – soil organic matter content; Nt – total nitrogen content; P – exchangeable phosphorus content; K – assimilable potassium content; PA – air porosity; BSI – Biological Synthetic Indicator. The sum of the gave scores varies between 10 points (low effective trophicity, oligo-trophic soil) and 100 points (very good effective trophicity, mega-trophic soil). Pedo-biological diagnosis of soil fertility (DIPEBIOS) was obtained by the sum of gave scores for each of the 10 biological synthetical indicators (Ştefanic, 1994; 1999), using formula:

$$DIPEBIOS = \sum_1^{10} (R + C + K + I + U + P + DA + IVAP + IEAP + BSI)$$

where: R – soil respiration; C – soil cellulolysae; K – catalase; I – invertase; U – urease; P – total phosphatase; DA – dehydrogenase activity; IVAP – Indicator of Vital Activity Potential; IEAP – Indicator of Enzymatic Activity Potential; BSI – Biological Synthetic Indicator.

The sum of the gave scores varies between 10 points (very low biological activity; very low fertility) and 100 points (very good biological activity; very high fertility).

RESULTS AND DISCUSSIONS

In table 1 we pointed out the main physical and chemical properties on genetic horizons of the soil profile:

- soil texture is fine (medium argillaceous earth TT) undifferentiated on the soil profile (38,8 – 44,6% colloidal clay).
- air porosity has low values on soil profile, beginning from surface (10% on 0-10 cm depth) and decreases on soil profile until 7%;

Table 1

The main physical and chemical properties of soil resources from pasture ecosystem Balta Academiei-Berheci Vaslui

Stationary	Depth (cm)	EC (ms/cm)	Colloidal clay (%)	Texture	PA (%)	Con.	pH _{H2O}	SOM (%)	Nt (%)	P _{AL} (ppm)	K _{AL} (ppm)	SB (me)	T (me)	BS (%)
Berheci Vaslui	A ₁ 0-10	0.56	40.5	TT	10	very hard	7.21	8.21	0.275	68	226	28.3	30.8	95
Balta Academiei	Am 10-20	0.47	44.6	TT	8	very hard	6.83	5.63	0.254	56	201	26.5	28.1	99
grassland meadow	ACGo 20-40	0.36	38.8	TT	9	very hard	6.66	2.71	0,101	45	153	16.3	16.3	100
<i>Gleysols</i>	CGr 40-70	0.51	41.5	TT	7	very hard	7.01	1.16	0.063	50	116	10.6	10.6	100

Table 2

Biological activity of soil resources from pasture ecosystem Balta Academiei-Berheci Vaslui

Staționar	Depth (cm)	Biotic Indicators		Enzymatic Indicators				Synthetic Indicators			
		R (mg CO ₂)	C (% celuloză)	K (cmc O ₂)	Sugar (mg glucose)	U (mg NH ₄)	P (mg P)	IPAV (%)	IPAE (%)	ISB (%)	DA (mg TPF)
Berheci Vaslui- Balta Academiei- grassland meadow <i>Gleiosol cernic</i>	0-20	44,61	45,01	431	1216	18,42	6,14	37,37	18,67	28,02	23,14
	20-40	22,11	23,42	206	586	8,74	2,81	19,08	8,91	13,99	11,83

- very hard summer consistency on soil profile.
- soil reaction is favourable, having neutral – low acid values (7,21 pH unities at surface and 6,66 pH unities on 20-40 cm depth).
- soil organic matter content has high values at surface (8,21% on 0-10 cm and 5,63% on 10-20 cm) then decreases on soil profile.
- the content of nutrients (N, P, K) has high values, especially at surface.
- the amount of exchange bases and cation exchangeable capacity have high values, especially at surface.
- base saturation has high values, the soil being eutrophic.

In table 2 we pointed out the main synthetic fertility indicators from gleysol belonging pasture ecosystem Berheci Vaslui.

Soil is a living space and whole its activity of genesis, developing and evolution carried out under action of biological factor. As a result of biological activity the soil acquires fertility (Bireescu, 2001, 2010; Ştefanic, 2006).

- soil respiration has high values on depth of 0-20 cm (44,61 mg CO₂) and significantly lower values, up to 50% for depth of 20-40 cm (22,11 mg CO₂);
- cellulolysae has high values on the surface (45,01% celluloses) and significantly lower, by 50% at 20-40 cm (23,42% degraded celluloses);
- the catalysis potential has high values (431 cmc O₂) at a depth of 0-20 cm and significantly lower, by 50% at 20-40 cm (206 cmc O₂);
- the sugar breakup potential has high values (1216 mg glucose) for a depth of 0-20 cm and significantly lower, by 50% at 20-40 cm (586 mg glucose);
- the urease breakdown has high values (18,42 mg NH₄) for a depth of 0-20 cm and significantly lower, by 50% at 20-40 cm (8,74 mg NH₄);
- the total phosphatase has high values (6,14 mg P) at a depth of 0-20 cm and significantly lower, with more than 50% at 20-40 cm (2,81 mg P);
- the Vital Activities Potential Indicator (IPAV) has average to high values (37,37%) for a depth of 0-20 cm and significantly lower, by 50% at 20-40 cm (19,08%);
- the Enzymatic Activities Potential Indicator (IPAE) has average values (18,67%), for a depth of 0-20 cm and significantly lower, by 50% at 20-40 cm (8,91%) correlated with the deficient aerohydric regime;
- the Synthetic Biologic Indicator (ISB) has average values (28,02%) for a depth of 0-20 cm and significantly lower, by 50% at 20-40 cm (13,99%);
- the dehydrogenase activity has average values (23,14 mg TPF) on a depth of 0-20 cm and significantly lower, by 50% at 20-40 cm (11,83%).

In table 3 we present the analytic and synthetic values for 10 main quality and fertility indicators, as well as the marks awarded for the two depths (0-20 cm and 20-40 cm). Thus, by summing up the awarded marks, we get 76 points, which indicates a high effective trophicity, at a depth of 0-20 cm. For the depth of 20-40 cm we have 57 points, which indicates an average effective trophicity.

In table 4 we present the matrix of the pedo-biological diagnosis (DIPEBIOS) of the fertility of the Mollic Gleysols from the pasture ecosystem Balta Academiei-Berheci area.

Not only soil respiration, but also the dehydrogenasic activity are quantified with 8 value points on 0-20 cm and 6 value points at 20-40 cm. Catalasys, sugar breakdown and phosphatase, as well as IPAV, IPAE and ISB are quantified with 8 value points for 0-20 cm and 4 value points for 20-40 cm. The added value of the partial marks is 76 points for

0-20 cm, which indicates a good biological activity, and for the 20-40 cm depth, the added value of the partial marks is 46 points, indicating an average biological activity.

Table 3

The matrix of the eco-pedological diagnosis (DEPTERS) of the effective trophicity of mollic gleysol from the pasture ecosystem of Academiei-Berheci Vaslui

Fertility indicators	Depth 0-20 cm	Mark (value points)	Dept 20-40 cm	Mark (value points)
Soil texture	40,5	4	44,6	2
Estival consistency	Very hard	4	Very hard	4
Soil reaction	7,21	10	6,83	10
Base saturation degree	95	10	99	10
Humus content	8,21	8	5,63	6
Total azoth content	0,275	10	0,254	6
Mobile phosphorus content	68	10	56	6
Assimilable potassium content	226	10	201	8
Aeration porosity	10	4	8	2
Synthetic biologic indicator	28,02	6	13,93	3
eco-pedological diagnosis (points) (DEPTERS)	-	76	-	57
	-	High effective trophicity	-	Average effective trophicity

Table 4

The matrix of the pedo-biological diagnosis (DIPEBIOS) of the fertility of the Mollic Gleysols from the pasture ecosystem Balta Academiei-Berheci Vaslui area

Fertility indicators	Depth 0-20 cm	Mark (value points)	Depth 20-40 cm	Mark (value points)
Respiration (mg CO ₂)	44,61	8	22,11	6
cellulosolysae (% cellulosis)	45,01	8	23,42	6
Catalasys (cmc O ₂)	431	8	206	8
Sugar breakdown (mg glucoses)	1216	8	586	4
Urease (mg NH ₄)	18,42	8	8,74	4
Total phosphatase (mg P)	6,14	8	2,81	4
IPAV (%)	37,37	8	19,08	4
IPAE (%)	18,67	6	8,91	4
ISB (%)	28,02	6	13,99	4
Dehydrogenasic activity - mg TPF	23,14	8	11,83	6
pedo-biological analysis (points) (DIPEBIOS)	-	76	-	46
	-	Good biological activity	-	Average biological activity

CONCLUSIONS

1. The quality and fertility of the soil resources represent synthetic and integrating characteristics of the structural and functional components of the biotope, correlated with the zonal and local ecological particularities. The impact of the ecologic,

weather and antropic factors of the studied soil, the main ecologic factors and determiners because of their lacking or low values being the low level of estival rains, the aeration porosity, the aerohydric regime and the low edaphic volume. The main ecological factors and determiners in excess are the hard estival consistency, the fine texture of the soil and the compaction of the soil due to grazing.

2. The analysis of the main fertility indicators indicates a good biological activity (76 points) at 0-20 cm and an average one for 20-40 cm (46 points).

3. The analysis of the main quality indicators indicates a high effective trophicity at 0-20 cm (76 points) and an average one (57 points at 20-40 cm).

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QUALITY AND FERTILITY OF SOIL RESOURCES FROM SOME PROTECTED FOREST ECO-SYSTEMS FROM N-E OF ROMANIA

CALITATEA ȘI FERTILITATEA RESURSELOR DE SOL DIN UNELE ECOSISTEME FORESTIERE PROTEJATE DIN N-E ROMÂNIEI

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Abstract. *Eutric gleysol from forest eco-system of Balta Academiei-Berheci-Vaslui, generally has good quality properties, except soft texture and very hard summery consistency of the dry soil (excessive values) and small aeration porosity (limiting values). Ecological specificity data sheet shows low values of precipitations and relative air humidity for summer period, which provide low favorability. The level of biological activity is medium at the surface and low on the soil profile. Potential and effective trophicity have medium, respectively low values for the forestry vegetation.*

Key words: quality, fertility, ecological specificity, ecological favorability, forest eco-system

Rezumat. *Gleiosolul eutric din ecosistemul forestier de la Balta Academiei-Berheci-Vaslui are, în general, însușiri bune de calitate, cu excepția texturii fine și a consistenței estivale a solului foarte dură în stare uscată (valori excesive) și a porozității de aerajie mici (valori limitative). Fișa specificului ecologic arată valori scăzute ale precipitațiilor și umidității relative a aerului pentru sezonul estival, care asigură o favorabilitate scăzută. Nivelul activității biologice este mijlociu la suprafață și scăzut pe profilul solului. Troficitatea potențială și efectivă au valori mijlocii, respectiv scăzute pentru vegetația forestieră*

Cuvinte cheie: calitate, fertilitate, specific ecologic, favorabilitate ecologică, ecosistem forestier

INTRODUCTION

Quality and fertility of soil resources represent integrative features of structural and functional components of the biotope, in the terrestrial ecosystem unit, in reciprocal and reversible ratio with regional and local specific ecological elements (Bireescu and co., 2010; Carter, 2002, Montanarella, 2008).

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Wander and co., 2002 considers that the notion of soil quality includes both soil trophicity (productivity) and environmental possibilities.

Seybold and co., 1996, Grant, 2002; Karlen and co., 1997 and Doran and co., 2000, characterize the notion of quality as a soil ability, as biological system, to provide conditions for biological activity, storage, recycling and mobilization of nutrients.

Biological potential of soil resources characterizes their fertility state and emphasize the stressful and limitative or excessive impact of local and regional environmental factors, as well as of various residual pollutants and anthropogenic factor (Ştefanic et al., 2006; Birescu, 2001; Dorneanu et al., 1976; Januszek, 1999; Nanipierri et al., 2002).

MATERIAL AND METHOD

Ecopedological and pedobiological researches were performed in the forest eco-system of oak and ash from Balta Academiei – Berheci (Vaslui). Researches focused on soil and biological analysis carried out in field and laboratory on genetic horizons of soil profile of eutric gleysols (SRTS, 2003, respectively eutric Gleysols, WEB, 2006).

There were analyzed by the matrix sheet of regional and local ecological specificity, the main 20 climatic and edaphic ecological factors and determinants, from quantitative point of view, by 4 ecological size classes (small, medium, large, excess) and from qualitative point of view, by 4 ecological favorability classes (low, medium, high and very high). The 20 main ecological factors and determinants that we analysed are: 3 growing factors (total nitrogen content - Nt, mobile phosphorus content - PAL and mobile potassium content KAL), 5 climatic factors (average annual temperature, average annual precipitations, wind regime, summery precipitations and relative humidity of summery air), 2 space and time ecological factors (edaphic volume, bioactive period), 2 negative ecological factors (alkalinity/acidity, summery consistency of dry soil), 5 pedoecological determinants (texture, reaction, aeration porosity, humus, base saturation degree), one synthetic pedobiological determinant and 2 pedological synthetic quality indicators (potential and effective trophicity). Biological activity is analysed by dehydrogenase activity indicator (Cassida – Kis method)

RESULTS AND DISCUSSIONS

The analysis of physical, chemical and biological main quality indicators on genetic horizons is presented in table 1:

- soil reaction is neutral – weak alkaline (6.56 – 7.42 pH units);
- soil texture is soft, undifferentiated on soil profile, with values of colloidal clay content varying between 42.3-45.2%;
- aeration porosity (AP) has low values, varying from 11% at the soil surface to 6% in depth;
- summery consistency (SC) of the dry soil has excessive values (is very hard);

- organic matter content (Hum) has medium values ranging from 7.16% at the surface and 3.56% in profile;
- total nitrogen content (Nt) has medium values (0.253-0.216 %);
- mobile phosphorus content (PAL) has high values (73-51 ppm);
- mobile potassium content (KAL) has medium values (207-121 ppm);
- total capacity of cation exchange (T) has medium values (27.3 – 14.3 me)
- the degree of base saturation (V) has high values (100%);
- dehydrogenase activity (DA), as a synthetic biological indicator has medium values (20.61 mg TPF) in the first 15 cm and low (15.33 to 10.11 mg TPF) in depth, correlated with the high clay content and an air-water deficient regime

Table 1

Main physical, chemical and biological characteristics of the eutric Gleysol

Horiz./ depth cm	Quality and fertility indicators										
	% clay	AP %	SC	pH	Hum %	Nt%	PAL ppm	KAL ppm	T me	V %	DA mg TPF
Am 0-15	42, 3	11	very hard	6.8 6	7.16	0.25 3	73	207	27. 3	10 0	20.6 1
Am 15-25	45, 2	9	very hard	6.5 6	3.62	0.21 6	51	153	24. 6	10 0	15.3 3
Ago 25-45	43, 6	8	very hard	6.7 5	3.56	0.09 5	36	144	18. 1	10 0	10.1 1
Cgo 45-65	42, 8	6	very hard	7.4 2	0.73	0.04 1	44	121	14. 3	10 0	2.41

Table 2 presents the synthetic matrix sheet of regional and local ecological specificity, that analyse the main 20 ecological factors and determinants, by size classes from quantitative point of view and by ecological favorability classes from qualitative point of view.

Table 2

The matrix sheet of regional and local ecological specificity

Ecological factors and determinants	Ecological size classes				Ecological favorability classes			
	small	medium	large	excess	low	medium	high	very high
Ecological growing factors								
Total nitrogen Nt %		X				0		
PAL ppm			X				0	
KAL ppm		X				0		

Ecological climatic factors								
Average annual temperature			X					0
Average annual precipitations		X						0
Wind regime		X						0
Summery precipitations	X				0			
Relative humidity of summery air	X				0			
Space and time ecological factors								
Edaphic volume	X				0			
Bioactive period			X					0
Negative ecological factors								
Alkalinity/Acidity	X							0
Summery consistency of dry soil				X	0			
Ecological determinants								
Organic matter%		X						0
Texture				X	0			
Aeration porosity	X				0			
Soil reaction			X					0
Base saturation degree			X					0
Synthetic biological indicator								
Dehydrogenase activity		X						0
Synthetic ecopedological indicators								
Potential trophicity			X					0
Effective trophicity		X				0		

The analyse of soil quality and fertility in regional and local ecological context from Moldavian forest steppe emphasizes the following significant aspects:

- most of the 20 climatic and edaphic ecological factors and determinants fit, from quantitative point of view, in medium and large size classes;

- in the small ecological size class fit: aeration porosity, small edaphic volume and also the low levels of summery precipitations and summery air humidity;

- in the excess ecological size class fits the soft texture (clay) together with the very hard summery consistency of the soil;

- most climatic and edaphic ecological factors and determinants fit, from qualitative point of view, in medium and high ecological favorability classes for oak and ash forestry vegetation;
- in the low ecological favorability class fit summery precipitations, summery air humidity, aeration porosity, summery consistency, texture and edaphic volume;
- in the very high favorability class fit: average annual temperature, bioactive period, base saturation degree and soil reaction.

CONCLUSIONS

1. The ecological soil interpretation, in the regional and local ecological context, emphasizes the qualities, deficiencies and excesses background of soil resources affected by an air-water deficient regime.
2. Most physical, chemical and biological indicators of soil quality ensure a high trophic potential background for oak and ash forestry vegetation.
3. Soft texture, very hard summery consistency of dry soil, low aeration porosity, excessively dry summer represent limitative and stressful factors that do not allow the complete exploitation of the high trophic potential background.
4. Biological activity has medium values, although the soil is well supplied in humus and nutrients, this because of the air-water deficient regime and the presence of the groundwater at the base of soil profile.
5. Although potential trophicity is high, however biocoenosis can not fully exploit the soil reserve; effective trophicity level for plants is medium.

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DETERMINATION AND INTERPRETATION OF INDICATORS OF SOIL FERTILITY IN GALATI COUNTY VINEYARDS

DETERMINAREA ȘI INTERPRETAREA UNOR INDICATORI DE FERTILITATE A SOLURILOR ÎN PLANTAȚIILE VITICOLE DIN JUDEȚUL GALAȚI

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Abstract. *Fertility is a soil ability to provide conditions for plant growth and development through the accumulation of vegetation factors (light, water, air, heat, nutrients and biological activity) and ensuring that these factors are used in plentiful quantities. Fertility is the result of all soil properties (physical, mechanical, physical, mechanical, hydro, chemical, biological and environmental) factors interact with all the vegetation and the crop is being studied by other disciplines (Pedology, Agrochemistry etc.). It is important the unitary approach from the agrotechnical point of view, systemic soil fertility to its conservative modeling, with emphasis on the requirements of crop plants. Soil fertility can be characterized by a series of indicators for systematic, can be divided into four groups: agrophysical, hydro, agrochemical, agrobiological. The study was conducted in plantations in the center of the vineyard Smulți, uşorului Hills.*

Key words: fertility, indicators, soil properties.

Rezumat. *Fertilitatea este însușirea solului de a asigura condiții pentru creșterea și dezvoltarea plantelor prin acumularea factorilor de vegetație (lumină, apă, aer, căldură, elemente nutritive și activitate biologică) și asigurarea condițiilor pentru ca acești factori să fie folosiți în cantități îndestulătoare. Fertilitatea fiind rezultatul tuturor proprietăților solului (fizice, mecanice, fizico-mecanice, hidrofizice, chimice, biologice și ecologice), în interacțiune cu toți factorii de vegetație și plantele cultivate este studiată și de alte discipline (pedologie, agrochimie etc.). Din punct de vedere agrotehnic este importantă abordarea unitară, sistemică a fertilității solului în vederea modelării conservative a acesteia, cu accent pus pe cerințele plantelor de cultură. Fertilitatea solului poate fi caracterizată printr-o serie de indicatori care, pentru sistematizare, se pot încadra în patru grupe: agrofizici, hidrofizici, agrochimici, agrobiologici. Studiul s-a efectuat în plantații din centrul viticol Smulți din podgoria Dealurile Bujorului.*

Cuvinte cheie: fertilitate, indicatori, proprietățile solului.

INTRODUCTION

Pedological factors, together with the climatic influence the processes of growth and fructification, the quantity and quality of vine production, plantation longevity, resistance to diseases and stress factors etc. Knowing the characteristics of the soil in details has a special importance for proper placement of varieties,

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using the most suitable rootstocks for the rational application of fertilizer and agro-technical measures (L. Dejeu, 2004).

The vineyard soil fertility is the main feature, which expresses its ability to meet the needs of the vine with water and nutrients (I.C Alexandrescu, P. Pițuc, M. Oșlobeanu, L. Jianu, 1994). The assessment of fertility of soil for the cultivation of vines is made starting from the specific characteristics of local soil and climate. These features are ecologically specific elements, by determining the productive potential of soil, are also elements of fertility (C. Chirita, 1974).

MATERIAL AND METHOD

Studies were conducted in two vineyards located in the center of the vineyard hills Smulți Bujorului Galați County. The soil samples were collected in three repetitions, the depth: 0-100 cm in each parcel.

Sampling, preparation and carrying out analysis was according to the ICPA methodology.

RESULTS AND DISCUSSIONS

Characterization of the vineyard climate center Smulți

Corni vineyard is located in the geomorphologic center unit of Covurlui Plateau, located in the center of Galati county.

In the classification given in the geographical monograph of Romania (1967) in south-eastern section Covurlui plateau climate is included in the continental climate of the steppe lands to the interpenetration of climate forest district, subdistrict Moldavian Plateau (11 BSp2), entering the vineyard classification 11 B Ps (x) continental steppe climate.

Climate is determined by geographical location, topography and microrelief region of the atmosphere general circulation is dominated advecții summer temperate oceanic air from the direction of V and NW. On land, hot, dry summers and cold winters, marked by strong blizzards, and the frequent interruptions caused by warm, humid air showers determining intervals of heating and melting snow.

Bioactive duration exceeds 160 days and weather conditions are favorable for growing vines.

Thermal resources particularly influence quality grape production, active or useful heat balance determines the degree of favorability or unadvantageous of years of harvest.

Table 1

Characterization of viticultural climate center Smulți

Annual Period		The vegetation Period			Oenoclimatic index capacity
Average temperature	Rainfall amount	Amount global temperatures	Sunstroke	Rainfall amount	
^o C	mm	^o C	ore	mm	4765
10,1	531	3304	1511	300	

Vegetation. The territory studied area belongs to the steppe vegetation. The area is mostly covered by agricultural land, meadows and vineyards also and forests.

Soil. Genesis and characteristics of the soils under study are a consequence of the interaction of natural conditions.

Soils that meet the specific vineyard center steppe territory, predominantly various types of chernozem (typically cambic, argic).

Determination and interpretation of soil fertility indicators agro-physical

Predominant soil type is cambic chernozem zone belonging to the cernisoils class whose general morphology is presented through a series of layers formed on loess clays Am-AB-Bv-B/Cca noted that by its stratigraphic characteristics and have printed some porous rock soil characteristics was formed, the perfection of these qualities with a fundamental climatic conditions.

Soil texture. Due to the high ecological plasticity of vine varieties can be grown on all types of textures, from sand to clay soils. The best conditions for growth, development and production to meet intermediate textured soils (sandy loam, silty, sandy-clay).

Medium texture soil of the area offers favorable conditions for grapes growing and for both for the wine quality and consumer of the current and table grapes.

Table 2

Depth cm	Granulometric fractions (% by mass of mineral soil)				
	Roughly sand	Fine sand	Dust	Clay	Natural clay
Amk(0-30)	22,6	21,1	28,7	22,2	31,00
ABk(31-50)	20,8	28,1	30,9	23,9	29,95
Bvk(51-68)	19,0	29,7	39,6	22,3	25,55
B/Ck(69-119)	17,8	44,3	28,8	32,2	24,00
Cca>119	30,5	37,6	19,8	21,1	19,85

Soil texture can be considered sandy-clay for the fact that in the top layer of soil and even in the deepest is a relatively high content of fine sand and coarse sand, which together forms 43.7% of soil mass (table 2). Relatively high content of sand size particles makes soil highly permeable and provide a favorable ventilation oxidoreduction conduct processes and root system activity and bacterial flora.

Soil structure. Fertility of land is closely linked to its structural condition. Soil structure engraves a number of features such as porosity and elasticity, thereby affecting fertility. Well structured soils store more water, air, heat and nutrients to make available to the vines.

Vine plantations studied are located on land from hilly areas, terraces, and therefore are less structured soils.

Soil porosity. Large pore diverse largely conditions the water regime, air temperature, nutrients, Roots penetration into the soil depends largely on the porosity and degree of soil compaction.

Its optimal values for vines are between 46 and 52%, the largest or the smallest have a negative influence on growth of roots and shoots. For normal growth of roots the soil aeration porosity must have a minimum of 10%. At low levels of aeration porosity decreases both production and quality.

Values from soil porosity in the study provides favorable conditions for the development of root system vines (table 3).

Apparent density values preferred by most plants varies between 1.0 to 1.4 g/cm³ culture. It is considered that the soil is too loose when the apparent density below 1.0 g/cm³ and is too harden when it is over 1.4 g/cm³. Values determined in the planting taken in the present study shows that soil has a moderate hardening phenomenon.

Determination and interpretation of hydro indicators of soil fertility.

The hydro indicators of soil fertility used in agricultural practice are: hydro indications and soil water relations, water movement in soil, water permeability (infiltration, filtration), the ability to retain water (useful water reserve), capillary rise of water (intake to phreatic soils) etc. (A. Lăcătuș, 1990).

Table 3

Constants of soil hydro

Apparent density g/cm ³	Field water capacity Cc %	Wilting coefficient Co%	*I.U.A. %	*Minimum threshold min P. %	Porosity%	
					Total	The aeration
1,35	22,79	8,45	14,34	15,62	51,88	22,88

*I.U.A. = active humidity range = Cc – Co

*Minimum threshold Pm = Co - 1 / 2 (Cc - Co)

Hydro soil constants (table 3) shows that it has a total porosity and high degree of aeration and a low value wilting coefficient, explained by clay and sandy soil texture.

Hydro soil constants presented in table 3 shows that soil have physical properties favorable for growing vines.

Determination and interpretation of agrochemical soil fertility indicators

Determined agrochemical indicators are: soil reaction, nutrient content, ability to hold and exchange of ions in soil solution etc.

Soil reaction is one of the most important properties of soil as an environment for plant growth. Vine has a great ecopedological plasticity, it can be cultivated within a pH range of 5.5 to 8.5 (L.Dejeu, 1984, quoted of Oșlobeanu et al., 1991).

Due to the presence of carbonates from the soil surface as it is normally present a slightly alkaline reaction from top to bottom, about 70 cm deep reaching pH 8 (table 4).

Table 4

Characterization of soil agrochemical

Depth [cm]	pH in H ₂ O	CaCO ₃ %	Humus %	Nt %	P _{AL} ppm	K _{AL} ppm
0-20	7,40	2,42	2,250	0,100	60,96	287,6
20-40	7,53	2,71	1,726	0,080	17,71	247,6
40-60	7,87	3,64	1,171	0,070	14,96	230,3
60-80	8,06	22,54	0,672	0,023	12,11	193,3
80-100	8,14	28,64	0,572	0,013	6,37	182,0

Mobile nutrient content (accessible or assimilable) is an essential plant growth factor (D. Davidescu Velica Davidescu, 1992).

Research in this area shows that vines growth and fructification normally, soil must contain the following quantities of macroelements (NPK) per 100 g soil: 0.1 to 0.2 g total N, P₂O₅ 10-20 mg, 25 -40 mg K₂O.

Specific nutrient consumption per unit of product is an indicator that summarizes the interaction factors and the economic ecosystem and has show a high practical utility.

The data presented in table 4 shows that total nitrogen from soil humus corresponds to the percentage found in each of those horizons. He manages to link the structural units as sandy-clay particles, this effect being due to the presence of calcium carbonate in the presence of which involved humus particles constituting a single bond linking the structural units.

Supply conditions from medium to good has relatively moderate potassium phosphate in easily accessible forms for plant and quantity of humus from the soil are barely satisfactory plantations under study correspond to the development from multiple views vines and has production of crops relative high and has superior quality. Retention capacity and ion exchange in the soil solution is the main property of soil colloids.

Particular emphasis has cationic adsorption or retention of physical - chemical (non-specific sorption or cation exchange), which is the ability of cations from diffuse layer from soil colloids can be changed in terms of equivalence to the cations from soil solution.

Tabel 5

Main agrochemicals indices

T-ml/100 g sol	V%	IPC	IN
16,6	100	1,77	3,0

Because of the sandy clay texture soil has a low cation exchange capacity, base saturation degree almost entirely due to the presence of carbonates from the surface and has a power index decreased chlorosis (1.77) explained by the fact that in the layer surface and deeper until the C horizon of the carbonate content is

low, which does not influence the development of vines roots and does not give has chlorosis characteristics to soil (table 5).

Determination and interpretation of agrobiological indicators of soil fertility

Among the agrobiological indicators determined only humus that can be considered a basic criterion in assessing the degree of fertility of different soil types, their production capacity, in the end of their productive potential. Most authors argue that soil the must be used for viticulture in the horizon 0-20 cm humus content of 2-3% (F. Hasselbach, 1976, G. Götz, 1979 F. Champagnol, 1980 Oşlobeanu quoted in 1991).

Dejeu L. (2004) shows that restrictive vines in soils with a humus content below 1.2% and those with less than 3%.

The data in table 4 shows that the soil has a moderate to satisfactory content of humus in the surface horizon, 20 cm thick, it obviously decreasing profile, being found even at the depth horizon C, which is explained by the fact that the acids Humic leachate, under the influence of relatively poor rainfall have precipitated their path leaching under the influence of calcium carbonate that are present from the surface layer, they can easily be put out on the horizon C. Therefore soil fertility taken in the study area is favorable for growing vines.

CONCLUSIONS

1. Knowledge of soil fertility indicators helps us to achieve a consistent approach to the correlation between soil fertility, agro-technical requirements of plants and measures to be applied to achieve higher quality grape production.

2. Calculated soil fertility indicators for vineyard soils from the center shows that they have a moderate to low fertility, which involves taking steps to improve it.

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RESEARCH CONCERNING THE INFLUENCE OF THE IRRIGATION IN POTATO CROP IN CRIȘURILOR PLAIN

CERCETĂRI PRIVIND INFLUENȚA IRIGAȚIEI ASUPRA CULTURII CARTOFULUI ÎN CAMPIA CRIȘURILOR

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Abstract. *The research were carried out in Agricultural Research and Development Station Oradea in 2007-2009, in the conditions of the luvo soil Ten to ten days determinations of the soil moisture emphasize that pedological drought and also strong pedological drought were present in all the three studied years. By applying irrigation was substantial improved the daily consumption and total water consumption of potato and were obtained verystatistically significant yield increases in all the three years studied; also, has increased the weight of large tubers in total yield and the quantity of tubers obtained at 1 m³ of water consumption.*

Key words: potato, pedological drought, irrigation, water consumption, yield, water use efficiency

Rezumat. *Cercetările au fost realizate la Stațiunea de Cercetare Dezvoltare Agricolă Oradea în perioada 2007-2009 în condițiile unui preluvo sol. Determinările decadale ale umidității solului au evidențiat faptul că atât seceta pedologică cât și seceta pedologică accentuată a fost prezentă în toți cei trei ani studiați. Prin aplicarea irigațiilor s-a îmbunătățit substanțial consumul zilnic și consumul total de apă al cartofului, s-au obținut sporuri de producție foarte semnificative statistic în toți cei trei ani studiați; a crescut ponderea tuberculilor mari în totalul producției, iar cantitatea de tuberculi obținută la 1 m³ de apă consumată*

Cuvinte cheie: cartof, secetă pedologică, irigare, consum de apă, producție, eficiența valorificării apei

INTRODUCTION

The Crișurilor Plain occupies about 410.000 ha (Domuța C., 2003, 2009) in the NorthWest of Romania (Domuța C., 2003). This area is favorable for potato (Muntean L.S. et al., 2008). The potato is one of the most demanding plant as regards the continue water supply. Considering this, from 1976 at Agricultural Research and Development Station Oradea (1976-1980) Ștefanescu E. performs a research concerning the soil water balance in irrigated and unirrigated potato crop. The researches were continued by Buta Mihaela (1981-1983), Colibaș Maria (1984-1985), Colibaș Maria and Maria Șandor (1986), and in 1987-2010 by Domuța C.; the publishing results (Grumezea N. et al. 1989; Domuța C., 1995, 2003,

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2005, 2009 a, 2009 b, Borza I. et al., 2010) sustain the need of irrigation in providing an optimum water consumption and very statistically significant yield gains determined by irrigation. This paper present researches carried out during 2007-2009.

MATERIAL AND METHOD

The researches were carried out in the conditions of luvisoil with a high degree of structuring (47,5%). On the watering depth (0-75 cm) of potato (Brejea R., 2010) the wilting point has a value of 10.1% (1158m³/ha) and the field capacity is 24.2% (2782 m³/ha). The clay content of soil (35.2%) determined an easily available water content (19.5%; is of 2240 m³/ha) at 2/3 from useful water capacity. In A_p horizon the humus content of soil is of 1.8%, pH is of 6.5 and mobile phosphorus and potassium have values of 131.2 ppm, respectively 210 ppm.

The water source for irrigation is a drilling and the water is very good for irrigations: CSR= -1.7; SAR = 0.52. The irrigation method was the sprinkler and the adapted equipment used provided an accurate measurement and a uniform distribution of water.

The soil moisture was determined 10 to 10 days, and the water reserve on the 0-75 cm depth was maintained between easily available water content and field capacity, irrigating whenever is necessary. The soil moisture data allowed the drawing of dynamic graphs of soil moisture. The graphs permit to determine the days with the pedological drought (days with the water reserve on the watering depth under easily available water content) and the days with strong pedological drought (days with the water reserve on the watering depth under the wilting coefficient level (Domuța C., 2005). The potato water consumption was determined by the balance of water in soil method (Domuța C., 2009), balance depth use was 0-150 cm. Water use efficiency (WUE) was determined such as a ratio between yield and total water consumption of potato.

RESULTS AND DISCUSSIONS

Pedological drought at unirrigated potato

Annual rainfall recorded in the three years studied were 556.1 mm in 2007, 585.7 mm in 2008 and 504.1 mm in 2009. In the vegetation period of potato were registered 283.1 mm in 2007, 304.4 mm in 2008 and 241.5 mm in 2009. In this conditions the pedological drought manifested in every year. Water reserve on 0-75 cm depth decreases below easily available water content in 93 days in 2007, 88 days in 2008 and 101 days in 2009. The bigger number of days with pedological drought were registered in April in 2007, in August in 2008 and in May and June in 2009 (table 1).

Table 1

The analysis of the number of days with water reserve (WR) bellow easily available water content (Wea) on 0-75 cm depth, at unirrigated potato, Oradea 2007-2009

Year	Vegetation period -days-	Days with WR < Wea					Total
		IV	V	VI	VII	VIII	
2007	160	26	10	15	15	17	93
2008	156	-	10	20	27	31	88
2009	147	14	31	10	31	13	101

The water reserve decreases below the wilting coefficient in 12 days in 2007, 9 days in 2008 and in 27 days in 2009 (table 2).

Table 2

The analysis of the number of days with water reserve (WR) below the wilting point (WP) on 0-75 cm depth, at unirrigated potato, Oradea 2007-2009

Year	Vegetation period - days -	Days with WR<WP					Total
		IV	V	VI	VII	VIII	
2007	160	-	4	5	3	-	12
2008	156	-	-	-	5	4	9
2009	143	-	-	4	13	10	27

The optimum water regime

For maintaining the water reserve on 0-75 cm between easily available water content and field capacity the following irrigation rate was used: 3000 m³/ha in 2007, 2800 m³/ha in 2008 and 3700 m³/ha in 2009 (table 3).

Table 3

Irrigation regime necessary to maintain the water reserve between easily available water content and field capacity on the watering depth of potato (0-75 cm) Oradea, 2007-2009

Year	V		VI		VII		VIII		V-VIII	
	Σm	n	Σm	n	Σm	n	Σm	n	Σm	n
2007	1300	3	800	2	900	2	-	-	3000	7
2008	500	1	11100	3	700	2	500	1	2800	7
2009	1000	2	700	2	1400	3	-	-	3700	9

Σm = irrigation rate; n = number of watering

The influence of irrigation on the potato water consumption

Irrigation determined an increase of the daily water consumption values of the plants. The biggest differences in comparison with unirrigated variante were registered in June (88%) in 2007 and in July (74%) in 2008 and 2009 (table 4).

Table 4

The influence of irrigation on the daily water consumption, Oradea 2007-2009

Year	Variant	April		May		June		July		August	
		m ³ /h a	%	m ³ /h a	%	m ³ /h a	%	m ³ /h a	%	m ³ /ha	%
2007	Unirrigated	16.1	100	23.3	100	31.0	100	33.1	100	25.7	100
	Irrigated	26.5	165	38.7	166	58.3	188	41.8	126	32.8	127
2008	Unirrigated	27.2	100	28.8	100	40.7	100	28.9	100	21.9	100
	Irrigated	28.4	104	36.9	128	56.2	138	50.2	174	25.8	118
2009	Unirrigated	24.4	100	27.6	100	36.9	100	30.2	100	25.0	100
	Irrigated	26.9	110	38.8	141	60.2	163	52.4	174	27.6	110
Average	Unirrigated	22.6	100	26.6	100	36.2	100	30.7	100	24.2	100
	Irrigated	27.3	121	38.1	143	58.2	161	48.1	157	28.7	119

Irrigation determined also an increase of the total water consumption values of potato with 53% in 2007, 41% in 2008 and 43% in 2009 (table 5).

Table 5

The total water consumption of unirrigated and irrigated potato and the covering sources from Oradea, 2007-2009

Variant	Total water consumption		The coverage sources of total water consumption; m ³ /ha		
	m ³ /ha	%	R _i -R _f	The rainfall from vegetation period	Irrigation
2007					
Unirrigated	3868	100	1037	2831	-
Irrigated	5915	153	84	2831	3000
2008					
Unirrigated	4237	100	1193	3044	-
Irrigated	5975	141,0	131	3044	2800
2009					
Unirrigated	4314	100	1899	2415	-
Irrigated	6174	143	59	2415	3700

R_i=Initial reserve of the water (at planting); R_f=Final reserve (at harvest)

The influence of irrigation on the potato yield

In all the three years studied, the irrigation determined an yield gains very significant statistically In 2007 the yield gain obtained in irrigated variant comparative with unirrigated variant was of 111%. An yield gain more higher registered in 2008, of 119%. The highest yield gain (21340 kg/ha; 210%) was obtained in 2009. In average of the studied period, the yield obtained in irrigated variant (34200 kg/ha) was higher with 137.2% (19780 kg/ha) than the yield obtained in unirrigated variant (table 6).

Table 6

The influence of the irrigation on potato yield, Oradea 2007-2009

Variant	Yield		Difference		Statistical signification
	Kg/ha	%	Kg/ha	%	
2007					
Unirrigated	17600	100	-	-	Control
Irrigated	37100	211	19500	111	***
LSD _{5%} 270		LSD _{1%} 490		LSD _{0.1%} 830	
2008					
Unirrigated	15500	100	-	-	Control
Irrigated	34000	219	18500	119	***
LSD _{5%} 430		LSD _{1%} 690		LSD _{0.1%} 1070	
2009					
Unirrigated	10160	100	-	-	Control
Irrigated	31500	310	21340	210	***
LSD _{5%} 510		LSD _{1%} 720		LSD _{0.1%} 1150	
Media 2007-2009					
Unirrigated	14420	100	-	-	Control
Irrigated	34200	237.2	19780	137.2	***
LSD _{5%} 403		LSD _{1%} 633		LSD _{0.1%} 1017	

The participation of the big tubers in total yield increase very significant statistically in the irrigated variant in comparison with the unirrigated, the differences being 13,1% in 2007, 16,3% in 2008 and 21.2% in 2009 (table 7).

Table 7

The influence of irrigation on the participation of the great tubers in the potato yield, Oradea 2007-2009

Variant	Great tubers		Difference		Statistical signification
	%	%	%	%	
2007					
Unirrigated	73.2	100	-	-	Control
Irrigated	82.8	113,1	9.6	13.1	***
LSD _{5%} 2.3		LSD _{1%} 4.6		LSD _{0.1%} 7.9	
2008					
Unirrigated	72.6	100	-	-	Control
Irrigated	84.5	116.3	11.9	16.3	***
LSD _{5%} 3.1		LSD _{1%} 5.2		LSD _{0.1%} 9.4	
2009					
Unirrigated	70.1	100	-	-	Control
Irrigated	85.0	121.2	14.9	21.2	***
LSD _{5%} 2.9		LSD _{1%} 5.1		LSD _{0.1%} 8.2	
Media 2007-2009					
Unirrigated	72.0	100	-	-	Control
Irrigated	84.1	116.8	12.1	16.8	***
LSD _{5%} 2.8		LSD _{1%} 5.0		LSD _{0.1%} 8.5	

The influence of irrigation on the water use efficiency

The irrigation determined the increase of the quantity of tubers at 1 m³ consumed water, the differences from unirrigated being 38% in 2007, 55% in 2008 and 24% in 2009 (table 8).

Table 8

The influence of irrigation on the water use efficiency (WUE) at potato, Oradea 2007-2009

Variant	WUE		Difference	
	Kg/ m ³	%	Kg/ m ³	%
Unirrigated	4.55	100	-	-
Irrigated	6.27	138	1.72	38
Unirrigated	3.66	100	100	-
Irrigated	5.69	155	2.03	55
Unirrigated	4.65	100	-	-
Irrigated	5.78	124	1.13	24

CONCLUSIONS

1. At unirrigated potato the pedological drought was present in 93 days in 2007, 88 days in 2008 and 101 days in 2009. The strong pedological drought was present in 12 days in 2007, 9 days in 2008 and 27 days in 2009.

2. For maintaining the soil water reserve on 0-75 cm between easily available water content and field capacity a specifically irrigation regime was used; the irrigation rate use were of 3200 m³/ha in 2007, 2800 m³/ha in 2008 and 3500 m³/ha in 2009.

3. The irrigation determined the increase of the daily water consumption of potato and finally the increase of the total water consumption with 35% in 2007, 29% in 2008 and 42% in 2009.

4. The irrigation determined yield gains very significant statistically every year; the relative differences in comparison with unirrigated variant were of 111% in 2007, of 119% in 2008 and of 210% in 2009.

5. The yield quantity of the tubers obtained at 1 m³ consumed water increased in irrigated variant in comparison with unirrigated variant with 38% in 2007, 55% in 2008 and with 24% in 2009.

6. The presence of pedological drought in all the three years studied and the positive influence of the irrigation on the daily consumption and total water gains consumption, the very significant statistically yield, the improvement of the great tubers percent in the total yield and the gains increase of the water use efficiency are important arguments for the potato irrigation in the Crișurilor Plain.

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IRRIGATION SCHEDULING IN DRIP IRRIGATED PEACH-TREE IN THE CONDITIONS FROM NORTHWESTERN ROMANIA

PROGNOZA IRIGAȚIEI LA CULTURA PIERSICULUI IRIGAT PRIN PICURARE ÎN CONDIȚIILE DIN NORD-VESTUL ROMÂNIEI

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Abstract. *The paper is based on the researches carried out in Oradea during 2007-2010. The purpose of this research was a comparative study of 4 determination reference evapotranspiration methods (measured with Pan and Piche evaporimeters or calculated with Thornthwaite and Penman-Monteith methods) with the optimum water consumption values of drip irrigated peach-tree. The results were calculated with variance analysis method and show statistically significant differences witch reflecting the need to determine the crop coefficients (Kc) for transformation the reference evapotranspiration values in the plant optimum water consumption. These coefficients will be used in the irrigation scheduling of drip irrigated peach-tree.*

Key words: *peach-tree, reference evapotranspiration, drip irrigation, irrigation scheduling, Pan evaporation.*

Rezumat. *Lucrarea se bazează pe cercetări efectuate la Oradea în perioada 2007-2010. Acestea au vizat studiul comparativ a 4 metode de determinare a evapotranspirației de referință (măsurate cu evaporimetrele Bac, respectiv Piche sau calculate prin metodele Thornthwaite, respectiv Penman-Monteith) comparativ cu valorile consumului optim de apă al piersicului irigat prin picurare. Calculul rezultatelor prin analiza varianței arată diferențe foarte semnificative statistic ceea ce reflectă necesitatea determinării coeficienților (Kc) de transformare a evapotranspirației de referință în consum optim de apă. Acești coeficienți, urmează să fie folosiți în prognoza irigației la piersicul irigat prin picurare.*

Cuvinte cheie: *piersic, evapotranspirație de referință, picurare, prognoza irigației, evaporimetrul Bac*

INTRODUCTION

For the peach-tree crop, Oradea fruit growing area is even more important because before 1990, the Bihor County was in second place in the country regarding the peaches export. The drip irrigation of peach-tree crop from Oradea fruit growing area was studied by Violeta Șcheau (2005) in her PhD. thesis and represented the subject of other scientific papers (Domuța C. et al., 2007, Șcheau V. et al. 2006, 2009.). Irrigation scheduling has a great importance in the use of the

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irrigation systems the paper studied 4 of most recognized methods to optimize the timing of watering for drip irrigated peach-tree.

MATERIAL AND METHOD

The researches were carried out during 2007-2010 at the Research and Fruit-Growing Development Station Oradea in an orchard planted in 1996. The cultivar used was Superb of Autumn.

In depth 0-100 cm (deep watering peach-tree in this area, Grumeza N. et. all., 1989, Brejea R., 2010), the luvisol from research field has a colloidal clay content of 41.4%. On this depth the field capacity is 23.61% (3571 m³/ha), and the wilting coefficient is 18.3% (2763 m³/ha). Determining of the soil moisture ten to ten days on 0-100 cm depth the water reserve was maintained between easily available water content and field capacity.

In the four years studied were registered the following values of the annual rainfall: 556,1 mm in 2007, 332,0 in 2008, 420,0 mm in 2009 and 855,7 mm in 2010. In the peach-tree vegetation period were registered 283,1 mm in 2007, 304,4 mm in 2008, 241,5 mm in 2009 and 499,7 mm in 2010.

The peach-tree water consumption was obtained using the soil water balance method, (the depth of the water balance was of 0-150 cm) after the following formula:

$$R_i + P_v + \sum m = \sum(e+t) + R_f$$

were,

R_i = initial reserve (at the resumption of vegetation); P_v = rainfall during the growing season; $\sum m$ = irrigation rate; $\sum(e+t)$ = total water consumption; R_f = final reserve (at the fall leaves) (Domuța C., 1995, 2003, 2005).

Thorntwaite and Penman-Monteith values of the reference evapotranspiration were calculated using a known formula (Domuța C., 2009) and the Pan evaporation and Piche evaporation were determined every day at 8 o'clock.

The results were calculated using the analysis of variance method.

RESULTS AND DISCUSSIONS

The differences between the water consumption of the drip irrigated peach-tree and the reference evapotranspiration (ET_o)

The difference between the total water consumption of the peach-tree and the reference evapotranspiration (ET_o)

There are statistically assured differences between the water consumption of the peach-tree for the period IV-IX and the reference evapotranspiration determined using the four methods.

In dripp irrigated peach-tree, the differences between the total water consumption and the reference evapotranspiration determined using the four methods, are smaller and there are statistically assured in all the cases.

Using ET_o Thornthwaite was obtained a statistically significant difference of 295 m³/ha (4.6%); using the Penman-Monteith and Pan evaporimeter methods were obtained significantly distinct differences of 778 m³/ha (12.3%) and 892 m³/ha (14.0%), by using the Piche evaporimeter was obtained a very significant difference of 3305 m³/ha (52.1%) (table 1).

Table 1

The differences between optimum water consumption (ETR_{opt}) of the drip irrigated peach-tree and the reference evapotranspiration (ET_o) determined using different methods, Oradea 2007-2010

Crt. nr.	Variant	Value		Difference	
		m ³ /ha	%	m ³ /ha	%
1	ETR- drip irrigation	4823	100	-	-
2	ET _o Thornthwaite	6629	137,4	1806	37,4
3	ET _o Pan	7226	149,8	2403	49,8
4	ET _o Piche	9639	199,9	4816	99,9
5	ET _o Penman-Monteith	7112	147,5	2289	47,5

LSD 5% = 214; LSD 1% = 570; LSD 0,1% = 112

The differences between the daily water consumption of the drip irrigated peach-tree and the reference evapotranspiration (ET_o)

In April, using the Penman-Monteith and Pan evaporimeter methods were not obtained statistically significant differences; the difference obtained using the Thornthwaite method is statistically significant distinct and other obtained using the Piche evaporimeter is very statistically significant. In May, the difference registered using the Thornthwaite method was not statistically significant, the differences obtained using Penman-Monteith and Pan evaporimeter were statistically significant and the difference obtained using the Piche evaporimeter was highly statistically significant. In June, the difference registered using the Thornthwaite method was statistically significant and the differences obtained using the Piche evaporimeter were highly statistically significant. In July, using the Pan evaporimeter and Thornthwaite and Penman-Monteith methods were obtained statistically significant differences and with the Piche evaporimeter was obtained a very statistically significant difference. In August and September were registered the greatest differences, significantly distinct difference using the Thornthwaite method and very significant statistically differences using other methods. In September, with all the methods obtained very significant statistically differences in comparison with the real optimum water consumption of the drip irrigated peach-tree (table 2).

Table 2

The differences between the daily optimum water consumption (ETR_{opt}) of the drip irrigated peach-tree and the total reference evapotranspiration (ET_o), Oradea 2007-2010

Crt. nr.	Variant	IV	V	VI	VII	VIII	IX
		m ³ /ha/day	m ³ /ha/day	m ³ /ha/day	m ³ /ha/day	m ³ /ha/day	m ³ /ha/day
1	ETR – drip irrigation	26.1	37.2	42.2	48.9	37.2	15.4
2	ET _o Thornthwaite	19.1	38.2	44.5	46.8	42.7	25.4
3	ET _o Pan	26.0	41.4	46.3	48.0	47.6	27.0
4	ET _o Piche	36.4	52.1	62.2	64.9	64.5	35.2
5	ET _o Penman-Monteith	25.6	40.7	49.2	45.5	46.7	24.9
	LSD 5% =	4	6	4	4	7	6
	LSD 1% =	12	15	9	10	14	13
	LSD 0.1% =	25	27	19	21	23	22

The crop coefficients (K_c) for the transformation of the reference evapotranspiration in the optimum water consumption of the drip irrigated peach-tree

Showing the differences statistically assured between the peach-tree optimum water consumption and the reference evapotranspiration calculated with the four methods, the transformation in the optimum water consumption with the K_c coefficients is an extremely important and useful operation in design and operation of irrigation facilities.

The (K_c) coefficients for drip irrigation

The results presented in table 3 suggest that the K_c coefficient values are specific to every months and methods. In all the months of the vegetation period the (K_c) coefficient values are under unit values when is used the Piche evaporimeter method. At other three methods the values are subunit and overunit.

Table 3

The values of (K_c) coefficients for the transformation of the reference evapotranspiration in the optimum water consumption of the drip irrigated peach-tree, Oradea 2007-2010

Crt. nr.	Method	Month					
		IV	V	VI	VII	VIII	IX
2007							
1	Thornthwaite	0.93	0.75	0.94	1.04	0.98	0.83
2	Pan evaporimeter	0.69	0.62	0.78	0.94	0.64	0.83
3	Piche evaporimeter	0.52	0.47	0.56	0.61	0.49	0.67
4	Penman-Monteith	0.89	0.66	0.82	1.04	0.85	0.91
2008							
1	Thornthwaite	1.77	1.00	1.03	0.96	1.44	1.30
2	Pan evaporimeter	1.47	0.81	1.06	1.04	1.54	1.49
3	Piche evaporimeter	1.02	0.67	0.83	0.80	0.50	0.53
4	Penman-Monteith	1.49	0.95	1.05	1.07	0.73	0.95
2009							
1	Thornthwaite	1.57	1.17	1.24	0.77	0.73	0.49
2	Pan evaporimeter	1.13	1.59	1.40	0.78	0.94	0.46
3	Piche evaporimeter	0.84	1.10	1.00	0.64	0.61	0.35
4	Penman-Monteith	1.18	1.22	1.12	0.77	0.71	0.48
2010							
1	Thornthwaite	1.39	1.01	0.96	1.34	0.90	0.50
2	Pan evaporimeter	0.91	0.85	0.89	1.22	0.78	0.46
3	Piche evaporimeter	0.59	0.74	0.70	0.90	0.60	0.34
4	Penman-Monteith	0.69	0.91	0.83	1.34	0.73	0.43
Average 2007-2010							
1	Thornthwaite	1.42	0.98	1.04	1.03	1.01	0.78
2	Pan evaporimeter	1.05	0.97	1.03	1.00	0.98	0.81
3	Piche evaporimeter	0.74	0.75	0.77	0.74	0.55	0.47
4	Penman-Monteith	1.06	0.94	0.96	1.06	0.76	0.69

The irrigation scheduling of peach-tree using Pan evaporimeter

The irrigation scheduling is an extremely important operation and use of Pan evaporimeter suppose soil sampling only once, in spring, at the resumption of vegetation. In rest of days, water reserve is known from the monthly balance chart. This chart has mentioned at inputs the rainfall and the watering and at the outputs the Pan water consumption determined by the multiplying of daily evapotranspiration Pan (determined every day at 8 o'clock with the known methodology) with the (K_c) coefficient for that month. By making the balance is stand out the water reserve at the end of the day. If this reserve reached the easily available water content, the irrigation begins, bringing the water reserve at field capacity level. The balance depth is the culture watering depth, in our situation, 0-100 cm. The use of Pan evaporimeter method in the irrigation forecast has known advantages (Grumeza et al., 1989, Domuța C. et al., 2007) and his accuracy is very good, as shown in our research. In 2010, at the micro sprinkler irrigated peach-tree crop, except the decade determinations of soil moisture, was calculated the water reserve also in balance monthly chart using the daily data of Pan evaporimeter and (K_c) coefficients for respectively month, established in 2007-2009 period.

Table 4

Differences between soil water reserve (m^3/ha) determined with Pan evaporimeter and water reserve determined by gravimetric method on 0-75 cm of the peach-tree, Oradea 2010

Crt. nr.	Determination data	Water reserve directly determined	Water reserve determined with Pan evaporimeter	Difference	
				m^3/ha	%
1	15.03	4284	4210	-74	-1.8
2	01.04	3956	3870	-86	-2.2
3	10.04	4391	4240	-151	-3.5
4	20.04	4137	4090	-47	-1.2
5	30.04	3699	3570	-129	-3.5
6	10.05	3593	3490	-103	-2.9
7	20.05	3246	3260	14	0.4
8	01.06	3624	3740	116	0.3
9	10.06	3684	3860	176	4.7
10	20.06	3171	3310	139	4.4
11	30.06	3608	3760	152	4.2
12	10.07	3503	3640	137	3.9
13	20.07	3398	3520	122	3.6
14	30.07	3669	3710	41	5.4
15	10.08	3518	3660	142	4.0
16	20.08	3593	3620	27	0.8
17	01.09	3442	3540	98	2.8
18	10.09	3570	3660	90	2.5
19	20.09	3620	3680	60	1.6
20	02.10	3642	3710	68	1.8
AVERAGE		3667	3707	40	1.1

The results presented in table 4 shows small differences between the water reserves directly obtained by gravimetric determination of soil moisture and water reserves indirectly determined using the Pan evaporimeter and (K_c) coefficients

for respectively month. The differences registered in 200 days of entire vegetation period of peach-tree crop are listed between -3.5% and 5.4%. This shows accuracy of method and considering the complexity of gravimetric determination of soil method is suggesting the great importance of using this method in the forecast irrigation by means of Pan evaporimeter at peach-tree crop.

CONCLUSIONS

1. In comparison with the total water consumption of drip irrigated peach-tree, the values of reference evapotranspiration calculated with Thornthwaite and Penman-Monteith methods or measured with Pan and Piche evaporimeter are statistically significant smaller.

2. Analysing statistically of the daily optimum water consumption in drip irrigated peach-tree in comparison with the reference evapotranspiration (ET_0) values determined with the four methods emphasized the statistically assured differences in every 6 month of the vegetation period of peach-tree. It shows the need of researches regarding the crop coefficient (K_C) for transformation of the reference evapotranspiration for every month of the vegetation period.

3. The research results obtained by parallel using of the Pan evaporimeter and gravimetric method for establishing the moment of watering application shows the differences between the two methods; the differences are between 3.5% and +5.4%, and sustain the opportunity of the Pan evaporimeter using in the irrigation scheduling of the peach-tree.

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ADJUSTING AGRICULTURAL DRAINAGE TO BUILDINGS

ADAPTAREA DRENAJULUI AGRICOL LA CLĂDIRI

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Abstract. *In order to enhance stability and to ensure the normal operation of a building, both the land on which the building is erected and its foundation should meet particular requirements, i.e. the foundation should be strong and dry. Underground waters are responsible for up to 70 % of the problems and damages caused to non-industrial and industrial buildings, both during building erection and during building use and operation. The drainage of rain water and sidewalk water accumulating at the foot of the foundations is also a permanent problem. It is therefore necessary, especially when the buildings have basements, to provide a viable drainage system able to allow water and water vapor to drain and, hence, reduce the hydrostatic pressure exerted on the building walls.*

Key words: building drainage, drainage tube, filtering prism, geotextile

Rezumat. *Pentru a se asigura o stabilitate mărită și o exploatare normală a unei clădiri, atât terenul pe care se construiește, cât și fundația trebuie să îndeplinească anumite condiții, adică fundația să fie puternică și uscată. Apele subterane sunt în proporție de 70 % vinovate de problemele și daunele cauzate construcțiilor civile și industriale atât în faza de execuție a construcției cât și, în timpul utilizării și exploatării lor. De asemenea, drenajul apelor pluviale și a celor provenite de pe trotuare, care se acumulează la baza fundațiilor, reprezintă o problemă permanentă. Din acest considerent este necesar, în special la construcțiile cu subsol, un sistem de drenaj viabil care să favorizeze eliminarea apei și a vaporilor de apă și, implicit, să reducă presiunea hidrostatică exercitată asupra pereților.*

Cuvinte cheie: drenaj la clădiri, tub de drenaj, prism filtrant, geotextil

INTRODUCTION

Drainage in building basements represents a permanent problem that must be solved by architects and designers. If water is not removed from the foundations' base, serious problems may appear in the rooms located under the ground, the infiltrate affecting the buildings' support walls (Rădulescu N. et al., 2010). Moreover, water accumulation near buildings loads the ground, in the detriment of the walls, which will have to bear sometimes even double pressures compared to the normal situations (Alexandrescu I., 2010). These problems may appear because of the absence of water elimination measures, of the inappropriate drainage or the incorrect methods of sealing walls against water.

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MATERIAL AND METHOD

In order to perform the marginal drainage of a building with basement, located on a land with an average slope of 15 %, a method was adapted, deriving from the removal of the excess water from the agricultural lands, made of absorbent drains and columns in filter material.

By removing the excess water from the agricultural lands by underground drainage associated with modeling the land in ridge bands, the specialty literature recommends the realization of columns in filter material for improving the intake of the absorbent drains located under ditches, from drains to ditches level. The introduction of filter columns, in the case of the drainage on the agricultural lands, allows the increase of ridges dimensions and the decrease of the collection-evacuation chain.

An economic solution of the modeling system of the land in ridge bands consists of performing water caption from ditches with collecting drains, located perpendicular on the bands, at long intervals (about 75 m) and the discharging process of each ditch in the collecting drain being made by means of a prism in granular filter material. The prism raised from drain level to the land surface realizes the ditch-drain hydraulic connection, this one being protected against plugging by a layer of geotextile (Barbu Fl., 1986).

RESULTS AND DISCUSSIONS

The drainage method consists of executing a channel at the foundation bloom, in marginal position of the building, at a distance of 1.20 m from the basement walls, so as that the drainage tube is laid on the vertical edge of the pavement (figure 1).

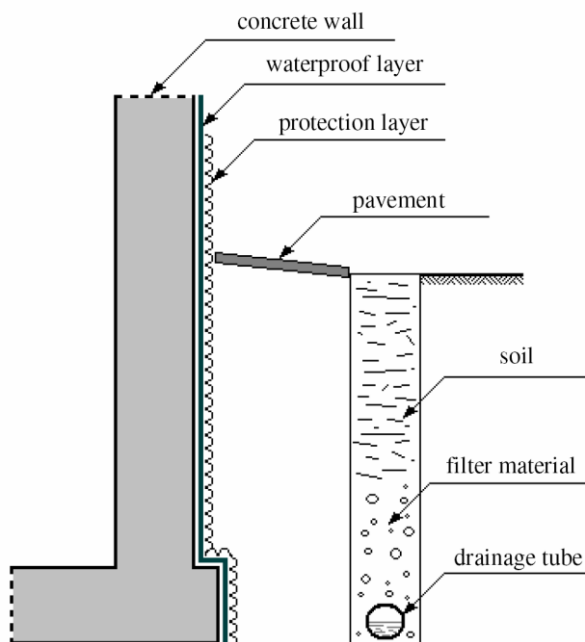


Fig. 1 – Drainage at the level of the building foundation bloom

Concrete wall, waterproof layer, protection layer, pavement, soil, filter material, drainage tube.

The channel with a latitude of 0.40 m (figure 2) was executed upstream at the level of the foundation bloom and downstream, at a depth greater than the foundation bloom, a longitudinal slope of about 2% has been ensured, for the flow of the water collected by the drainage tube.



Fig. 2 – Channel execution for laying the drain

The drainage tube of embossed PVC with the diameter of 110 mm, provided with sectional slots with latitude of 2 mm, slot area of 20 mm² and with a number of 40 slots per metric linear unit has been wrapped with geotextile for preventing its plugging (figure 3).



Fig. 3 – Laying the drainage tube wrapped with geotextile

The filter material made of gravel has been deposited on the drainage tube on a layer with a thickness of 0.50 m and latitude of 0.40 m (figure 4). In order to keep the latitude of the filter material layer, the gravel has been deposited concomitantly with the soil between the basement walls and the filter layer.

In order to facilitate the access of the rainwater and of the water from the pavements to the drainage tube, filter material columns were executed, having the diameter of 0.30 m and being located at a distance of 3 m, also made of gravel, from the level of the filter layer to the land area (figure 5).



Fig. 4 – Placing the filter material on the drainage tube

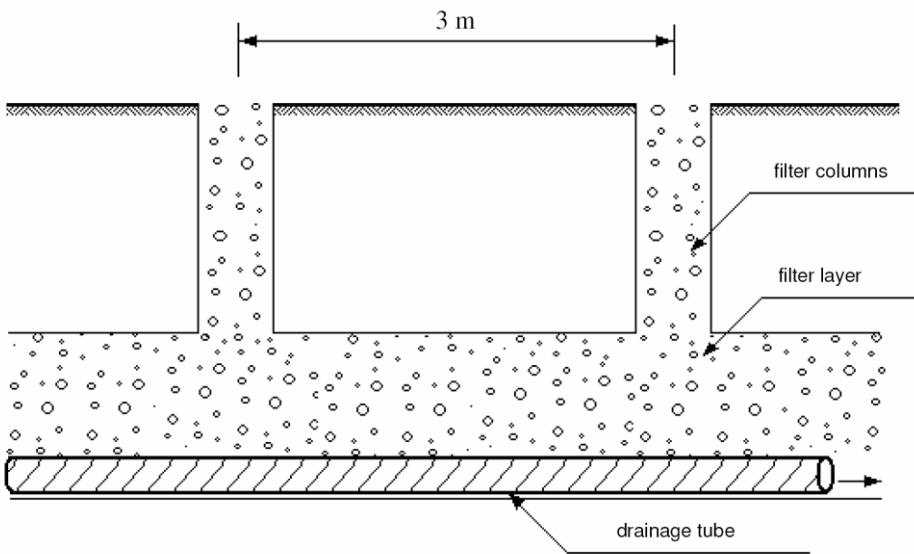


Fig. 5 – Building drainage with filter prism

The columns have been obtained by using tubes and bottomless barrels, which were filled with gravel and, after the spaces between them were filled with soil, the tubes and barrels were raised, forming this way filter columns (figure 6).

In order to reduce even more the hydrostatic pressure exercised by the soil on the wall upstream the building, an absorbent drain tube wrapped with geotextile was installed diagonally, laid at a depth of 1.00 m, using gravel as filter material, with a thickness of 0.30 m (figure 7). The water collected in this drain is

taken over by the marginal drainage of the building by means of a bucket, which has been installed at the corner of the building downstream, which can be noticed in figure 3.



Fig. 6 – Obtaining filter columns

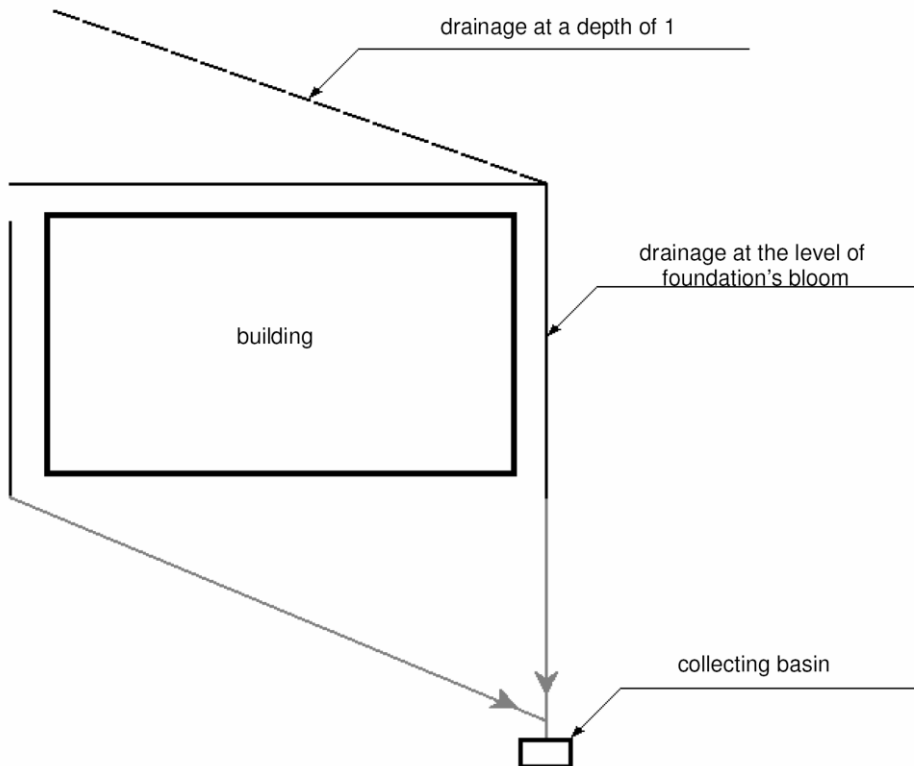


Fig. 7 – Building drainage outline

The water sources absorbed by the building drainage network are evacuated in a collecting basin, being used for irrigating the areas in the building neighborhood. The flows evacuated by the drainage network reaching the value of 2l/s during the periods with heavy rainfall. The drainage system performed keeps the walls dry, avoiding dampness and mould in the rooms in the basement and their consequences.

CONCLUSIONS

1. The flows evacuated from the drainage network have different values according to rainfall intensity and duration, but also in the period of the year when rainfall is registered.

2. By executing an adequate marginal drainage for the buildings with basement, we avoid water infiltration in walls, dampness and mould formation, which allows an appropriate use of the areas in the basement.

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RESEARCH REGARDING THE IMPACT OF AGRICULTURAL MACHINES TRAFFIC ON SOME PHYSICAL PROPERTIES OF THE SOIL AT WINTER WHEAT CROP

CERCETĂRI PRIVIND IMPACTUL TRAFICULUI UTILAJELOR AGRICOLE ASUPRA UNOR PROPRIETĂȚI FIZICE ALE SOLULUI LA CULTURA GRÂU DE TOAMNĂ

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***Abstract.** The agricultural machines traffic, involved in carrying out mechanized agriculture, has a great impact on physical and mechanical properties of the soil and, consequently, on agricultural production. In this paper experimental investigations were performed to quantify the effect of soil compaction induced by the running systems of the agricultural tractors and agricultural machines on winter wheat crop. To this end there has been carried out several experimental variants, with different degrees of compaction, and the evolution of the following parameters: resistance to penetration, bulk density, the mean weight diameter of the structure elements and the water stable aggregates of these elements.*

Key words: winter wheat, compaction, soil properties.

***Rezumat.** Traficul utilajelor, implicate în realizarea mecanizată a lucrărilor agricole, are un impact deosebit asupra proprietăților fizico-mecanice ale solului și, implicit, asupra producțiilor agricole. În cadrul acestei lucrări s-au efectuat cercetări experimentale pentru cuantificarea efectului de tasare asupra solului realizat de sistemele de rulare ale tractoarelor și mașinilor agricole la cultura grâu de toamnă. În acest scop s-au efectuat mai multe variante experimentale, cu grade diferite de tasare și s-a determinat evoluția următorilor parametri: rezistența la penetrare, densitatea aparentă, diametrul mediu ponderat al elementelor de structură și hidrostabilitatea acestor elemente.*

Cuvinte cheie: grâu, tasare, proprietățile solului.

INTRODUCTION

The problem of soil compaction is usually associated with tillage practices or with naturally formed restrictive layers found in many soils. Conventional tillage system usually involves mouldboard ploughing and additional secondary tillage to prepare the seedbed. Soil compaction can result particularly when weather conditions force tillage operations to be completed under unfavourable soil moisture and by unnecessary secondary tillage. During conventional soil tillage cycle may appear two different problems of soil compaction. First is

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compaction of the cultivated horizon, which can be solved by annual tillage. Second is compaction of layer below the annual tillage horizon or subsoil compaction, where the problem worsens because compaction has cumulative effect which is more complex and expensive to solve than compaction within the tilled layer. Conservation tillage systems are usually a result of reduced tillage practices. Those systems try to disturb the soil as little as possible to conserve its natural structure and should lead to less soil compaction (Varsa E.C. et. al., 1997)

Soil tillage allows a rapid and uniform seed emergence, deep penetration of the roots, good soil drainage, weed control and seedbed preparation. Cultivation can alter the physical and mechanical properties of the soil, whereby plant growth, development, and yield are influenced. The physico-mechanical properties of the soil are extremely vital for plant growth. Tillage systems have significant effect on the physical properties of soil (Grant C.A., Lafond G.P., 1993).

The degree of compaction created by tillage and heavy machinery traffic is often also a function of soil texture (Ellies S.A. et al., 2000), soil bulk density (Hakansson I., Lipiec J., 2000), soil structure (Mosaddeghi M.R. et. al., 2000) and soil resistance to penetration (Hamza M.A., Anderson W.K., 2003).

MATERIAL AND METHOD

The experiment was conducted at the Didactic Station of the „Ion Ionescu de la Brad” University of Agricultural Sciences and Veterinary Medicine of Iasi, Ezareni Farm, during farming years 2009-2010. The experimental site is located in the North-East part of Romania (47°07` N latitude, 27°30` E longitude) on a chamic chernozem (SRTS-2003, or haplic chernozems after WRB-SR, 1998), with a clay-loamy texture, 6.8 pH units, 3.7 % humus content and a medium level of fertilization. The soil has high clay content (38-43%) and is difficult to till when soil moisture is close to 12%. The experimental site has an annual average temperature of 9.6°C and precipitation of 517.8 mm. The experimental design was with a single factor of influence, in three replications, having as influence factor the degree of soil compaction. There were established three experimental plots, with the same system of agricultural machines, but with different degrees of soil compaction (table 1). The soil compaction was realized by many “wheel by wheel” passages, using the tractor with 190 horse power, before plowing, by one or two passages in order to achieve different degrees of compaction. Experimental plots covered surface of 150 m² each, being cultivated with wintewr wheat, Glosa variety (approved in 2005, Hungary), drilled on October 21 2010 using the Valtra T190 tractor with the complex aggregate AGPS-24-DR (vertical harrow + universal pneumatic drill). The distance between rows was of 0.125 m and the and the depth at which the wheat was drilled was about 5 cm.

Table 1

Experimental plots layout at wheat crop in agricultural year 2009-2010

Experimental plots	Soil compaction degree	Agricultural machines system used
V ₁ -control	Uncompacted	Valtra T190 tractor + AGPS-24-DR
V ₂	Compacted once	
V ₃	Compacted twice	

In this experimental research the influence of soil compaction degree on some soil physical and mechanical properties was studied. In order to determine soil bulk density, mean weight diameter of soil structural elements and the hydro stability of these elements, soil samples were taken from each plot in ten days after the wheat seeding.

Soil penetration resistance was measured in ten days after sowing, by using a digital penetrometer (Eijkelkamp equipment, The Netherlands). The measurements were realised at a soil depth of 40 cm by using the Eijkelkamp penetrometer which had a 30° cone angle and a 1 cm² base area and by making ten repetitions for each experimental plot.

After seeding, in order to determine the soil bulk density soil samples were taken from each experimental plot using a steel cylinder of 100 cm³ volume (5 cm in diameter, and 5.1 cm in height) (Blake G.R. et. al, 1986), which were carried out at four depths (0-10 cm, 10-20cm, 20-30 cm and 30-40 cm).

The analysis of hydro aggregate stability of soil structural elements and the analysis of soil structural elements distribution was measured by using the dried and wet sieving, after Tiulin-Erikson procedure. The soil samples were taken on three depths: 0-10 cm, 10-20 cm and 20-30 cm and each sample was air-dried. The soil samples were sieved by using a sieve shaker machine named „Granular composition test set” (Eijkelkamp, Netherlands), provided with a set of overlapping sites (sites with holes: 10, 5, 3, 2, 1, 0.5 and 0.25 mm), in order to achieve the dry sieving. The eighth sieve, mounted below the sieve with 0.25 mm holes, is blind (without holes). After finishing the dry sieving, the soil fractions for each sieve were weighed and the percentage of soil structural elements for each fraction was calculated: soil structural elements larger than 10, between 10 to 5, 5 to 3, 3 to 2, 2 to 1, 1 to 0.5, 0.5 to 0.25 mm and smaller than 0.25 mm. According to Tiulin-Erikson procedure, in order to determine the hydro stability of soil structural elements, twenty grams of average soil sample of dry soil structural elements were placed on a set of six overlapping sieves, having holes of 0.25, 0.5, 1, 2, 3, 5 mm diameter. The fractions of soil structural elements retained by each sieve were gently back-washed off the sieve. The soil samples were rinsed, the water was removed, and then, the soil structural elements were put in numbered aluminum vials and they were weighed. Forwards, the vials were placed in a forced-air oven at ~105°C and then, after 8 hours, they were weighed. Certain indicators, as mean weight diameter of soil structural elements, were determined by calculation (Canarache A., 1990).

The wheat seed yield was determined from 5 m² of each experimental plot by taking ten repetitions for each experimental plot.

Statistical processing of data was done by means of the analysis of variance.

RESULTS AND DISCUSSIONS

The influence of soil compaction degree on some soil physical and mechanical properties and wheat seed yields are presented herein.

The soil penetration resistance values are presented in table 2. It is noted that, once with the increasing of the soil compaction degree, the values of soil penetration resistance increase. Regarding the variation in depth of the soil resistance to penetration, we find that in the upper soil layers of 0-10 cm, the soil penetration resistance has lower values due to the action of active working bodies of vertical harrow within the complex aggregate AGPS-24-DR. In the soil layers, in the range of 10-40 cm, due to compaction produced by the agricultural

machinery wheals, we can observe a systematic increase of the amount of soil resistance to penetration, as the depth increases. The experimental plot with the highest value of soil resistance to penetration is V_3 , respectively 0.526 MPa, a very significant positive difference towards the experimental plot $V_{1-control}$.

Table 2

Soil resistance to penetration at wheat crop in agricultural year 2009-2010

Experimental plots	Depth (cm)										Statistical significations
	0-5	5-10	10-15	15-20	20-25	25-30	30-35*	35-40*	Average 0-30	Average 0-40	
	Soil resistance to penetration (MPa)										
$V_{1-control}$	0.2	0.31	0.32	0.336	0.352	0.416	0.426	0.466	0.322	0.353	-
V_2	0.24	0.386	0.4	0.426	0.454	0.481	0.528	0.572	0.397	0.436	xxx
V_3	0.285	0.419	0.494	0.501	0.536	0.594	0.658	0.724	0.471	0.526	xxx

*the subsoil layers was not tilled with the plow

LSD 5%=5%=0.032 MPa LSD 1%=0.047 MPa LSD 0.1%=0.062 MPa

The soil bulk density, as well as the soil resistance to penetration, is having the same variation, depending on the degree of the soil compaction. As seen in table 3, the experimental plot which has the highest value of the soil bulk density is V_3 . This value is of 1.49 g/cm³, having a very significant positive difference towards the experimental plot $V_{1-control}$. It is also found that the soil bulk density increases continuously with the depth's increase.

Table 3

Soil bulk density at wheat crop in agricultural year 2009-2010

Experimental plots	Depth (cm)						Statistical significations
	0-10	10-20	20-30	30-40*	Average 0-30	Average 0-40	
	Soil bulk density (g/cm ³)						
$V_{1-control}$	1.08	1.31	1.35	1.43	1.25	1.29	-
V_2	1.21	1.39	1.44	1.55	1.35	1.4	xxx
V_3	1.31	1.47	1.57	1.61	1.45	1.49	xxx

*the subsoils layer was not tilled with the plow

LSD 5%=0.038 g/cm³ LSD 1%=0.057 g/cm³ LSD 0.1%=0.092 g/cm³

Table 4

Mean weight diameter at wheat crop in agricultural year 2009-2010

Experimental plots	Depth (cm)				Statistical significations
	0-10	10-20	20-30	Average 0-30	
	Mean weight diameter (mm)				
$V_{1-control}$	3.159	4.132	4.413	3.901	-
V_2	2.641	3.067	3.705	3.138	0
V_3	2.528	2.762	3.246	2.845	00

LSD 5%=0.466 mm

LSD 1%=0.772 mm

LSD 0.1%=1.443 mm

In table 4 we can observe that the mean weight diameter of the structural elements of the soil decreases once the degree of soil compaction increases. The lowest value of the mean weight diameter of the soil structural elements is recorded at V₃, the experimental plot with a distinctly significant negative difference towards the experimental plot V_{1-control}.

Regarding the hydro stability of the soil structural elements we can conclude that, from the values of the I₁ quality parameter of soil structure presented in table 5, the hydro stability of the structural elements of the soil are decreasing once the degree of the soil compaction is increasing.

As it resulted from the data presented in table 5, by making an extrapolation to the value classes of the hydro stability of the soil structural elements (I₁=3 to 5, the soil structure is very good; I₁=0.61 to 3, the soil structure is good; I₁=0.3 to 0.61, the soil structure is medium; I₁=0.18 to 0.3, the soil structure is weak), we can conclude that the experimental plot V₁ is having the best soil structure from the soil hydro stability's point of view by belonging to the value class „soil with a very good structure”, respectively 3.67, while the experimental plot V₃ belongs to the value class „soil with a good structure”, respectively 1.76. The experimental plot V₂ is having a distinctly significant negative difference towards the experimental plot V_{1-control} meanwhile the experimental plot V₃ is having a very significant negative difference towards the experimental plot V_{1-control}.

Table 5

Values of the I₁ quality parameter of soil structure at wheat crop in agricultural year 2009-2010

Experimental plots	Depth (cm)				Statistical significations
	0-10	10-20	20-30	Average 0-30	
	The values of I ₁ quality parameter of soil structure				
V _{1-control}	2.584	3.115	3.355	3.018	-
V ₂	1.911	2.221	2.814	2.315	00
V ₃	1.055	1.584	2.167	1.602	000

LSD 5%=0.271

LSD 1%=0.450

LSD 0.1%=0.842

The wheat seed yields obtained in the three experimental plots are presented in table 6. It can be noted that the increase of the soil compaction degree leads to drastic yield decrease. The experimental plots V₂ and V₃ have a very significant negative difference towards the experimental plot V_{1-control}.

Table 6

The yields obtained at wheat crop in agricultural year 2009-2010

Experimental plots	Wheat seed yield (kg/ha)	Statistical significations
V _{1-control}	4539	-
V ₂	3583	000
V ₃	3196	000

LSD 5%=248.7 kg/ha

LSD 1%=412.4 kg/ha

LSD 0.1%=770.2 kg/ha

CONCLUSIONS

1. The increase of the soil compaction degree, induced by the traffic of the agricultural machines, has a negative impact on the soil physical and mechanical properties.

2. The soil resistance to penetration increases once with the increase of the soil compaction degree, having lower values in the upper soil layers of 0-20 cm.

3. The soil bulk density is having the same variation as the soil resistance to penetration, this two parameters being the most used indicators of the soil state of compactness. As the soil bulk density increases, it's of soil compaction degree increases too.

4. The mean weight diameter of the soil structural elements presents major modifications, it's values decreasing once with the increase of soil compaction degree.

5. The hydro stability of the soil structural elements is also decreasing once with the increase of soil compaction degree.

6. All these negative modifications of the physical and mechanical properties have lead to drastic yield decrease.

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MULBERRY TREE BACTERIAL CANCER

CANCERUL BACTERIAN AL DUDULUI

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Abstract. Mulberry tree is a specie commonly used in parks, street alignments etc., but is heavily affected by the attack of phytopathogenic agents such as *Pseudomonas mori* (Boyer et Lambert, Stevens) and by some species of phytopathogenic fungi such as *Mycosphaerella morifolia* (Fuck.) Lind., *Cercospora pulvinulata* Sacc. et Wint.f. *angulosa* Săvul. et Sandu, *Gibberella baccata* (Wallr.) Sacc. var. *moricola* (Nees) Wr. Since 2006 the authors have observed for the first time in Romania, the presence of mulberry tree bacterial cancer produced by *Agrobacterium tumefaciens* (Smith et.Townsend). Con., on multiple mulberry trees older than 80 years in various areas of the Herastrau Park - Bucharest. The attack occurs on most trees in the form of very large brown tumors, of 1.22 m height and 0.72 m wide, located in the first centimeters above the soil, with irregular rough surface.

Key words: mulberry, bacterial cancer, tumor

Rezumat. Dudul este o specie utilizată frecvent în parcuri, pentru aliniamentele stradale etc., însă este afectat în foarte mare măsură de atacul unor agenți fitopatogeni, ca de exemplu bacteria *Pseudomonas mori* (Boyer et Lambert, Stevens) și de unele specii de ciuperci fitopatogene ca: *Mycosphaerella morifolia* (Fuck.) Lind., *Cercospora pulvinulata* Sacc. et Wint.f. *angulosa* Săvul. et Sandu, *Gibberella baccata* (Wallr.) Sacc. var. *moricola* (Nees) Wr. etc. Începând cu anul 2006 autorii au observat, pentru prima dată în România, prezența cancerului bacterian al dudului produs de bacteria *Agrobacterium tumefaciens* (Smith et.Townsend).Con., pe mai multe exemplare de dud în vârstă de peste 80 de ani, în diferite zone din parcul Herăstrău – București. Atacul se manifestă la majoritatea pomilor sub forma unor tumori de dimensiuni foarte mari, de 1,22 m înălțime și de 0,72 m lățime, dispuse în zona coletului, de culoare brună, având suprafața aspră, neregulată.

Cuvinte cheie: dud, cancer bacterian, tumoare

INTRODUCTION

Mulberry (*Morus alba* L. and *Morus nigra* L.) is a highly appreciated specie both for its fruits, with a complex content of nutrient substances but also for its leaves, used to feed the silkworms.

Mulberry fruits contain: organic acids (aspartic, folic, folinic, acetic, citric, propionic, butyric), adenine, arginine, volatile compounds (butilamin), tannin, aldehids, cetons, beta-carotene, calcium carbonate, pectin, vitamin C, antocians, proteine, albumine, lecitine, glutaminic derivates etc, that have an anti-scorbutic, laxative, depurative, hypoglycemic, sudorific action.

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These compounds are efficient in constipation treatment, diabetes mellitus, stomatitis, gingivitis, the thrush, gastric and duodenal ulcers, lung disease and detoxification by the depurative and diuretic effect. Can also be used as a tonic and astringent. Mulberry fruits reduce the appearance of breast nodules by fragranic acid effect, offering protection against cancer. The development of this species, commonly found in parks, street alignments etc., however, is largely affected by the attack of phytopathogenic agents such as *Pseudomonas mori* (Boyer et Lambert, Stevens) that produces mulberry bacterial burning, and by some phytopathogenic fungi species such as *Mycosphaerella morifolia* (Fuck.) Lind. causing leaves brown staining, *Cercospora pulvinulata* Sacc. et Wint. f. *angulosa* Săvul. et Sandu, which causes leaves brown staining, *Gibberella baccata* (Wallr.) Sacc. var. *moricola* (Nees) Wr. causing shoots withering etc.

MATERIAL AND METHOD

The experiment was carried out during 2010-2011 and involved *Morus alba* and *Morus nigra* trees from Herastrau Park and other locations in Bucharest. The method consisted of observations and measurements of the trees diagnosed with cancerous tumors. Measurements involved the size of the tumor, the colour, the external aspect while the observations interested as the position of the tumour on the trees stem (trunk or branches) and the high (m) from the ground.

RESULTS AND DISCUSSIONS

Since 2006 the authors have observed for the first time in Romania, the presence of mulberry tree bacterial cancer produced by *Agrobacterium tumefaciens* (Smith et. Townsend). Con., (V. Severin, 2006) on multiple mulberry trees older than 80 years in various areas of the Herastrau Park - Bucharest.

The attack occurs on most trees in the form of very large brown tumors, of 1.22 m height and 0.72 m wide, located in the first centimeters above the soil, with irregular rough surface. Often, on the same tree, beside the giant tumor from the basal part of the stems are observed throughout numerous tumors, the size of a child's head, which are irregularly distributed around, which sometimes merge of over 1 m distance.



Fig.1 - Cancerous tumor developed at 1 m above the ground (original photo)

In some plants cancerous tumor developed on the stem at a distance of about 1 m above the ground (fig. 1).

At other plants, aged about 25-40 years, the disease is manifested by the presence of numerous cancers tumors, hard, brown, with rough surface, the size of cabbage, irregularly distributed from the bottom to the top of the stem and branches (fig. 2 a, b, c, d).



Fig. 2a - Cancerous tumors irregular disposed on branches and truck (original photo)



Fig. 2b - Cancerous tumors irregular disposed - detail (original photo)



Fig. 2c - Cancerous tumors (original photo)



Fig. 2d - Cancerous tumors disposal all over the tree stem (original photo)

Diseased plants, although some very advanced age, continues to vegetate, but with much lower growth of shoots, leaves and fruit, compared with unaffected trees.

CONCLUSIONS

The fight against this disease is based primarily on preventive measures, including the most important, the use of healthy seedlings for planting only (grown in uncontaminated nurseries). Suspects seedlings coming from infected nurseries will be disinfected before planting by dipping roots into a ditch consists of a mixture of potassium salt 1% and 0.4% calcium chloride.

If seedlings present tumors at removal from the nursery, there will be destroyed by burning.

After dissolution of infected nurseries, the land will be cultivated 4-5 years with cereals, which are resistant to cancer.

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MONITORING OF NITROGEN COMPOUNDS CONTENT IN UNDERGROUND WATER FROM TIMIS RIVER

MONITORIZAREA CONȚINUTULUI ÎN COMPUȘI CU AZOT AL APEI FREATICE DE PE CURSUL RÂULUI TIMIȘ

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Abstract. The purpose of this paper is to present the results of monitoring the river Timis in terms of nitrogen content in the period 2009-2010. Experimental were determined nitrogen compounds (nitrate, nitrite, ammonium) in wells from five localities situated along the river Timis Slatina-Timis Caransebes Gavojdia, Cebza, Graniceri, points distributed between the source and the point out of the river, namely the border with Serbia. Samples determinations were done with the help of Spectrophotometer SQ 118. In autumn and winter months, concentrations of nitrogen compounds have maximum values and are due to frequent rainfall recorded during this period of year. Samples analyzed from drilling along the Timis River, are characterized with low nitrates and nitrites content, but with higher values of ammonium ion concentration. The existence of ammonium ion in water and absence of nitrates indicate a recent water contamination. When water contains both ammonia and nutrient indicates a pollution since that passed a certain period. Lack of ammonia, but the presence of nitrates and nitrites, involves a contamination that occurred a long time ago. Therefore, in this time, water was self-cleaned.

Key words: nitrates, nitrites, ammonia, Timis river

Rezumat. Scopul acestei lucrari este de a prezenta rezultatele monitorizării râului Timiș din punct de vedere al conținutului de compuși cu azot în perioada 2009-2010. Experimental s-au determinat trimestrial compușii cu azot (nitrați, nitriți, amoniu) în foraje provenite din 5 localități situate de-a lungul râului Timiș: Slatina-Timiș, Caransebeș, Găvojdia, Cebza, Grăniceri, puncte distribuite uniform între izvoare și punctul de ieșire din țară a râului, și anume granița cu Serbia. Analizele au fost efectuate în Laboratorul de determinări reziduuri de la USAMVB Timișoara, iar aparatul utilizat pentru determinarea compușilor studiați a fost Spectrofotometru SQ 118. În lunile de toamnă-iarnă, valorile concentrațiilor de compuși cu azot sunt maxime și se datorează precipitațiilor frecvente înregistrate în această perioadă a anului. Probele analizate, provenite din foraje efectuate de-a lungul râului Timiș, se caracterizează prin conținut scăzut de nitrați și nitriți, dar prin valori mai ridicate a concentrației ionului amoniu. Existența în apă a ionului amoniu și lipsa azoților indică o impurificare recentă a apei. Când apa conține atât amoniac, cât și nutrienți se presupune o poluare de la care a trecut un anumit interval de timp. Lipsa amoniului, dar prezența azoților și azoților, presupune o impurificare care s-a produs de mult timp. Astfel că, în acest interval de timp, apa s-a autoepurat.

Cuvinte cheie: nitrați, nitriți, amoniu, râul Timiș.

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INTRODUCTION

Timis River, the richest water resources in the Area of Banat River basin drains an area of over 5677 km². His length is 244 km. Timis has its sources on the eastern slopes of the mountains Semenic in Caras-Severin. River is formed at the confluence of three branches: Semenic Gradiste and Brebu. Overcoming the barrier of the Three Waters, stormy river flows in a narrow channel oriented NW - SE. From the Timis Teregova take direction from south to north, and from Caransebes, due to lower slope, the river meanders describes large (http://ro.wikipedia.org/wiki/R%C3%A2ul_Timi%C8%99_Dun%C4%83re)

In the category of polluting factors of surface and depth is an important chemical compounds. A first effect of chemical pollution is the potential for toxic chemicals. Among the chemical compounds with toxic effects on the human body an important role has nitrogen compounds (nitrates, nitrites, ammonium) (European Directive 98/83/EC water quality for human consumption).

Following the biological effects caused by chemical pollutants, legislation of countries technologically advanced, or with a strong chemical industry, considered and imposed limits that must not exceed the concentrations of pollutants in the environment (the maximum permissible concentration - MPC) (Cuc Liana, 2002).

Nitrogen compounds (ammonia, nitrites and nitrates) are important steps in the presence of inorganic nitrogen in its complex cycle in nature (Alexa Ersilia, 2008). Nitrates may be either obtain synthetically or used as fertilizer. Industrial nitrates are produce on a large scale, nitric acid, ammonium formed by catalytic oxidation. Nitrite (NO_2) is also a metabolite in the biological nitrogen cycle, both as an intermediate compound in the nitrification and denitrification process. Effect of nitrogen pollutants on the environment due to anthropogenic sources of data using synthetic fertilizers in agriculture and horticulture crop fertilization, and because of waste from livestock farms cultivated soils. Literature studies have indicated that the waste produced within 7-8 cattle, can be use on one hectare of land and implementing this high dose may increase nitrate levels above 10 mg /L in groundwater (Adriano C. et al., 2003).

MATERIAL AND METHOD

Experimental were determined nitrogen compounds (nitrate, nitrite, ammonium) in wells from five localities situated along the Timis river : Slatina-Timis, Caransebes, Gavojdia, Cebza, Graniceri, points distributed between the source and the point out of the river, namely the border with Serbia. Samples were taken quarterly, during the two years 2009-2010, the results were interpreted according to the requirements of the Law 458/2002 regarding chemical parameters of water quality. Sampling points are shown in table 1.

The content of nitrate, nitrite and ammonium in water was determined experimentally in the laboratory using rapid tests MERCK, the SQ 118 Spectrophotometer at wavelengths: 515 nm, 525 nm, 690 nm for nitrate, nitrite, respectively ammonium.

Table 1

Sampling points descriptions	
Sampling points	Characteristics
Slatina-Timis	The sampling point is located on the upper reaches of the Timis river and can be considered, as a reference point, a witness, being located upstream of potential pollution point sources such as Caransebes, Lugoj cities or some factories and livestock complexes.
Caransebes	The sampling point is located near the water intake for drinking water abstraction in the city water plant No.2 Caransebes. Timis river water is used to supply the five wells (S = 1800 m ²) that complement the underground flow of 15 wells which provide 25% of the needed water of city of Caransebes
Gavojdia	The sampling point is located downstream of the junction points of Timis with Nădrag and Spaia streams and Bistra River, possible pollution sources of the Timis, but situated before Lugoj city, a major source of pollution. To a small distance, about 10-15 km downstream, there is no. 2 drinking water plant Lugoj.
Cebza	Sampling point is located downstream of the Timis-Bega River splitting point, downstream from the discharge of sewage from the city of Lugoj.
Graniceri	The sampling point is located close to the border with Serbia, about 7 km downstream from the confluence with the streams –Birda-Lanca that collects wastewater from livestock belonging to Ciacova farm and downstream of the pig farm Peciu which discharging sewage directly into the Timis river.

RESULTS AND DISCUSSIONS

The experimental results obtained are show in figures 1-6.

The maximum ammonia content in water wells was established according to Law 458/2002 to 0.5 mg ammonium /L of water (Legea 458/2002).

In 2009 were registered values that exceeded the ammonium limit on drilling at Gavojdia (1.05 mg/L in January) and Graniceri (1.23 mg/L in January, 0.75 mg/L in July and 0,90 mg/L in October).

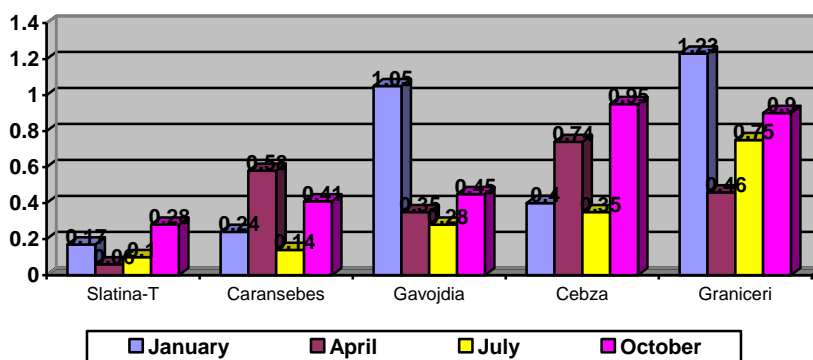


Fig. 1 - Ammonium content (mgN/L) in water samples taken from drillings along of Timis river 2009

Gavojdia sampling point is located downstream of the confluence with the streams –Birda-Lanca that collects wastewater from livestock belonging to Ciacova farm and downstream of the pig farm Peciu which discharging sewage directly into the Timis river, so explains the annual average value of 0.84 mg ammonia /L (figure 1).

Chemical parameters of water quality according to Law 458/2002 for nitrate are limited to 50 mg/L (Legea 458/2002).

This value was exceeded in Cebza sampling point (65.4 mg /L) in January 2009 and drilling from Graniceri, in October when has been recorded a maximum value of 126.1 mg/L exceeding the limit maximum allowed of 2.52 times .

In autumn and winter months, concentrations of nitrogen compounds has maximum value and are due to frequent rainfall recorded during this time of year (figure 2).

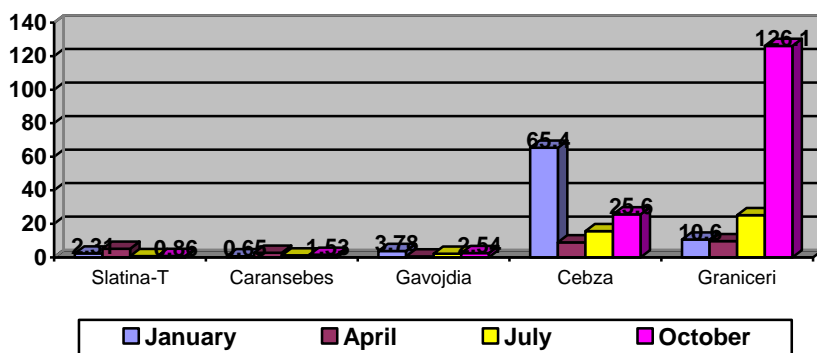


Fig. 2 - Nitrates content (mgN/L) in water samples taken from drillings along Timis river 2009

Values of nitrite content in the analyzed samples is within the limit values laid down in standards, except Graniceri sampling point with a value exceeding the limit of 0.5 mg /L in April and in October 2009. Also, in drilling from Gavojdia has been registered a value of 0.52 mg/L near the maximum allowable limit of 0.5 mg/L nitrite (figure 3).

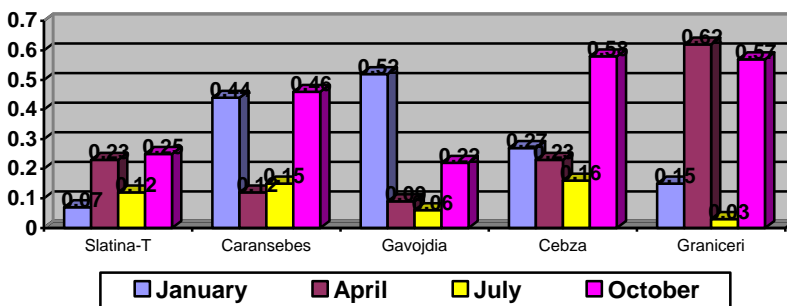


Fig. 3 - Nitrites content (mgN/L) in water samples from drillings along Timis River, 2009

In 2010, there was a decrease of ammonium content in the annual average value in the Graniceri sampling point to 0.53 mg ammonia/L water compared with 2009 when it scored an average value of 0.9 mg/L. Maximum allowed limit of 0.5 mg/L was exceeded in October when was recorded the maximum value of 1.04 mg/L. In the sampling points Caransebes, Cebza and Gavojdia were recorded in 2010, annual average values that exceeded maximum allowed value. In January and October 2010 were recorded values that exceed the maximum permissible limit of 0.5 mg /L in the three sampling points earlier mentioned, correlated with the rainfall level recorded in this year (figure 4).

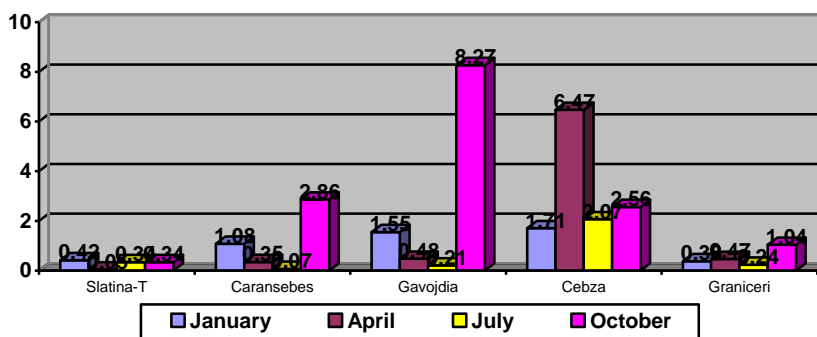


Fig. 4 - Ammonium content (mgN/L) in water samples taken from drillings along of Timis river 2010

Nitrate content in wells existing in the area of Timis watercourse does not exceed the maximum allowable value of 50 mg/L stipulated by law in Law 458/2002 (figure 5).

In 2010, with the exception Graniceri sampling point, in January, when there was a nitrite content of 0.64 mg/L, was not exceeded maximum permissible limit of 0.5 mg /L (figure 6).

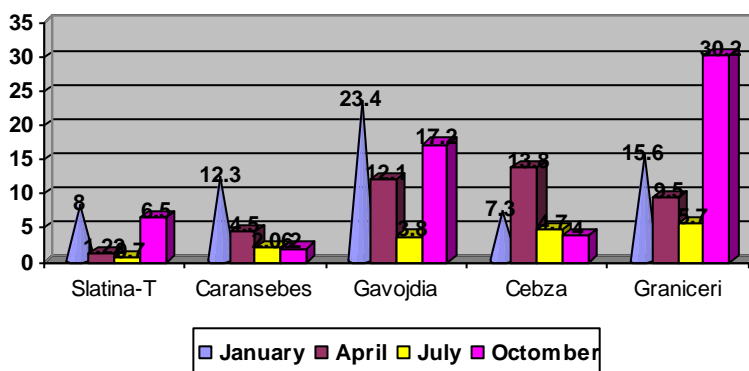


Fig. 5 - Nitrates content (mgN/L) in water samples taken from drillings along Timis River 2010

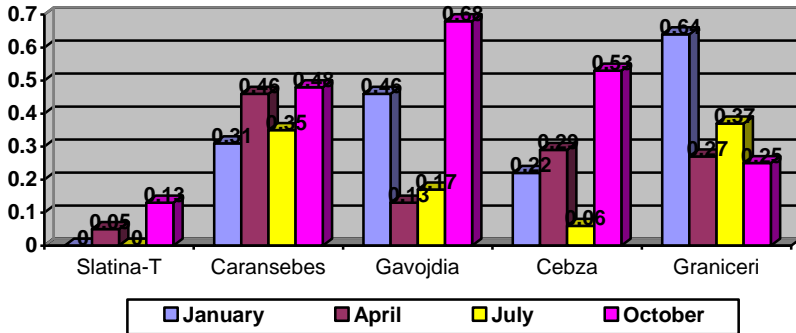


Fig. 6 - Nitrites content (mgN/L) in water samples from drillings along Timis River, 2010

CONCLUSIONS

1. Analyzed samples from wells along the Timis River, are characterized by low content of nitrates and nitrites, but with higher values of ammonium ion concentration. The existence of ammonium ion in water and lack of nitrates indicate a recent water contamination.

2. Maximum allowable limit of 0.5 mg/L established for ammonium ion was exceeded in samples collected from localities Gavojdia and Gradinari. Gavojdia sampling point is located downstream of the confluence with the Lanca-Birda creek, that collects wastewater livestock farm belonging Ciacova and downstream of the pig farm Peciu Nou which discharging manure directly into the Timis River, which explain the exceeding of the maximum allowed value.

3. In autumn and winter months, concentrations of nitrogen compounds have maximum values and are due to frequent rainfall recorded during this time of year.

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RESEARCH ON THE RELATIONSHIP BETWEEN SPECIES DIVERSITY IN DECIDUOUS FOREST AND LUMBRICIDE COMMUNITY EXISTS IN ITS GROUND

CERCETĂRI PRIVIND RELAȚIA DINTRE DIVERSITATEA SPECIILOR ARBORICOLE DIN PĂDUREA DE FOIOASE ȘI COMUNITATEA DE LUMBRICIDE EXISTENTĂ ÎN SOLUL ACESTEIA

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Abstract. *The present study presents results of the influence of tree species diversity on the earthworm community in a Eastern Carpathian deciduous mixed forest. Earthworms were taken from soil, from May to November, sorted manually and identified. The tree diversity is correlated with earthworm densities, indicating the importance of diverse food qualities for the decomposer fauna, especially in springtime. The forest is dominated by beech (*Fagus sylvatica*), ash (*Fraxinus excelsior*), hornbeam (*Carpinus betulus*), but locally a mosaic of up to 8-12 tree species occurs with varying composition. The present earthworm species are *Dendrobaena octaedra* var. *typica*, *Lumbricus terrestris*, *Eisenia submontana*, *Octolassium lissaense*, *Eiseniella tetraedra typica*, *Lumbricus rubellus*, *Lumbricus castaneus*.*

Key words: lumbricidae; earthworm diversity; tree diversity; deciduous mixed forest.

Rezumat. *Acest studiu prezintă efectul diversității speciilor arboricole asupra comunității de lumbricide, în solul unei păduri mixte de foioase localizată în Carpații orientali. Râmele au fost colectate din sol din luna mai și până în noiembrie, sortate manual apoi determinate. Diversitatea speciilor de foioase determină densitatea lumbricidelor din sol, arătând importanța calității hranei pentru fauna de descompunători ai materiei organice, mai ales primăvara. Specia dominantă din pădure este fagul- *Fagus sylvatica*, alături de care se află frasinul (*Fraxinus excelsior*) și carpenul (*Carpinus betulus*), der se formează local un amestec de până la 10 specii de arbori diferiți care măresc indicele de diversitate. Speciile de lumbricide determinate în solul acestui areal sunt: *Dendrobaena octaedra* var. *typica*, *Lumbricus terrestris*, *Eisenia submontana*, *Octolassium lissaense*, *Eiseniella tetraedra typica*, *Lumbricus rubellus*, *Lumbricus castaneus*.*

Cuvinte cheie: lumbricide, diversitatea rămelor, diversitate arboricolă, pădure mixtă de foioase.

INTRODUCTION

Forest ecosystems in our country are changing both, the surface and the age and species composition. And these elements act of the soil characteristics and elements in the soil fauna and vegetation of the upper floors.

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Recording as changes in the structure and density of fauna elements land, air and soil, and mobility of fauna elements (species) that are either forced to restrict their living area or migrate to other locations or expand their occupied areas (K. Chapman et al., 1988).

Regarding the influence of tree species on soil structure and earthworms fauna relatively little known, fact is that both, trees and earthworms be considered ecosystem engineers, and always change their environment (J.P. Curry, 2004).

The structure of earthworm fauna is extremely varied, being determined by the depth to which they are active, and by the feeding type.

There are other group of earthworms with various functions, but equally important in forest soil.

MATERIAL AND METHOD

The location of the study is a forest of deciduous trees on the forest range Rasca, Suceava county , were the dominant species is beech (*Fagus sylvatica*), with ash (*Fraxinus excelsior*) and hornbeam (*Carpinus betulus*), but locally form up to 8-12 species mixtures, which increases the diversity index.

Regions annual average temperature is 8,8° with large variations in summer, and annual rainfall exceeds is 600 l/ sq.

For the collection of biological samples have been previously established four location (marked synthetic L1, L2, L3 and L4), spaced on a circular area of 1 km in diameter, preferred over mixed tree species and soil surface covered by dense herbaceous vegetation (A. Gunn, 1992).

Each of the four location its own structure of trees and herbaceous plants species. The characteristics of the location are presented in table 1.

Table 1

The structure of tree species on the research area

Nr. crt.	Trees species	L1/ specimens	L2 specimens	L3/ specimens	L4/ specimens
1	<i>Fagus sylvatica</i>	2	1	-	2
2	<i>Fraxinus excelsior</i>	1	-	-	1
3	<i>Carpinus betulus</i>	1	1	-	1
4	<i>Quercus robur</i>	-	1	-	-
5	<i>Robinia sp.</i>	-	-	-	1
6	<i>Prunus serotina</i>	-	1	-	-
7	<i>Tilia sp.</i>	-	1	-	-
8	<i>Salix.sp.</i>	-	-	3	-
9	<i>Populus sp.</i>	1	-	1	-
10	<i>Acer sp.</i>	1	-	1	-
	Total species/ location	5	5	3	4
	Total trees / location	6	5	5	5

Each location selected for biological sampling was a circle with 5 m radius, and from each location were taken at 5 soil samples (centre and four directions, as opposed two by two). For biological sampling pits were dug to the size of 40 cm/ 25 cm depth/ width. Sampling of biological material was carried out in four stages, each

to a season (november 2009, april, june and august 2010). Samples were manually sorted, into categories of species (epigeal, endogeal and anecic species), anecic species being extracted from the pit with a 0,33% solution of mustard.

After collecting, species have been identified in the laboratory. After removal of biological material, and to determine existing species, have centralizing the informations, to follow the structure of earthworms in each location and in each season, numerical density evolution of each species depending the season and the changes of climate factors, and the results were compared by season, location and function of the trees species composition in the area.

RESULTS AND DISCUSSIONS

Following the determinations made in the four location (L1, L2, L3, L4) have been identified 12 species of earthworms, 1077 individuals. Of these, six species are present in all locations, and the rest were present, as the case, in at least on.

The structure of the earthworm species determinate in all four area, throughout the entire year of study, is in the table 2.

Table 2

The structure of the earthworm species determinate in all four area

Nr. crt.	Earthworm species	L1/ Total number collected	L2/ Total number collected	L3/ Total number collected	L4/ Total number collected	Total number collected / year	% by Total number collected
1.	<i>Allolobophora caliginosa</i>	28	14	-	-	42	3,80
2.	<i>Allolobophora rosea</i>	23	6	-	12	41	3,70
3.	<i>Octolasion lissaense</i>	-	4	-	-	4	0,30
4.	<i>Eisenia foetida</i>	50	47	49	47	193	17,50
5.	<i>Eisenia submontana</i>	43	32	50	24	129	11,50
6.	<i>Lumbricus terrestris</i>	18	8	4	-	30	2,50
7.	<i>Lumbricus castaneus</i>	45	56	40	36	177	16,00
8.	<i>Lumbricus rubellus</i>	51	47	58	57	213	19,70
9.	<i>Dendrobaena typica</i>	15	1	-	2	18	1,60
10.	<i>Dendrobaena octaedra</i>	5	-	1	-	6	0,50
11.	<i>Dendrobaena rubida</i>	21	21	29	36	107	9,90
12.	<i>Eiseniella tetraedra</i> f. <i>typica</i>	46	60	25	27	158	13,00
	Total number	345	296	256	244	1077	100

The earthworms species collected in each area, during the year were *Eisenia foetida* - 193 individuals; *Eisenia submontana* - 129 individuals; *Lumbricus castaneus f. Typica* - 177 individuals; *Lumbricus rubellus* - 213 individuals; *Dendrobaena rubida*- 107 individuals and *Eiseniella tetraedra typica* - 158 individuals.

The total number of earthworm collected of these species, was 977 individuals, representing 90,71% about total earthworms collected.

Of the four species of earthworms, which recorded a 100% consistency at every location, the dominant species is *Lumbricus rubellus* with 213 individuals, 19,7 of all individuals collected, the second place is *Eisenia foetida* with 193 individuals, 7,5% of all species.

The species with the lowest number of individuals collected, recording accidentally in a single location, was *Octolasion lissaense* with 4 individuals, 0,3% from total collected.

CONCLUSIONS

1. Of the 12 species collected in the research area, only 6 are present in all location , representing over 90% of total, other species are accidental occurrence.

2. By analyzing the density of each species, was seen that the species with high density and present in each location was *Lumbricus rubellus* (19,90 % individuals), followed by *Eisenia foetida* (17,5%).

3. The presence of two species reinforce an area occupied by deciduous trees and herbaceous vegetation, confirmed their preference for rich soil, which is completed by the high numerical density of earthworms of both species.

4. However, both species diversity and density are varied in each location, this phenomenon been explained to varying environmental factors during the year, but also because the composition of trees and herbaceous vegetation.

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RESEARCH ON KNOWLEDGE OF SPECIES OF INSECTS BELONGING USEFUL FAUNA IN SOME CHERRY ORCHARDS FROM IAȘI COUNTY

CERCETĂRI PRIVIND CUNOAȘTEREA SPECIILOR DE INSECTE APARTINÂND FAUNEI UTILE ÎN UNELE PLANTAȚII DE CIREȘ DIN JUDEȚUL IAȘI

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Abstract: Research on knowledge of useful species of insects was took place and during 2010 from Teaching resort „Vasile Adamachi” Iasi, Rediu Farm and at Research and Development Station for Fruit Tree Growing Iasi National Cherry Collection. For catching insects in orchards we chose for two methods: capture using traps soil type Barber method and beating method. During the vegetation at traps type Barber have been collected insects at the following dates: 24.05; 09.06; 22.06; 05.07. Through the beating method have been captured insects on the following dates: 24.05; 09.06; 22.06; 14.07 and 30.07. The most frequently species was: *Forficula auricularia* L., *Brachysomus echinatus*, *Podonta nigrita* F., *Attagenus piceus* Olivier, *Pyrrhocoris apterus* L., *Carabus coriaceus* L., *Chrysopa carnea* Steph., *Coccinella 7 punctata* L., *Halyzia 12 gutatta* and those family belonging: *Formicidae*, *Anyhomyidae*, *Cicadellidae*, *Miridae*, *Lygaeidae*.

Key words: traps soil type Barber, beating method, useful species, *Attagenus piceus*, *Chrysopa carnea*.

Rezumat: Cercetări privind cunoașterea speciilor de insecte utile s-a desfășurat pe parcursul anului 2010 în staționarele: Stațiunea Didactică „Vasile Adamachi” Iași, Ferma Rediu și la Stațiunea de Cercetare Dezvoltare pentru Pomicultură Iași - Colecția Națională de Cireș. Pentru capturarea speciilor de insecte din plantațiile pomicole am optat pentru două metode: metoda capturării cu ajutorul capcanelor de sol de tip Barber și metoda frapajului. Pe parcursul perioadei de vegetație la capcanele de sol de tip Barber s-au făcut colectări la următoarele date calendaristice: 24.05; 09.06; 22.06; 05.07. Prin metoda frapajului s-au capturat insecte a următoarele date: 24.05; 09.06; 22.06; 14.07 și 30.07. Speciile frecvent întâlnite au fost: *Forficula auricularia* L., *Brachysomus echinatus*, *Podonta nigrita* F., *Attagenus piceus* Olivier, *Pyrrhocoris apterus* L., *Carabus coriaceus* L., *Chrysopa carnea* Steph., *Coccinella 7 punctata* L., *Halyzia 12 gutatta* cât și cele aparținând familiilor: *Formicidae*, *Anyhomyidae*, *Cicadellidae*, *Miridae*, *Lygaeidae*.

Cuvinte cheie: capcane de tip Barber, frapaj, entomofaună utilă, *Attagenus piceus*, *Chrysopa carnea*.

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MATERIAL AND METHOD

The research was conducted in 2010 in cherry orchards in Science Teaching Station “Vasile Adamachi”, Rediu Farm and Research and Development Station for Fruit Tree Growing Iasi, National Cherry Collection.

Harvesting of material it was used traps type Barber. Setting traps was installed in mid-May, they worked until the end of July, one six traps for each inpatient. Beting method which consisted of shaking suddenly two branches of 30-50 cm length of 10 trees (Herea Monica et al., 2010).

The research are made to continue in 2009 to establish a structure of parasitic and predatory insect species, and useful depending on the parking surveys were conducted and by default depending on the degree of pollution

From material collected were selected only species belonging useful entomofauna.

RESULTS AND DISCUSSIONS

Results of useful entomofauna centralize represented by parasitic, predatory and indifferent insect species, were met in Science Teaching Station “Vasile Adamachi”, Rediu Farm and Research and Development resort for Fruit tree growing Iasi National Cherry Collection using traps Barber type and beating method. In the “Vasile Adamachi” Iasi Farm from table 1 using traps type Barber from collections we recorded a total of 472 samples belonging to orders Heteroptera, Coleoptera, Hymenoptera, Dermaptera.

Table 1

The situation of trap collections by Barber method of “Vasile Adamachi” farm in 2010

Order	No.	Name of species or a family	Total	Type of fauna
Heteroptera	1	Pentatomiidae	1	Pd
	2	Miridae	3	Pd
Coleoptera	1	<i>Harpalus aeneus</i> L.	3	Pd
	2	<i>Cymindis vaporariorum</i> L.	1	Pd
	3	<i>Olibrus affinis</i> Sturm.	1	Pd
	4	<i>Harpalus distinguendus</i> Duft.	2	Pd
	5	<i>Cymindis humeralis</i> Fouk.	4	Pd
	6	<i>Harpalus calceatus</i> Duft.	1	Pd
	7	<i>Attagenus piceus</i> Olivier	4	Pd
	8	<i>Staphylinus caesareus</i> Cederh	2	Pd
	9	<i>Amara eurynota</i> Duft.	1	Pd
	10	<i>Dromius longiceps</i> Dejean.	3	Pd
Hymenoptera	1	Formicidae	249	Pd
	2	Ichneumonidae	12	Pz
	3	Syrphidae	1	Pz
	4	Apoidea / Apidae	2	U
	5	Encyrtidae	3	Pz
Dermaptera	1	<i>Forficula auricularia</i> L.	15	Pd
	2	Ixodes	1	Pd
	3	Aranea /Araneidae	3	Pd
Total			472	

In the Farm Miroslava Iasi belonging Research and Development Station for Fruit Tree Growing Iasi, National Cherry Collection from table 2 using traps type Barber from collections we recorded a total of 221 samples belonging to orders Hymenoptera, Coleoptera, Heteroptera.

Table 2

The situation of trap collections by Barber method of Miroslava Farm belonging Research and Development Station for Fruit Tree Growing Iasi, National Cherry Collection Iasi in 2010

Order	No.	Name of species or a family	Total	Type of fauna
Hymenoptera	1	Formicidae	183	Pd
	2	Encyrtidae	3	Pz
	3	Ichneumonidae	5	Pz
	4	Chalcididae	2	Pz
	5	Torymidae	1	Pz
	6	Apoidea	3	U
Coleoptera	1	<i>Harpalus distinguendus</i> Duft.	1	Pd
	2	<i>Ontophagus lenur</i> F	1	U
	3	<i>Harpalus tardus</i> Panz	1	Pd
	4	<i>Microlestes minutulus</i> Goeze.	2	Pd
	5	<i>Halyzia 12 gutatta</i> L.	2	Pd
	6	<i>Dermestes lardarius</i> L.	11	Pd
	7	<i>Chalatus fuscipes</i> Goeze	3	Pd
Heteroptera	1	Miridae	3	Pd
Total			221	

Pd- predator species; Pz – parasite species; U - useful species.

Table 3

The situation of trap collections by Barber method of Rediu farm in 2010

Order	No.	Name of species or a family	Total	Type of fauna
Dermaptera	1	<i>Forficula auricularia</i> L.	15	Pd
Hymenoptera	1	Formicidae	149	Pd
	2	Apidae	3	U
	3	Ichneumonidae	13	Pz
	4	Encyrtidae	4	Pz
	5	Omiscidae	12	U
Coleoptera	1	<i>Ontophagus taurus</i> Lat.	14	U
	2	<i>Calathus fuscipes</i> Goeze.	2	Pd
	3	<i>Calathus metallicus</i> Dejean.	1	Pd
	4	<i>Cantharis fusca</i> F.	5	Pd
	6	<i>Harpalus calceatus</i> Duft.	2	Pd
	7	<i>Harpalus aeneus</i> L.	3	Pd
	8	<i>Cymindis humeralis</i> Fourc.	4	Pd
	9	<i>Attagenus piceus</i> Olivier	4	Pd
	10	<i>Amara eurynota</i> Panz.	1	Pd
	11	<i>Dromius longiceps</i> Dejean.	1	Pd
	Heteroptera	1	<i>Pyrrhocoris apterus</i> L.	4
2		Miridae	3	Pd
Acari	1	Aranea	3	Pd
Total			244	

In the Farm Rediu Iasi from table 3 using traps type Barber from collections we recorded a total of 244 samples belonging to orders Dermaptera, Hymenoptera, Coleoptera, Heteroptera and Acari.

The “Vasile Adamachi” Farm from table 4 using the beating method after harvesting we recorded a total of 82 samples belonging to the orders Hymenoptera, Coleoptera, Neuroptera and Dermaptera.

Table 4

The situation of collections by beating method of “Vasile Adamachi” farm in 2010

Order	No.	Name of species or a family	Total	Type of fauna
Hymenoptera	1	Formicidae	25	Pd
	2	Chalcididae	12	Pz
	3	Braconidae	6	Pz
	4	Cynipidae	2	Pz
	5	Encyrtidae	4	Pz
	6	Eulophidae	1	Pz
	7	Pteromalidae	2	Pz
	8	Scelionidae	10	Pz
Coleoptera	1	<i>Cantharis assimilis</i> Payk.	1	Pd
	2	<i>Cartodere elongata</i> Curtis.	1	Pd
	3	<i>Coccinella bipunctata</i> L.	1	Pd
	4	<i>Stethorus punctillum</i> Wiese.	5	Pd
Neuroptera	1	<i>Chrysopa carnea</i> Steph.	9	Pd
Dermaptera	1	<i>Forficula auricularia</i> L.	3	Pd
Total			82	

Pd- predator species; Pz – parasite species; U - useful species.

The Rediu Farm from table 5 using beating method after harvesting we recorded a total of 63 samples belonging to the orders Coleoptera, Hymenoptera, Neuroptera, Dermaptera and Heteroptera.

Table 5

The situation of collections by beating method of Rediu farm in 2010

Order	No.	Name of species or a family	Total	Type of fauna
Coleoptera	1	<i>Cantharis flavipes</i> F.	1	Pd
	2	<i>Cantharis assimilis</i> Payk.	1	Pd
	3	<i>Cartodere elongata</i> Curtis.	1	Pd
	4	<i>Stethorus punctillum</i> Wiese.	4	Pd
Hymenoptera	1	Formicidae	17	Pd
	2	Braconidae	9	Pz
	3	Chalcididae	5	Pz
	4	Cynipidae	2	Pz
	5	Encyrtidae	1	Pz
	6	Eurytomidae	2	Pz
	7	Pteromalidae	3	Pz
	8	Scelionidae	5	Pz
	9	Vespidae	1	U
Neuroptera	1	<i>Chrysopa carnea</i> Steph.	6	Pd
Dermaptera	1	<i>Forficula auricularia</i> L.	1	Pd
Heteroptera	1	Miridae	4	Pd
Total			63	

Pd- predator species; Pz – parasite species; U - useful species.

Miroslava farm belonging to SCDP from table 6 Iasi using the beating method after harvesting we recorded a total of 36 samples representing two orders Coleoptera and Hymenoptera.

Table 6

The situation of collections by beating method of Miroslava farm belonging SCDP Iași in 2010

Order	No.	Name of species or a family	Total	Type of fauna
Coleoptera	1	<i>Stethourus punctilum</i> Wiese.	24	Pd
Hymenoptera	1	Ichneumonidae	2	Pz
	2	Formicidae	2	Pd
	3	Pteromalidae	4	Pz
	4	Scelionidae	4	Pz
Total			36	

Pd- predator species; Pz – parasite species.

It is necessary to fight to be taken into account taxonomy studies (Talmaciu M. et al, 2003) determination of host and parasite species and predators, studies the biology, ecology studies the influence of climate factors, relationships between species attacked and harmful pests and species of parasites, the importance of parasites in limiting pest population.

These studies are offered guided intervention of human, in order to reduce damage and recovery biocenotic balances and observations conducted in the four stationary we noted that all species of insects belonging useful entomofauna 2010 is 1098 samples. The method used traps type Barber amounted to a total of 917 samples (fig. 1) and beating method were collected a total of 181 specimens (fig. 2).

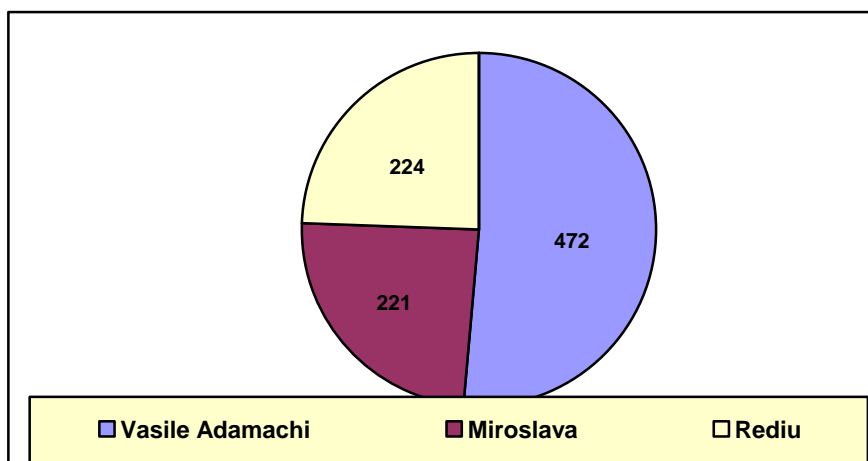


Fig. 1 - The general situation of useful entomofauna collected using traps type Barber in three stationary.

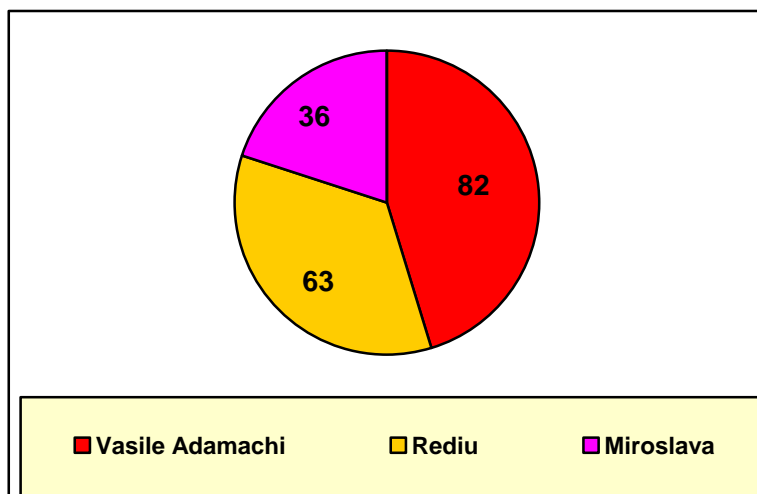


Fig. 2 - The general situation of useful entomofauna collected using beating method in three stationary

From this analysis shows that the number of samples representing useful entomofauna from Barber method is significantly greater than the number of samples collected by beating method.

CONCLUSIONS

1. In the investigated stationary in entomofaunistic terms the useful species have been identified are: Ichneumonidae, Formicidae, Braconidae, Scelionidae, Chalcididae, *Ontophagus taurus*, *Stethourus punctilum*, *Cartodere elongata* Curtis, *Harpalus aeneus* L. *Dermestes lardarius* L., *Forficula auricularia* L..

2. Biodiversity has been most in the “Vasile Adamachi” Farm using Barber method and biodiversity has been the lowest in Miroslava stationary used the beating method in tree crown.

3. Total number of samples of useful species collected by the two methods in the Iasi stationary was 1098 samples.

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OBSERVATION ON USEFUL AND HARMFUL ENTOMOFAUNA WITH PREVENTION AND CONTROL MEASURES APPLIED IN APPLE ORCHARDS FROM IASI AND VASLUI COUNTIES

OBSERVAȚII CU PRIVIRE LA ENTOMOFAUNA UTILĂ ȘI DĂUNĂTOARE CÂT ȘI MĂSURILE DE PREVENIRE ȘI COMBATERE APLICATE ÎN PLANTAȚIILE POMICOLE DE MĂR DIN JUDEȚELE IASI ȘI VASLUI

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Abstract: Observations was made in the fruit farms belonging S.A. Loturi Service S.R.L. Delești, Vaslui country and Vasile Adamachi Iași stationary in May-August 2010. For this it was made regular observations directly on the farm, and is also harvesting samples and evidence using the beating method which were then analyzed in the laboratory. Specify that in the stationary from the "Vasile Adamachi Iași" stationary, samples was collected from a apple orchards were is or not performed chemical and control treatments. The useful species who were reported during observation period was: *Harpalus aeneus*, *Harpalus distinguendus*, *Polydrosus marginatus*, *Cartodere elongata*, *Stethorus punctillum*. The families to belonging the species collected are: *Formicidae*, *Aphididae*, *Tipulidae*, *Miridae*, *Carabidae* ,

Key words: beating method, useful species, *Stethorus punctillum*, *Chrysopa carnea*.

Rezumat: Observațiile au fost efectuate în cadrul fermelor pomicole aparținând S.A. Loturi Service S.R.L. Delești, jud. Vaslui și Fermei „Vasile Adamachi Iași, în perioada mai-august 2010. Pentru aceasta au fost efectuate periodic observații direct pe teren, totodată recoltându-se și probe cu ajutorul metodei frapajului ce au fost apoi analizate în laborator. Menționăm faptul că în cadrul Stațiunii Didactice Vasile Adamachi Iași” recoltarea probelor s-a făcut dintr-o plantație de măr unde nu au fost efectuate tratamente chimice de combatere. Speciile utile semnalizate în perioada de observație au fost: *Harpalus aeneus*, *Harpalus distinguendus*, *Polydrosus marginatus*, *Cartodere elongata*, *Stethorus punctillum*. Familiile la care aparțin speciile colectate sunt: *Formicidae*, *Aphididae*, *Tipulidae*, *Miridae*, *Carabidae* etc.

Cuvinte cheie: frapaj, entomofaună utilă, *Stethorus punctillum*, *Chrysopa carnea*.

MATERIAL AND METHOD

Gathering of the material was made by the beating method (Herea Monica et. al., 2010), from an apple plantation, ecologically sustained and performed chemical control. The observations were made in 2010; the biological material have been

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gathered from May to July. Gathering of the biological material have been done from 8 to 17 days period of time, totally being effectuated a number of 4 gatherings in SC Loturi Service SRL Delesti, Vaslui, and 5 harvesting in Vasile Adamachi Iasi stationary.

RESULTS AND DISCUSSIONS

Totally, in 4 harvesting (table 1) were collected 5 species respectively 9 family (Stănoiu I, Năstase A. 1995), with a total of 56 samples.

-on first harvest on 28.05 I collected a total of 4 species and 6 families with a total all of 25 copies. Among them remember: Aphididae (11 samples), Anthomyidae (4 samples), Cicadelidae, *Polydrosus marginatus* (2 samples).

- the second harvest 15.06 total number of samples of individuals collected was 4, family owned Arachnidae duplicate and duplicate Cecidomyidae family belong.

- the third harvest 08.06 we collected a total of 13 specimens belonging to the order Hymenoptera, Coleoptera order have a samples belonging to, and one belonging to Diptera order.

Table 1

The species of entomofauna gathered, gathering data and the number of exemplars gathered from SC Loturi service SRL Delesti Vaslui in 2010

Data of harvesting	Order	No.	Name of species or family	No.of samples
28.05.2010	Diptera	1	Anthomyidae	4
		2	Chloropidae	1
	Coleoptera	1	<i>Polydrosus marginatus</i>	2
		2	<i>Microspis sedecimpunctata</i>	1
		3	<i>Orchestes pratensis</i>	1
	Hymenoptera	1	Formicidae	1
		2	Pteromalidae	1
	Homoptera	1	Cicadelidae	2
		2	Aphididae	11
	Neuroptera	1	<i>Chrysopa carnea</i>	1
Total			25	
15.06.2010	Arachnida	1	Arachnidae	2
	Diptera	1	Cecidomyidae	2
	Total			4
08.07.2010	Homoptera	1	Cicadelidae	3
		2	Aphididae	10
	Coleoptera	1	<i>Cantharis assimilis</i>	1
	Diptera	1	Chloropidae	1
	Total			15
29.07.2010	Heteroptera	1	Miridae	3
	Homoptera	1	Aphididae	9
	Total			12

- fourth collection 29.07 total was 12 samples, belonging to the families Miridae (3 samples), and Aphididae (9 samples).

Totally, in 5 harvesting (table 2) were collected 5 species respectively 12 family, (Rogojanu V., Perju T., 1979) with a total of 65 samples.

-on first harvest on 05.05 I collected a total samples of 5 families with a total all of 18 samples. Among them remember: Aphididae (13 samples), Lygaeidae (2 samples), and other.

- the second harvest 09.06, total number of samples of individuals collected was 13, they belong to the *Myzus cerasi* species and Chloropidae family.

- the third harvest 24.06, we collected a total of 10 samples belonging to the Hymenoptera, Homoptera and Diptera order.

- fourth collection 14.07, total was 14 samples, belonging to the Tipulidae, Chloropidae, Anthomyidae, Lygaeidae, Formicidae etc.

Tabelul 2

The species of entomofauna gathered, data and the number of exemplars gathered from Vasile Adamachi lasi in plantation chemically treated in 2010

Data of harvesting	Order	No.	Name of species or family	No.of samples
05.05.2010	Heteroptera	1	Lygaeidae	2
	Diptera	1	Tipulidae	1
	Hymenoptera	1	Ichneumonidae	1
	Thysanoptera	1		1
	Homoptera	1	Aphididae	13
	Total		18	
09.06.2010	Homoptera	1	<i>Myzus cerasi</i>	12
	Diptera	1	Chloropidae	1
	Total		13	
24.06.2010	Diptera	1	Anthomyidae	1
	Homoptera	1	Aphididae	6
		2	Cicadelidae	2
	Hymenoptera	1	Pteromalidae	1
	Total		10	
14.07.2010	Diptera	1	Chloropidae	4
		2	Anthomyidae	1
		3	Tipulidae	5
	Heteroptera	1	Lygaeidae	1
	Hymenoptera	1	Formicidae	1
	Coleoptera	1	<i>Coccinella 7 punctata</i>	1
		2	<i>Phyllotreta vittula</i>	1
	Total		14	
30.07.2010	Heteroptera	1	Miridae	4
	Coleoptera	1	<i>Stethourus punctilum</i>	4
	Neuroptera	1	<i>Chrysopa carnea</i>	2
	Total		10	

- the fifth collection the number of samples collected was 10, of which: *Chrysopa carnea*, *Stethourus punctilum*, Miridae.

Totally, in 5 gathering (table 3) were collected 3 species respectively 12 family, with a total of 55 samples.

-on first harvest on 26.05 I collected a total samples of 3 families, and 2 species with a total all of 21 samples. Among them remember Formicidae with 8 samples, Aphididae with 10 samples (Rogojanu V., Perju T., 1979).

- the second harvest 09.06, total number of samples of individuals collected was 14, they belong to the Aphididae, Cicadelidae, Lygaeidae, Tipulidae, Ichneumonidae family.

- the third harvest 22.06, we collected a total of 5 samples belonging to the Hymenoptera, Homoptera and Diptera order.

- fourth collection 14.07, total was 6 samples, belonging to the Tipulidae, Aphididae, Miridae and *Chrysopa carnea* species.

- the fifth collection 30.07 the number of samples collected was 7, of which: *Chrysopa carnea* (1 samples), *Stethorus punctillum* (4 samples) and Miridae (4 samples).

Table 3

The species of entomofauna gathered, gathering data and the number of exemplars gathered from "Vasile Adamachi" lasi in plantation chemically untreated

Data of harvesting	Order	No.	Name of species or family	No.of samples
26.05.2010	Hymenoptera	1	Formicidae	8
	Homoptera	1	Aphididae	10
	Diptera	1	Chloropidae	1
	Neuroptera	1	<i>Chrysopa carnea</i>	1
	Coleoptera	1	<i>Cartodere elongata</i>	1
	Total		21	
09.06.2010	Homoptera	1	Aphididae	8
		2	Cicadelidae	2
	Heteroptera	1	Lygaeidae	1
	Diptera	1	Tipulidae	1
	Hymenoptera	1	Ichneumonidae	1
	Neuroptera	1	<i>Chrysopa carnea</i>	1
	Total		14	
22.06.2010	Homoptera	1	Cicadina	1
		2	Aphididae	1
	Diptera	1	Cecidomyidae	1
		2	Chloropidae	1
	Hymenoptera	1	Ichneumonidae	1
	Total		5	
14.07.2010	Diptera	1	Tipulidae	3
	Homoptera	1	Aphididae	1
	Heteroptera	1	Miridae	1
	Neuroptera	1	<i>Chrysopa carnea</i>	1
		Total		6
30.07.2010	Neuroptera	1	<i>Chrysopa carnea</i>	1
	Coleoptera	1	<i>Stethorus punctillum</i>	4
	Heteroptera	1	Miridae	4
		Total		9

To combat pests and pathogens of apple plantations in both stationary and have applied a series of chemical treatments.

Table 4

The chemical treatment situation applied in 2010 from Delesti Vaslui stationary

No. treatment	Date of application treatment	The product used	The dose used in ha	The amount of water (l)
1	01.04.2010	Sulfomat 80 PU	9 kg	1500
		Sulfat de cupru	15 kg	1500
2	06.04.2010	Confidor oil SC 004	15 l	1500
3	13.04.2010	Sulfomat 80 PU	10 kg	1500
		Cocide (Kosaid)	7 kg	1500
4	24.04.2010	Chorus	0,6 kg	1500
		Dithane	5 kg	1500
		Insegar	1 kg	1500
5	11.05.2010	Score	0,45 l	1500
		Karatezeon	0,45 l	1500
		Merpan	3 kg	1500
		Sulfomat	10 kg	1500
6	15.05.2010	Coragen	0,25 l	1500
		Zato	0,15 kg	1500
		Sulfomat	10 kg	1500
		Cocide (Kosaid)	7 kg	1500
7	06.06.2010	Stroby	0,3 kg	1500
		Actara	0,3 kg	1500
		Magical Wite	4 l	1500
8	05.07.2010	Stroby	0,2 kg	1500
		Coragen	0,27	1500
9	15.07.2010	Insegar	0,5 kg	1500
		Shavit	3 kg	1500
10	28.07.2010	Calypso	0,5 l	1500
		Topsin	1,5 kg	1500

In Delesti Vaslui stationary were applied a total of 10 chemical treatments as follows (table 4): 01.04.; 06.04.; 13.04.; 24.04.; 11.05.; 15.05.; 06.06.; 05.07.; 15.07.; 28.07., and the products used were: Sulfomat 80 PU, Confidor oil SC 004, Cocide, Chorus, Dithane, Insegar, Score, Karate Zeon, Merpan, Coragen, Actara, Magical Wite, Stroby, Insegar, Shavit, Calypso, Topsin.

Table 5

The chemical treatment situation applied in 2010 from Vasile Adamachi Iasi stationary

No. treatment	Date of application treatment	The product used	The dose used in ha	The amount of water (l)
1	07. 04	Bravo Decis WG	2l/ha 50g/ha	1500
2	06.05	Score	0,25 l/ha	1500
		Topas	0,25 l/ha	
		Karate Zeon	0,3 l/ha	
3	16.05	Folicur	0,75 l/ha	1500
		Decis	0,75 l/ha	
4	23.05	Zeama sulficalcica	20l/ha	1500
5	27.05	Score	0,25 l/ha	1500
		Calypso	0,2l/ha	

Table no.5 continued

6	06.06	Folicur Actelic	0,1 l/ha 1,5 l/ha	1500
7	13.06	Clarinet Calypso	1,5 l/ha 0,2 l/ha	1500
8	22.06	Dithane Thiovit Karate zeon	2,5 l/ha 4 kg/ha 0,25 l/ha	1500
9	1.07	Clarinet Calypso	1 l/ha 0,25 l/ha	1500
10	15.07	Clarinet Calipso	1 l/ha 0,25 l/ha	1500

In Vasile Adamachi Iasi stationary were applied a total of 10 chemical treatments as follows (table 5): 07.04, 06.05, 16.05, 23.05, 27.05, 06.06, 13.06, 22.06, 1.07, 15.07, and the products used were: Bravo, Decis WG, Score, Antracol, Calypso, Actelic, Clarinet, Thiovit, Karate Zeon.

The research during 2010, in both stationary were collected a total of 120 samples of insects belonging to a total of 14 families and 9 species (Panin I., 1951; Stănoiu I et Năstase A. 1995). In the two locations where chemical treatments were applied, their number was 10, and was taken into account previously forecast and warning and warning center in each county.

CONCLUSIONS

1. Two or three standing plantations, the method of collecting biological material was performed using the beating method.

2. Delesti Vaslui stationary, collected number was 4, with a total of 56 samples, of which: *Aphididae* (11 samples), *Anthomyidae* (4 samples), *Cicadelidae* and *Polydrosus marginatus* (2 samples).

3. In "Vasile Adamachi" Iasi stationary, chemically treated plantation, the number of samples collected was 65 belonging to a total of 5 species and 12 families, but in plantation chemically untreated, the number of samples collected was 65, belonging to the 12 families and 3 species.

4. For to combat pest and pathogens in both stationary chemically treated, were applied to a total of 10 treatments for each of the two locations.

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RESULTS REGARDING THE INFLUENCE OF CLIMATIC CONDITIONS ON DYNAMICS EVOLUTION OF PATHOGENS IN PLUM CULTURE OF S.C. TERRA VIVA LLC BALS DURING 2007-2009

REZULTATE PRIVIND INFLUENȚA CONDIȚIILOR CLIMATICE ASUPRA DINAMICII EVOLUȚIEI AGENȚILOR PATOGENI DIN CULTURA DE PRUN DIN S.C. TERRA VIVA S.R.L. BALȘ ÎN PERIOADA 2007 – 2009

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Abstract. *The plum alongside the apple is another fruit growing species that prevails in SC Terra Viva LLC Bals, the area occupied by it being 25 ha. Data from the plum plantation checks have revealed pathogen attack: Monilinia Laxa (Aderh et Ruhl.) Honey, Stigmata carpophilla (Lev.) Ellis and Polystigma rubrum (Pers.) D.C. to combat these pathogens in scientific reasoning, warning is a basic measure, most commonly based on the phenological criterion, biological reserve of the pathogen and the evolution of the climate conditions, each climatic factor having a well-established influence on pathogens that affect plant fruit.*

Key words: plum, pathogen attack, dynamics, evolution.

Rezumat. *Prunul, alături de măr, este o altă specie pomicolă care predomină în S.C. Terra Viva S.R.L. Balș, suprafața ocupată de acesta fiind de 25 ha. Datele obținute la controalele efectuate în plantația de prun au evidențiat atacul patogenilor: Monilinia laxa (Aderh et Ruhl.) Honey, Stigmata carpophilla (Lev.) Ellis și Polystigma rubrum (Pers.) D.C. pentru combaterea acestor patogeni în cadrul raționamentului științific, avertizarea este o măsură de bază, ea fiind întemeiată cel mai frecvent pe criteriul fenologic, rezerva biologică a agentului patogen și evoluția condițiilor climatice, fiecare factor climatic având o influență bine determinată asupra agenților patogeni care afectează plantele pomicole.*

Cuvinte cheie: prun, patogen, atac, dinamică, evoluție.

INTRODUCTION

Plum, as well as other fruit species is susceptible to pathogens attack that cause production losses and adversely affect fruit quality which requires the application of prevention and control measures (Mitrea Rodi, 2006). The correct identification of pathogens and establishing of interaction between host biology, pathogen ecology, climatic elements represents a first step in ascertain the most effective prevention and control measures to be applied at some point.

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MATERIAL AND METHOD

The biological material studied was represented by the Angeleno and President plum varieties grown in SC Terra Viva LLC Bals.

The results regarding the spreading and evolution of the main pathogens of plum culture were recorded in the climatic conditions of the years 2007 - 2009 (table 1).

The estimation of the attack made by the reported pathogens was carried out accordingly to the methodologies used in Forecasting and Warning Stations. Thus, frequency (F%), intensity (I%) was established for each pathogen and the (GA%) degree of attack was calculated, the collected data being processed by the usual formulas (Săvescu A., Rafailă C., 1978).

Collecting of data on pathogens attack of plum culture in SC Viva Terra LLC Bals was carried out through surveys, which means the act of observing, counting and analysis of target organs.

RESULTS AND DISCUSSIONS

Alongside temperature, precipitations and relative air humidity are factors whose action directly impacts the dynamics and performance of pathogen infections (Gheorghieș C., Geamăn I., 2003).

Thus, analyzing the evolution of the main pathogens causing damage in plum plantation in SC Terra Viva LLC Bals, in the climatic conditions of the years 2007 - 2009 the following has been established:

Table 1

Climatic elements from the plum growing season, influencing pathogens' attack in S.C. Terra Viva LLC Bals during 2007 -2009

Year	March			April			May			June		
	T ⁰ C	P mm	U %	T ⁰ C	P mm	U %	T ⁰ C	P mm	U %	T ⁰ C	P mm	U %
2007	9,6	49,0	63,5	13,1	2,0	60,2	17,1	97,7	59,6	25,9	14,4	61,2
2008	10,8	17,2	62,7	16,9	73,8	65,1	22,7	37,6	67,5	24,9	65,8	66,3
2009	8,6	52,4	64,7	11,9	13,8	62,7	17,4	28,6	63,7	21,4	170,4	60,0

Year	July			August			September			October		
	T ⁰ C	P mm	U %	T ⁰ C	P mm	U %	T ⁰ C	P mm	U %	T ⁰ C	P mm	U %
2007	26,5	10,8	56,5	24,5	178,2	62,7	17,3	27,6	66,1	13,7	130,2	68,3
2008	25,9	91,2	64,5	25,5	0	61,8	19,7	74,8	64,5	13,8	70,2	74,3
2009	23,9	112,8	66,3	25,1	2,6	65,5	22,5	21,8	64,9	13,9	126,0	73,4

For the *Monilinia laxa* pathogen, which spreads through conidia, which germinate and produce infections within wide temperature range (0 to 25⁰C) and frequent precipitations (Tomșă M., Tomșă Elena, 2003), the Agro Expert System of Olt Phytosanitary Unit has advised the application of some treatments at different times in relation to climatic changes.

In the year 2007, the first treatment was advised on March the 15th when the trees were in green button phenological stage and when, as a result of the rainfall, the conditions have become favourable for the attack.

Treatment two was advised on the 22nd March, when the plum was in the phenological stage of "white button" - the opening of the first flowers.

Treatment three was advised on April the 5th, when 15 - 20% flowers had fallen petals.

In the subsequent phenophases, of fruit formation, another treatment was advised, as a result of May rainfalls. In this year's plum crop in S.C. Terra Viva LLC Bals, there was a weak pathogen attack (table 2). In the year 2008, the conditions for the installing of primary infections were recorded on the 14th of March, the environmental conditions being similar to those recorded in 2007. For the second treatment, the Agro Expert station has warned about the presence of favourable conditions on the 21st of March, thus recommending the implementation of this treatment at 7 days after the first one.

When 15-20% of the flowers had fallen petals namely on the 8th of April, the third treatment was advised, in the fruit formation phenophase as a result of low rainfall no other treatment has been advised, the year 2008 being a dry year, unfavourable for the attack of the *Monilinia laxa* fungus. The attack recorded this year was a weak one (table 2).

In the climatic conditions of the 2009 spring, the first treatment was advised in SC Terra Viva LLC Bals on 31st of March in order to fight the *Monilinia laxa* pathogen, recommending the treatment to be carried out in 2-3 days. Treatment two was advised in the phenological stage of "white button" that corresponded to the date of April the 6th. Treatment three was warned on April the 13th, when the flowers had shaken petals on a ratio of 15-20%.

This year, due to the small amounts of precipitation fallen in spring months, the attack produced by the *Monilinia laxa* fungus can be placed in the category of a weak attack (table 2).

Table 2

Dynamics of the attack produced by *Monilinia laxa* in plum culture of SC Terra Viva LLC Bals, in the period 2007 – 2009

Year	F%	I%	GA%	%	Differences	Significance
2007	40,5	12,2	4,9	144,1	1,5	xx
2008	34,8	10,6	3,7	108,8	0,3	
2009	20,3	8,4	1,7	50	-1,7	00
Average / 3 years	31,8	10,4	3,4	100	-	-

DL 5% = 0,1

DL 1% = 1,2

DL 0,1 = 2,4

As seen from the data given in table 2, regarding the attack of the *Monilinia laxa* fungus, the latter has recorded values oscillating between 1,7% in 2009 and respectively 4,9% in 2007.

The differences from the three-year average, taken as witness, were statistically ensured as significantly distinct positive for the year 2007 and respectively significantly distinct reduced for 2009.

For the *Stigmina carpophilla* pathogen, in springs with high humidity, when the temperature is above 20°C, the fungus' resistance mycelium becomes active by forming conidiophores with conidia, which provide the pathogen spread throughout the growing season. Thus, the presence of the infection source throughout the plum growing season, results in the warning of a large number of treatments, except for the dry years.

As a result, for the *Stigmina carpophilla* pathogen the Agro Expert System has warned the application of some preventive treatments according to the year of culture.

In the 2007 climatic conditions, the treatments to combat the *Stigmina carpophilla* fungus the following phenological phases have been advised:

Treatment one at buds before the flowering, the second decade of March.

Treatment two at the end of the flowering, in the second decade of April.

Treatment three when fruits have normal size, in the second decade of June (the 22nd of June).

The 2008 climatic conditions were similar to those of 2007. The summers were dry, with days when there were frequently temperatures that exceed the biological threshold of 34,5°C.

To combat the *Stigmina carpophilla* fungus, as in happened in 2007, 3 treatments have been advised at the same phenological stages.

For the year 2009 two treatments have been advised to combat the *Stigmina carpophilla* pathogen, namely:

- Treatment one at buds, before the flowering;

- Treatment two at the end of the flowering.

The dynamics of the attack produced by *Stigmina carpophilla* during 2007 - 2009 is presented in table 3.

Table 3

Dynamics of the attack produced by *Stigmina carpophilla* in plum culture of SC Terra Viva LLC Bals, in the period 2007 – 2009

Year	F%	1%	GA%	%	Differences	Significance
2007	26,6	5,3	1,4	70	-0,6	-
2008	30,3	6,7	2,0	100	0	-
2009	46,8	7,8	3,7	185	1,7	x
Average / 3	34,6	6,6	2,0	100	-	-

DL 5% = 1,4

DL 1% = 2,6

DL 0,1% = 3,4

The notation of frequency and intensity of the attack on the leaves was carried out in the field, and the degree of attack was calculated in the laboratory.

Data analysis written in table 3, show that the highest value of the degree

of attack was recorded in 2009 (GA% = 3,7%), year in which the difference from the variants' average taken as witness was statistically ensured as significantly positive.

At the *Polystigma rubrum* fungus, the projection of the ascospores providing primary infections is possible after heavy rains, that occur after tree leafing and the temperature has influence on the incubation period, which is long, ranging between 16 to 31 days. Therefore, for this pathogen, for the plum culture in SC Terra Viva LLC Bals, the Agro Station Expert advised the application of 4-5 treatments at different times in relation to the climatic changes, during 2007 - 2009.

Thus, for the *Polystigma rubrum* pathogen, the 2007 climatic conditions allowed the warning to five preventive treatments to the next application times:

- treatment one, when 15-20% of the flower petals were shaken (April the 5th);
- treatment two, on the April the 24th;
- treatment three, on May the 14th;
- treatment four, on June the 2nd;
- treatment five, on June the 6th.

In the climatic conditions of the year 2008, following treatments were advised in order to prevent the attack of the *Polystigma rubrum* pathogen:

- treatment one when 15-20% of the flowers have fallen petals (April 8th);
- treatment two, on 14th May;
- treatment three, on 23rd May;
- treatment four, on 13th June.

In the climatic conditions of the year 2009, for the plum culture in SC Terra Viva LLC Bals four prevention treatments were advised, as follows:

- treatment one , on 14th May;
- treatment two, on 22nd May;
- treatment three, on 12th June;
- treatment four, on 24th June.

The centralization of data related to the attack of the *Polystigma rubrum* fungus in plum culture of SC Terra Viva LLC Bals are presented in table 4.

Table 4

Dynamics of the attack produced by *Polystigma rubrum* in plum culture of SC Terra Viva LLC Bals, in the period 2007 – 2009

Year	F%	1%	GA%	%	Differences	Significance
2007	24,2	2,6	0,6	50	-0,6	-
2008	30,4	4,6	1,3	108,3	0,1	-
2009	32,1	5,8	1,9	158,3	0,7	-
Average	28,9	4,3	1,2	100	-	-

DL 5%-0,9

DL 1%=1,4

DL 0,1% = 2,7

The analysis of data recorded in table 4, shows that regarding the attack of the *Polystigma rubrum* pathogen the lowest values of the degree of attack occurred in 2007 (0,6%) and in 2008 (1,3%). In the three years studied, the differences from the average of the years taken as a witness were not ensured in terms of statistics.

CONCLUSIONS

1. In the plum culture from the SC Terra Viva LLC Bals the simultaneous attack of pathogens *Monilinia laxa* (Aderh et Ruhl.) Honey, *Stigmata carpophilla* (Lev.) Ellis and *Polystigma rubrum* (Pers.) D.C. has occurred during 2007 – 2009.

2. For fungi reported in the period under review, 3-5 treatments were advised depending on the pathogen's ecobiology, plum's phenology, and the changing of climate conditions.

3. As regarding the *Monilinia laxa* pathogen, in the period under study, the attack on the fruit showed values between 1,7 – 4,9% while for the *Stigmata carpophilla* the value of the degree of attack on leaves fluctuated between 1,4 – 3,7% and for *Polystigma rubra* from 0,6 to 1,9%.

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THE EFFICACY OF SOME PESTICIDE COMPLEXES IN CONTROLLING APRICOT TREE CULTURE SPECIFIC PATHOGEN AGENTS IN S.C. TERRA VIVA S.R.L. BALS DURING 2007-2009

EFICACITATEA UNOR COMPLEXE DE PESTICIDE ÎN COMBATAREA AGENȚILOR PATOGENI SPECIFICI CULTURII DE CAIS DIN S.C. TERRA VIVA S.R.L. BALȘ ÎN PERIOADA 2007-2009

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Abstract. Long time experience in controlling pathogen agents and animal pests in fruit growing sector led to a multitude of studies that tried to elucidate different aspects imposed by the fruit growing cultures pedoclimatic conditions, as well as, the biological efficacy of different plant protection products during their use in time. In this context, on the knowledge of the pesticide range used in controlling pests in apricot tree cultures, we have aimed to observe, in specific production conditions, the biological efficacy of the main active substances used in controlling apricot tree specific pests.

Key words: apricot tree, pathogen, attack, pesticide, efficacy

Rezumat. Experiența îndelungată în combaterea agenților patogeni și a dăunătorilor animalii în sectorul pomicol a indus efectuarea unei multitudini de studii prin care s-a încercat să se elucideze diferite aspecte impuse de condițiile pedoclimatice ale plantațiilor pomicole, dar și de eficacitatea biologică a diverselor produse de protecție a plantelor în decursul folosirii lor în timp. În acest context, pe baza cunoașterii gamei de pesticide utilizate în combaterea agenților de dăunare din cultura de cais, ne-am propus să urmărim, în condiții specifice de producție, eficacitatea biologică a principalelor substanțe active folosite în combaterea organismelor dăunătoare specifice acestei specii pomicole.

Cuvinte cheie: cais, patogen, atac, pesticide, eficacitate

INTRODUCTION

A difficult problem of contemporary fruit growing, with a tendency to increase in the near future, is represented by the sensibility of cultured species to pathogen agents and animal specific pests (Murg Silvia, Ilie Cornelia, Știrbu Patricia, 2006). Preventing the damage caused by pest agents specific to apricot tree culture implies using expensive treatments representing, therefore, a significant part of the production costs (Tomșa M., Tomșa Elena, 2003). Nevertheless, protecting apricot tree cultures against diseases and animal pests with Romanian current pesticides is a necessity, no other method being able to guaranty both the quantitative and qualitative safety production (Oroian I., Porca Monica, Oltean I., Șerba I., 2003).

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MATERIAL AND METHOD

The research was conducted on Portici apricot variety, newly introduced in culture in SC Terra Viva SRL Bals. In order to establish the health status of the crop we have considered the following pests: *Plumpox virus*, *Podosphaera tridactyla*, *Monilinia laxa*, *Stigmia carpophilla*, *Quadraspidiotus perniciosus*, *Hyphantria cunea*, teranychid mites.

Depending on the medium values of the attack degree (A D%), these were classified into: Low attack degree – A D%=1-10%; Medium attack degree– A D=10-20%;High attack degree – A D=20-30%;Very high attack degree – A D>30% (Simeria Gh., Pîrșan P., Damianov Snejana, 2007). In controlling pests, in specific production conditions, we used two treatment schemes (variants). Variant 1: an annual treatment scheme that used fungicides with mainly surface action, excepting safety treatments (table 1). Variant 2: an annual treatment scheme that used fungicides with mainly systemic action (table 2). Each variant consisted in a number of 5 apricot trees, experiences being set up in randomized blocks. Data collection was made on five trees establish in each variant for every repetition. During the research period were conducted in the orchard macroscopic controls and in laboratory microscopic controls before and after treatments. For comparison of experimental results has been taken as a control variant the average of the variants. This choice was based on the fact that apricots can't be grown without phytosanitary protection, setting a variant without treatment was impossible and in addition, other variants would be come out significant, affecting results.

RESULTS AND DISCUSSIONS

Apricot is another stone fruits species, grown in SC Terra Viva SRL Bals. Like all fruit species, apricot is attacked by a number of pest agents, for which we carried out controls on the 756 existing trees in the orchard.

If the case of *Monilinia laxa* attack was found that 300 of the 756 control trees had not presented any attack symptom representing a rate of 39.6%. A percentage of 60.4% from the trees presented a weak attack, and no tree has not presented a medium or powerful attack. The attack of the *Stigmia carpophilla* fungus has been signaled at all controlled trees, from which 694 trees presented weak attacks, and 62 trees were recorded with medium attack. Regarding the pest attack, analyzed trees had presented week attacks produced by: *Quadraspidiotus perniciosus*, *Hyphantria cunea* and tetranychids mites. Of the 756 controlled trees, 33 trees, representing a rate of 4.4% presented symptoms of tetranychids mites attack, 24 representing a rate of 3.2% presented symptoms of *Quadraspidiotus perniciosus* attack, while 15 trees, representing a rate of only 2.0% presented symptoms of *Hyphantria cunea* attack.

The data listed in table 3 shows that in the apricot orchard of SC Terra Viva SRL Bals during 2007 to 2009 the majority of harmful agents have registered weak attacks, and for pathogens *Plum pox virus* and *Podosphaera tridactyla*, the attack was not reported. During the period under study has been followed the biological action of a complex of pesticides (table 2 and 3) used in controlling the "key" disease reported. For *Monilinia laxa* were made observations regarding the degree of attack on fruits and shoots.

Regarding the attack degree on fruits the results presented in table 4 were obtained from the analysis in the field of 250 fruits/variant. Interpreting the collected data showed that the apricot Portici variety from SC Terra Viva Portici SRL Bals, the degree of attack on fruits has recorded low values especially in the use of fungicides with predominantly systemic action. Low value of the attack degree at the variant 1 where there were used it mainly products with surface action is explained by the fact that at critical moments to apricot at the attack of the fungus *Monilinia laxa* were used systemic products.

Table 1

Variant I – treatment scheme with products used for controlling harmful agents in the apricot orchard

Nr.	Phenologic phase	Agent	Commercial name of product	Active substance	Dose kg, 1 / ha conc. %	Observations
1	White button	<i>Monilinia laxa Stigmia carpophilla</i>	Funguran OH 50 WP	Metallic copper 50%	0,065	Treatment performed at phenological stage (March - decade 3)
2	15-20% of flowers has fallen petals	<i>Monilinia laxa Stigmia carpophilla</i> <i>Anarsia lineatella Grapholita molesta</i> Aphids	Sumilex 50 PU Calypso480SC	procimidon tiacloprid 480 g/1	0,1 0,02	The most important treatment for combating moniliosys Treatment performed at phenophase (April - decade 1)
3	Complete fallen of petals	<i>Monilinia laxa Stigmia carpophilla</i> Defoliation insects, aphids, moths, mites	Merpan 80 WDG Decis 2,5 CE	captadin 80% deltametrin 25 g/1	0,25	Treatment runs phenological, complexed (April - decade 2 and 3)
4	Fruits as a peanuts size	<i>Monilinia laxa Stigmia carpophilla</i> Aphids, Defoliation insects	Dithane M 45 Reldan 40 EC	mancozeb 80% clorpirifos metil	0,2 0,15	Treatment runs phenological, complexed (May – decade 1 and 2)
5	Fruits with diameter of 1,5 -2 cm	<i>Monilinia laxa Stigmia carpophilla</i> <i>Anarsia lineatella Grapholita molesta</i> , aphids, mites	Bravo 500 SC Decis 2,5 CE	clorotalonil deltametrin 25 g/1	0,15 0,01	Treatment phenological runs, complexed with the treatment to control <i>Anarsia lineatella</i> - first treatment generation I (June - decade 2)
6	Normal fruits before ripening	<i>Monilinia laxa, Stigmia carpophilla</i> San Jose scale, Aphids, Defoliation insects	Teldor 500 SC Talstar 10 EC	fenhexamid bifentrin	0,08 0,2	Treatment phenological runs, complexed with the treatment to control <i>Anarsia lineatella</i> - second treatment generation I (July - decade 3)
7	After harvest	<i>Monilinia laxa, Stigmia carpophilla</i> , <i>Anarsia lineatella, Grapholita molesta</i> , Aphids, mites, San Jose scale	Funguran OH 50 WP Decis 25 WG	Metallic copper 50% deltametrin 25 g/1	0,065 0,003	Treatment phenological runs, complexed with the treatment to control <i>Anarsia lineatella</i> - first treatment generation II (August - decade 1)
8	75% of leaves fallen	<i>Monilinia laxa</i> <i>Stigmia carpophilla</i>	Bordelaise solution	Metallic copper as CuSO ₄ neutralized	0,5	The treatment is performed during vegetative rest period

Table 2

Variant II – treatment scheme with products used for controlling harmful agents in the apricot orchard

Nr.	Phenologic phase	Agent	Commercial name of product	Active substance	Dose kg, 1/ha conc. %	Observations
1	White button	<i>Monilinia laxa Stigmia carpophilla</i>	Sumilex	procimidon	0,1	Treatment performed at phenological stage (March - decade 3)
2	15-20% of flowers has fallen petals	<i>Monilinia laxa Stigmia carpophilla Anarsia lineatella Grapholita molesta</i> Aphids	Teldor 500 SC Calypso 480 SC	fenhexamid tiacloprid 480 g/1	0,08 0,02	The most important treatment for combating moniliosys Treatment performed at phenophase (April - decade 1)
3	Complete fallen of petals	<i>Monilinia laxa Stigmia carpophilla</i> Defoliation insects, aphids,	Topsin 70 PU Talstar 10 EC	tiofanat metil bifentrin	0,07 0,2	Treatment runs phenological, complexed (April - decade 2 and 3)
4	Fruits as a peanuts size	<i>Monilinia laxa Stigmia carpophilla</i> Aphids, Defoliation insects	Dithane M 45 Sinoratox 35 CE	mancozeb 80% dimetoat	0,2 0,1	Treatment runs phenological, complexed (May – decade 1 and 2)
5	Fruits with diameter of 1,5 -2 cm	<i>Monilinia laxa Stigmia carpophilla Anarsia lineatella Grapholita molesta</i> , aphids, mites	Teldor 500 SC Decis 2,5 CE	fenhexamid deltametrin 25 g/1	0,08 0,01	Treatment phenological runs, complexed with the treatment to control <i>Anarsia lineatella</i> - first treatment generation I (June - decade 2)
6	Normal fruits before ripening	<i>Monilinia laxa, Stigmia carpophilla</i> , San Jose scale, Aphids, Defoliation insects	Rovral 50 WP Calypso 480 SC	iprodione tiacloprid 480 g/1	0,1 0,02	Treatment phenological runs, complexed with the treatment to control <i>Anarsia lineatella</i> - second treatment generation I (July - decade 3)
7	After harvest	<i>Monilinia laxa, Stigmia carpophilla, Anarsia lineatella, Grapholita molesta</i> , Aphids, mites, San Jose scale	Dithane M 45 Fastac 10 EC	mancozeb, alfa - cipermetrin	0,2 0,015	Treatment phenological runs, complexed with the treatment to control <i>Anarsia lineatella</i> - first treatment generation II (August - decade 1)
8	75% of leaves fallen	<i>Monilinia laxa Stigmia carpophilla</i>	Champion 50 WP	Metallic copper as CuSO ₄ neutralized	0,3	The treatment is performed during vegetative rest period

Table 3

Phytosanitary status of apricot crop from SC Terra Viva SRL Balș during 2007 – 2009

Harmful agent	Nr. trees	Nr. Controlled trees	Nr. Trees without attack	%	Nr. Trees with attack	%	Nr. Trees with low attack	%	Nr. Trees with medium attack	%	Nr. Trees with high attack	%	Nr. Trees with very high attack	%
<i>Plum pox virus</i>	756	756	756	100	0	0	0	0	0	0	0	0	0	0
<i>Podosphaera tridactyla</i>	756	756	756	100	0	0	0	0	0	0	0	0	0	0
<i>Monilinia laxa</i>	756	756	300	39,6	456	60,4	456	60,4	0	0	0	0	0	0
<i>Stigmina carpophylla</i>	756	756	0	0	756	100	694	91,8	62	8,2	0	0	0	0
<i>Quadraspidiotus perniciosus</i>	756	756	732	96,8	24	3,2	24	3,2	0	0	0	0	0	0
<i>Hyphantria cunea</i>	756	756	741	98,0	15	2,0	15	2,0	0	0	0	0	0	0
<i>Tetranychids mites</i>	756	756	723	95,6	33	4,4	33	4,4	0	0	0	0	0	0

Table 4

Monilinia laxa — attack degree on fruits during 2007 – 2009

Variant	Attack degree %	%	Differences	Signification
V ₁	2,2	146,6	0,7	-
V ₂	0,9	60	-0,6	-
Variants average	1,5	100	-	-

DL 5% = 0,9

DL 1% = 1,4

DL 0,1% = 2,6

It has taken this choice, because in the studied years pathogen infection pressure was high, so use a product contact could lead to impairment of production.

Regarding the attack frequency on shoots, as seen in table 5, it fluctuated between 2.2% at V₂ variant respectively 3.4%, at V₁ variant. Low values of the attack degree following the application of the two treatment scheme guarantee that the mycelium fungus has not infiltrated the skeleton branches, being known the severity of the disease at apricot in case of a strong attack. For pathogen *Stigmia carpophilla* observations were made on the attack degree on the leaves. From the analysis results shown in table 6 is observed that the attack degree of the pathogen showed similar values in the two variants, the difference from the variants average taken as a witness is statistically ensured.

Table 5

Monilinia laxa – attack frequency on shoots during 2007 – 2009

Variant	Attack frequency %	%	Diferences	Signification
V ₁	3,4	121,4	0,6	-
V ₂	2,2	78,6	-0,6	-
Variant average	2,8	100	-	-

DL 5% = 1,2 DL 1% = 2,5 DL 0,1% = 2,9

Table 6

Stigmia carpophilla – the attack degree on the leaves during 2007 – 2009

Variant	Attack degree %	%	Diferences	Signification
V ₁	2,8	116,6	0,4	-
V ₂	2,0	83,3	0,4	-
Average variant	2,4	100	-	-

DL 5% = 1,5 DL 1% = 2,3 DL 0,1% = 2,8

CONCLUSIONS

1. In the apricot orchard the pathogen whose attack is met with greater frequency and intensity is *Monilinia laxa*. At this pathogen attack on fruits showed higher values than attack on shoots, regardless of the variant.

2. In the apricot crop, regardless of treatment scheme has been recorded a weak attack of the *Stigmia carpophilla* fungus, another pathogen that can cause crop losses of apricot orchards unprotected in terms of phytosanitary.

3. Based on the results, one can say that for the culture of apricot can be used successfully one of the tested variants, but noting that at the critical moments for apricots, should be used a systemic product to achieve safety.

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COMMENTS ON CADMIUM AND LEAD CONCENTRATION IN SOME PLANTS AND FEED PRODUCTS FROM IASI AREA

OBSERVAȚII PRIVIND CONCENTRAREA CADMIULUI ȘI PLUMBULUI ÎN UNELE PLANTE ȘI PRODUSE FURAJERE DIN ZONA IAȘULUI

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Abstract. *Agricultural land pollution induces contaminants accumulation and determine the conversion to risk for food safety hazard. This paper presents results on lead and cadmium concentration in fodder and feed derived plant determined by SAA as part of a research project that proposes monitoring food safety in Iasi area for the whole circuit soil-plant-animal. Investigation was focused both on the area of a farm situated on the outskirts of Iasi, near the plant that provides heat for the city and on that of a farm located about 100 km from Iasi. Cadmium concentration ranged from 15.76 to 270.38ppb, below the maximum allowed limit (1000ppb) while lead content ranged from 304.06 to 893.78ppb, very significantly lower ($p < 0.001$) compared to maximum allowed concentration (10000ppb) according legislation. Monitoring cadmium and lead concentrations allowed to appreciate the forage capacity to translocate and accumulate contaminants depending on variety, soil type, climate and distance from the source that generates pollution.*

Key words: Cadmium and lead concentrations, feed plant, Iași

Rezumat. *Poluarea solurilor agricole induce acumularea contaminanților și determină transformarea pericolului în risc pentru siguranța alimentului. Lucrarea prezintă rezultatele determinării concentrației plumbului și cadmiului în plante furajere și furaje derivate prin SAA ca parte componentă a unui proiect de cercetare ce propune monitorizarea siguranței alimentului în zona Iașului pentru întreg circuitul sol-plantă-animal. Investigațiile au vizat arealul unei ferme situată la periferia Iașului, în vecinătatea centralei ce furnizează agentul termic pentru oraș, respectiv al unei ferme situată la aproximativ 100 km de Iași. Concentrația cadmiului a variat între 15,76-270,38 ppb, sub limita maximă admisă (1000ppb), iar conținutul în plumb a variat între 304,06-893,78 ppb, fiind foarte semnificativ scăzut ($p < 0,001$) comparativ cu concentrația maxim admisă (10000 ppb) de legislația în vigoare. Monitorizarea concentrației cadmiului și plumbului a permis aprecierea capacității plantelor furajere de a transloca și acumula contaminanții în funcție de soi, tipul de sol, factorii climatici respectiv distanța față de sursa care generează poluare.*

Cuvinte cheie: cadmiu, plumb, plante furajere, Iași

INTRODUCTION

Agricultural soil and water pollution is the main reason that induces accumulation of various toxic metals (Gomes C. et al., 2007, Pârnu Gh., 1992, Vries W.

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et al., 2007) and convert the danger in food safety risk. This paper aims to determine Pb and Cd concentrations in various plant and derived feed by AAS method as part of the food chain circuit monitoring soil-plant-animal in the Iasi area.

MATERIAL AND METHOD

Feed samples were collected from two farms, drive D (dairy farm) located on the outskirts of Iasi, near the plant that provides heat for the city and drive R (sheep farm) located about 100 km from Iasi. Samples from 1 to 12 are from farm D and 13 to 23 are from farm R. The cadmium and lead concentration were expressed in ppb (mg Cd/kg, or mg Pb/kg,)

RESULTS AND DISCUSSIONS

Cadmium and lead content in analyzed feed samples are shown in table 1.

Table 1

Mean Cd and Pb concentrations(ppb) in feed samples from farm D

Crt Nr.	Sample	Cd	Pb
		Max. 1000 ppb	Max. 10000 ppb
1	Corn silage(Aron Vodă Area)	24.25	572.86
2	Corn silage(Securitate Area)	15.76	607.73
3	Grass Sudan(Chirița Area)	83.25	430.32
4	Green soybean(Securitate Area)	46.39	378.46
5	Prepared corn sillage(Farm, platform)	67.88	517.93
6	Alfalfa, 3rd harverst (Aron Vodă Area)	40.47	536.63
7	Green alfalfa(Bazin Area)	45.88	503.04
8	Corn grains	99.45	415.05
9	Silage (grasses 20% leguminouses 80%)	60.55	511.44
10	Alfalfa hay wrapped	45.72	433.47
11	Hay wrapped	130.98	572.37
12	Barley straw	171.63	893.78
13	Green corn silage (Canal 2 Area)	33.00	403.15
14	Green corn silage -(Cotul Beșlegii Area)	36.78	393.93
15	Green alfalfa 3 harverst (Pump station Area)	103.71	289.44
16	Green alfalfa 1 harverst-(Pump station Area)	88.27	347.97
17	Alfalfa hay-Botoșani, 2007	95.42	304.06
18	Alfalfa hay-2007	80.50	481.68
19	Hay , 2007	56.58	483.54
20	Hay, 2006	234.65	382.12
21	Bramus hay, 2007	37.24	428.63
22	Corn silage, 2006	149.35	560.26
23	Complex (flour+bran+sunflower meal)	270.38	861.55

Analysis of the data presented in table 1 showed cadmium concentrations below the maximum (1000 ppb) allowed according legislation in force (***, 2002) with variations between 15.76 to 270.38 ppb. Lead content in the feed samples analyzed ranged from 304.06 to 893.78 ppb, complying with legal norms (***, 2002) to admit a maximum of 10 000 ppb Pb. Interpretation of the results showed a 30% maximum accumulation of cadmium and lead up to 8% of the maximum allowed level (MAL) under current legislation.

Table2

Feed with high content of cadmium and lead				
Nr. crt.	Metal	Concentration Level	Percent of feed sample	Feed type
1	Cd	Cd concentration 15-30% MAL (1000 ppb)	13%	Straw barley Hay 2006 Complex (flour+bran+sunflower meal)
2	Pb	Pb concentration 8-10%MAL (10000 ppb)	8.7%	Straw barley Complex (flour+bran+sunflower meal)

The results in table 2 shows that 87% of the feed samples analyzed present a cadmium concentration below 15% of the maximum permissible and 13% of the feed samples analyzed show a concentration of cadmium between 15-30% of the maximum permissible. In the case of lead, 91.3% of the samples shows a concentration of up to 6% of the maximum permissible, and 8.7% of feed samples analyzed show a concentration of lead of 6-8% of the maximum permissible.

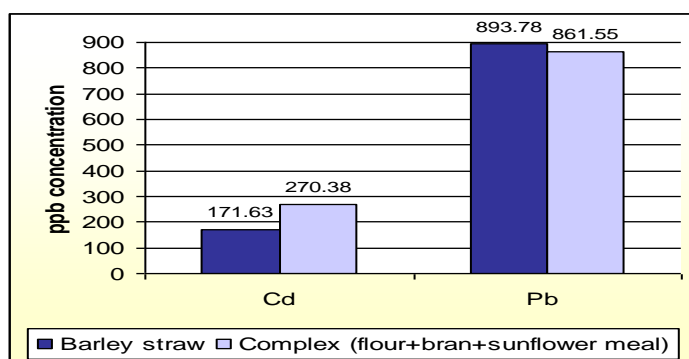


Fig. 2 - Concentration level in the feed samples with high contents of cadmium and lead

There is significant by simultaneous concentration of cadmium and lead (fig. 2) samples of barley straw and complex meal (mixed bran, meal, flower), which highlights the increased capacity of these feed plants to translocate and accumulate contaminants from the soil. Diversity of forage samples collected and analyzed induced a large number of variable factors considered difficult to perform statistical analysis To ensure correct interpretation of data, statistically Student t test calculation took into account the feed taken from the two farms, derived from corn and alfalfa.

Table3

Cadmium and lead concentration in feed derived from corn			
Nr crt	Proba	Cd	Pb
		Max. 1000 ppb	Max. 10000 ppb
1	Corn green silage,D	34,89±1.33	590,29±24.65
2	Corn green silage,R	20,00±6.00	398,54±6.51
3	Corn silage,D	149.35±10.2	560.26±117.4
4	Corn silage, R	67.88±4.4	517.93±62.0
5	Corn, grains, D	99.45±9.0	415.05±32.2
6	Corn, grains, R	72.21±6.6	464.52±40.4

According to data from table 3 the significant concentration ($p < 0.01$) of cadmium and lead in the samples (corn silage and corn green silage) from farm D can be due to noxious pollutants resulted from burning fuel to produce heat, a conclusion supported by other similar studies (Avarvarei I. et al., 2010, Kirkham M., 2006).

Table 4

Crt Nr	Sample	Cd	Pb
		Max. 1000 ppb	Max. 10000 ppb
1	Green lucerne ,D	95,99±10.91	519,835±23.75
2	Green alfalfa,R	43,175±1.91	318,705±41.38
3	Alfalfa hay,D	80.50±6.2	481.68±37.4
4	Alfalfa hay, R	45.72±4.0	433.47±32.2
5	Hay, D	130.98±7.3	572.37±34.0
6	Hay, R	46,91±4.4	456,08±40.2

High concentrations (table 4) showed feed derived from alfalfa (green alfalfa, hay and naturally alfalfa hay)- highly statistically significant ($p < 0.001$) respectively for cadmium and statistically significant ($p < 0.01$) for lead (green alfalfa hay and naturally alfalfa hay) in case of the samples from the farm D compared with the samples from farm R.

CONCLUSIONS

1. Investigations were conducted to measure cadmium and lead content in various feed plants in order to assess the ability of forage plants translocated and accumulate contaminants depending on variety, soil type, climate, distance from that area of industry that generates pollution.

2. Cadmium concentration in the analyzed feed samples was below the maximum (1000ppb) permitted limit by current legislation, with variations ranging from 15.76 to 270.38 ppb.

3. Lead content in the analyzed feed samples ranged from 304.06 to 893.78 ppb and was according to legal rules that allowed a maximum of 10 000 ppb .

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THE BEHAVIOUR IN CROP CONDITIONS OF SOME ORNAMENTAL SPONTANEOUS SPECIES

COMPORTAREA ÎN CONDIȚII DE CULTURĂ A UNOR SPECII ORNAMENTALE SPONTANE

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Abstract. This case of study presents results of research on culture resilience and decorative value of four identified taxa from the spontaneous flora of the NE Romania (*Asarum europaeum*, *Lathyrus vernus*, *Lithospermum purpureocoeruleum*, *Telekia speciosa*). Experimental fields were organized in teaching collection of Floriculture discipline from USAMV Iasi. Results showed a good adaptability of the species under "ex situ" conditions and the maintaining of the ornamental character identified in the natural habitat.

Key words: „ex situ” adaptability, *Asarum*, *Lathyrus*, *Lithospermum*, *Telekia*.

Rezumat. În lucrare sunt prezentate rezultatele cercetărilor privind capacitatea de adaptare în cultură și valoarea decorativă a patru taxoni identificați în flora spontană din zona de NE a României (*Asarum europaeum*, *Lathyrus vernus*, *Lithospermum purpureocoeruleum*, *Telekia speciosa*). Câmpurile experimentale au fost organizate în colecția didactică a disciplinei de Floricultură de la USAMV Iași. Rezultatele au evidențiat o bună adaptabilitate a speciilor în condiții „ex situ” și menținerea caracterelor ornamentale identificate în habitatul natural.

Cuvinte cheie: adaptabilitate „ex situ”, *Asarum*, *Lathyrus*, *Lithospermum*, *Telekia*.

INTRODUCTION

One way to enrich the range of cultivated plants, including ornamental culture, is the introduction of spontaneous flora that corresponds with growers' objectives in the culture. The adaptation of these species to other environmental conditions, different from those of the natural habitats of origin, sometimes raises a number of issues related to survival and breeding ability, or maintaining optimal character parameters for which they were selected.

The purpose of this paper is to assess the culture behavior of four taxa with ornamental value (*Asarum europaeum*, *Lathyrus vernus*, *Lithospermum purpureocoeruleum*, *Telekia speciosa*) from the Romanian spontaneous flora, by determining their adaptability under "ex situ" conditions.

Studies based on morphological, environmental and technological characteristics of these taxa have been made by other authors (Chelariu Elena Liliana et al., 2010; Diez M. J. et al., 1986; Draghia Lucia et al., 2010, 2009; Kováts D., 1983; Kohut Ildiko et al., 2010).

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MATERIAL AND METHOD

The experiences were conducted in the experimental field of the Floriculture discipline from USAMV Iasi, where "ex situ" cultures were established with biological material collected from natural habitats where the studied taxa were identified.

There were studied four taxa identified in the NE areas of Romania: *Asarum europaeum* L., *Lathyrus vernus* (L.) Bernh., *Lithospermum purpureocoeruleum* L. (*Buglossoides purpureocaerulea* (L.) Johnston), *Telekia speciosa* (Schreber) Baumg.

In order to assess the adaptability and decorative value of plants in culture conditions, the results of biometric measurements and observations made in different plants phenophase in experimental cultures were compared with those recorded in the biological material from the natural habitat of origin. There were analyzed and compared the following characters: plant height and diameter, number of stems or branches of the stalk, number of leaves and flowers (inflorescences). It was also determined the decoration period, with special reference to the flowering period.

RESULTS AND DISCUSSIONS

In fig 1 and fig. 2 there are plotted the results on plant height and bush diameter from the four taxa: *Asarum europaeum* (Ae), *Lathyrus vernus* (Lv), *Lithospermum purpureocoeruleum* (Lp), *Telekia speciosa* (Ts). Data is supplemented with other measurements performed in *Lathyrus vernus*, *Lithospermum purpureocoeruleum* and *Telekia speciosa* (table 1).

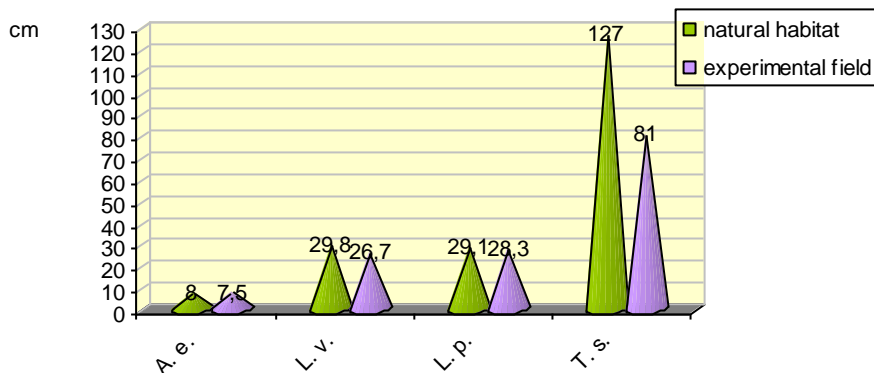


Fig. 1. - Height of plants

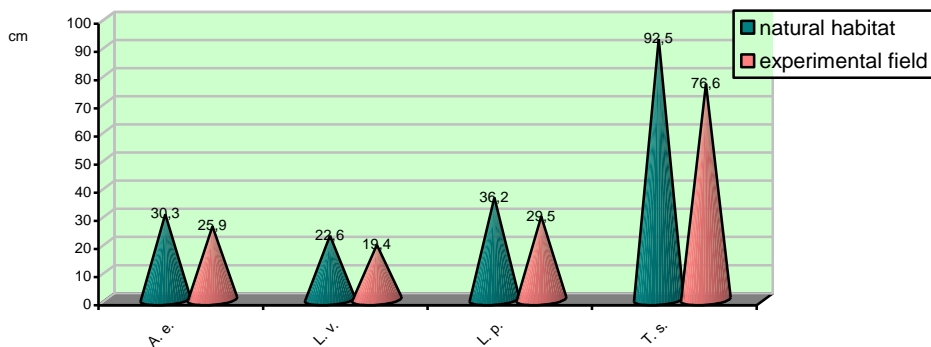


Fig. 2. - Diameter of the bush

Table 1

Morphometric characteristic of plants (in natural habitat and in experimental field)

Species	Locul	No. stem/ pl.	No. leaves / pl.	No. shoot /pl.	No. leaves/ shoot	No. ramif./ stem	No. infll/ pl.	No. flowers infl./stem	No. flowers /infl.
<i>Lathyrus vernus</i>	Natural habitat (Dorohoi)	1,3	6,1	-	-	-	-	2,6	5,5
	Experimental field	1,0	5,7	-	-	-	-	2,4	5,3
<i>Lithospermum purpureo coeruleum</i>	Natural habitat (forest Berheci, Vaslui)	-	-	32,0	20,0	-	-	7,2	-
	Experimental field	-	-	25,3	18,2	-	-	6,5	-
<i>Telekia speciosa</i>	Natural habitat (Durău, Neamț)	-	14,2	-	-	6,2	6,0	-	-
	Experimental field	-	12,4	-	-	5,4	5,1	-	-

1. *Asarum europaeum* L., Aristolochiaceae family

The asarum plant behavior in culture was very good, indicating that the registration data was made to the plants placed under the shade, similar to those from natural habitat (figures 1 and 2).

2. *Lathyrus vernus* (L.) Bernh., Fabaceae family

It performed well in culture and presented special ornamental features by elegant port and lively colors of flowers (fig. 3). It had a slight reduction in height and diameter of the bush (figures 1 and 2), but the average number of flowers / plant was about the same, regardless of culture place (table 1).

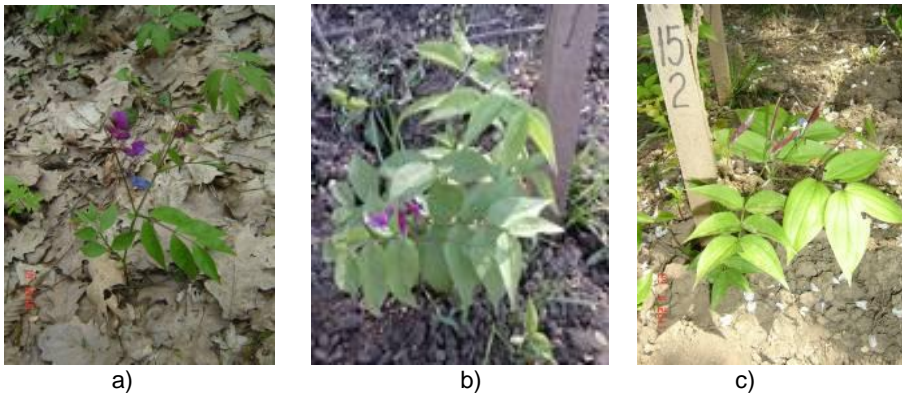


Fig. 3. *Lathyrus vernus* in natural habitat (a) and in the experimental field (b - flowering plants, c - plant with fruits)

3. *Lithospermum purpureocoeruleum* L. (*Buglossoides purpureocaerulea* (L.) Johnston), Boraginaceae family

Species with modest claims to environmental conditions, performed well in the experimental field in Iasi. There were larger differences in the number of shoots per plant and bush diameter (table), justified by the difference in plant age.

From the second year of culture, plants were vegetative propagated through sterile shoots (fig. 4).

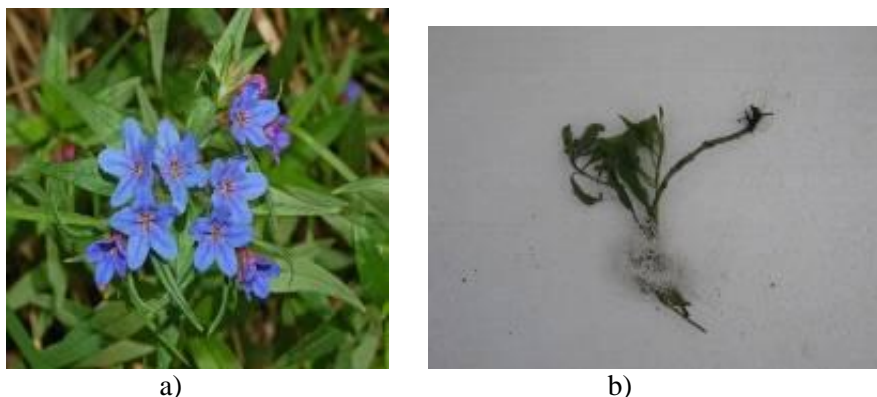


Fig. 4 - *Lithospermum purpureocoeruleum*: a) flowering plants, b) rooted shoots

4. *Telekia speciosa* (Schreber) Baumg., Asteraceae family

In the experimental field there was a significant reduction in waist plants, 46 cm from the natural range, but this has not diminished ornamental value (figures 1 and 2). The leaves are large, ovate, in smaller number than in the natural habitat with an average of 1.8 (table 2). The flowers are yellow and they are grouped in solitary capitulum, with 7.5 cm diameter in the experimental field, compared to 8.1 cm in the natural area (table 2). The number of inflorescences and branches is about the same in both locations (table 2). Species recovered well in shaded and wet lands, unsuitable for other species, though morphological parameters are in lower value in terms of culture, species didn't diminish their ornamental characters (fig. 5).

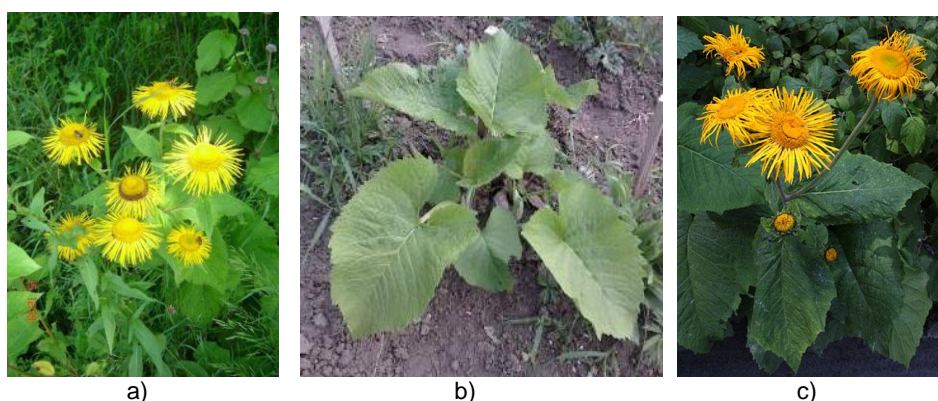


Fig. 5 - *Telekia speciosa* in natural habitat (a) and in the experimental field (b - flowering plants, c - flowering plants)

Table 2

Diagram period decor of plants

Species	Month	I			II			III			IV			V			VI			VII			VIII			IX			X			XI			XII		
		Days			Days			Days			Days			Days			Days			Days			Days			Days			Days			Days			Days		
	Growth conditions	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
<i>Asarum europaeum</i>	Natural habitat	Leaves decor																																			
	Crop conditions	Leaves decor																																			
<i>Lathyrus vernus</i>	Natural habitat	Leaves decor (I-III), Flowers decor (IV-V), Fruits and leaves decor (VI)																																			
	Crop conditions	Leaves decor (I-III), Flowers decor (IV-V), Fruits and leaves decor (VI)																																			
<i>Lithospermum purpureocaeruleum</i>	Natural habitat	Leaves decor (I-III), Flowers decor (IV-VI), Fruits and leaves decor (VII-IX)																																			
	Crop conditions	Leaves decor (I-III), Flowers decor (IV-VI), Fruits and leaves decor (VII-IX)																																			
<i>Telekia speciosa</i>	Natural habitat	Leaves decor (I-III), Flowers decor (IV-VI), Fruits and leaves decor (VII-IX), Leaves decor (X-XI)																																			
	Crop conditions	Leaves decor (I-III), Flowers decor (IV-VI), Fruits and leaves decor (VII-IX), Leaves decor (X-XI)																																			

Legenda

- Flowers decor
- Leaves decor
- Fruits and leaves decor

During this study it has been found that select taxa can provide landscape decorations setting in different periods, the decor is represented by the flowers, leaves, port, fruits (table 2). Time setting ranges from 30-50 days to permanent setting, throughout the year:

- 30-50 days: *Lathyrus vernus*;
- 5-6 months: *Lithospermum purpureocoeruleum*;
- 6-7 months: *Telekia speciosa*;
- 10-12 months: *Asarum europaeum*.

From the table 2 it is observed that at some species the period provided by flowers is extended by leaves and port, and even by fruits (*Lathyrus vernus*, *Lithospermum purpureocoeruleum*). *Asarum europaeum*, with the evergreen foliage, decorates throughout the year.

CONCLUSIONS

1. Evaluation of "ex situ" culture conditions of the four taxa showed a good adaptability and the maintaining of the ornamental character identified in the natural habitat.

2. The value decrease of certain characteristics of plants in experimental conditions (height, diameter of the plant, the number of flowers and branches), did not affect their ornamental potential.

3. The taxa studied provide decor in different times of the year, time setting ranges from 30-50 days (*Lathyrus vernus*) to permanent setting (*Asarum europaeum*), throughout the year.

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ECOLOGICAL IMPACT OF SETTING UP AGROINDUSTRIAL FARMS IN PRUT RIVER MEADOW

IMPACTUL ECOLOGIC AL ÎNFIINȚĂRII UNOR FERME AGROINDUSTRIALE ÎN LUNCA PRUTULUI

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Abstract. *On a land placed in location Moreni, commune Prisecani, two investors proposed a design to erect a complex for production of mushrooms, Agaricus bisporus for population consumption at a national level as well as for export. The production capacity, on which the extent of the construction works is based, is 1500 tons/year mushrooms, in 8 production cycles. The site is on the right bank of Prut River at one hundred meter distance from NATURA Site, code ROSCIO213. The estimation of the potential impact of the project on the zone was carried out by considering the activities involved by the project as well as the extent these activities should generate migrating emissions of pollutants, noise, destructions or modifications of the landscape directly or indirectly affecting the environment factors, population health state, terrestrial or aquatic flora and fauna in the implementation area of the project.*

Key words: mushrooms, farm, pollutants, landscape, flora, fauna

Rezumat. *Pe un teren situat în localitatea Moreni, comuna Prisacani, doi investitori propun un proiect în vederea execuției unui obiectiv complex pentru producția de ciuperci Agaricus Bisporus pentru consumul populației la nivel național, dar și pentru export. Capacitatea de producție, funcție de care se dimensionează lucrările de construcție, este de 1500 tone/an ciuperci, în 8 cicluri de fabricație. Amplasamentul se află pe malul drept al râului Prut, la o sută de metri distanță de Situl NATURA 2000, cod ROSCIO213. Evaluarea impactului potențial al proiectului asupra zonei s-a realizat luând în considerare activitățile promovate prin proiect și măsura în care aceste activități prin emisii de poluanți, producere de zgomot, distrugere sau modificare de peisaj, pot genera prin migrarea emisiilor sau în alte moduri un impact direct sau indirect asupra factorilor de mediu, sănătății populației, faunei și florei terestre sau acvatice din zona de implementare a proiectului.*

Cuvinte cheie: ciuperci, fermă, poluanți, mediu, floră, faună

INTRODUCTION

The aim of the investment objective is to provide mushroom production, the valuation of some waste – fowl/horse dejections - by their processing within the complex, their storing and direct transport after sorting to the beneficiary. The developments provided in the project should ensure sanitary and environment protection terms in compliance with national and European legislation (C. Ciobănașu, 2010).

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MATERIAL AND METHOD

The two farms should be erected on a total surface area of 7.8 ha on a land located at DC 33/1 limit at about 100 m from NATURA SITE 2000, developed on the bank of Prut River and from the flood control dam for overflowing water of Prut River. The NATURA SITE framed within NATURA 2000, CODE ROSCIO213 from Prut river meadow represents 16% of the land administrated by Prisecani commune.

Sensitive habitats

Coordinates of NATURA 2000 SITE are:

Latitude 47° 12'53" N, longitude 27° 47'1" E

The coordinates of the land allotted to the mushroom production complex are:

Latitude 47° 06'40-65" N, longitude 27° 49' 57-91" E

The site NATURA 2000 CODE ROSCIO213 and the connection with the neighboring sites have the role of protecting the area located downstream Stâncă Costești Lake, on the watercourse of Prut River whose riverbed is closed within the flood control dams.

The project will abide the European Legislation regarding this subject:

92/43/EEC DIRECTIVE FOR BIODIVERSITY PRESERVATION

76/464/EEC DIRECTIVE FOR DANGEROUS SUBSTANCES

75/440/EEC DIRECTIVE FOR SURFACE WATERS

RESULTS AND DISCUSSIONS

A potential source of significant impact is the processing/removing of exhausted soil bed resulting at the end of the mushroom production cycles. The soil bed is formed of the exhausted compost (the exhausted compost after mushroom harvesting can be reintegrated in natural circuit by keeping under control of pollution risk for final agricultural usage or other usage by exploiting the nutritive or organic value) which is a fertilizer for agriculture lands having favorable characteristics of using it in arable soil rehabilitation. The contained dry and volatile substances as well as the 40-60% dry substances, the lack of toxic and inhibiting substances, make the compost an admitted material for land fertilization (C. Ciobanasu, 2010).

For large-scale and non-polluting mushroom production there are of utmost importance the technological phases of a polluting potential as well the provision of equipment and endowment and measures for emission control and material loss. The following aspects may be rendered:

- ✓ The transport, handling and process entering of compost;
- ✓ Initial wetting of compost, periodical wetting (irrigation with spraying nozzles and water dosing for spraying);
- ✓ Ventilation of spaces of mushroom cultivation tunnels;
- ✓ Mushroom harvesting, integral collection of waste;
- ✓ Collection of exhausted compost, transport to the platform;
- ✓ Storing of used compost on the specially arranged platform;
- ✓ Valuing the nutritive potential of compost by fertilizing the agriculture lands;
- ✓ Technological process monitoring - temperature, air quality within the mushroom cultivation space – by CO₂ and CO sensors

Description of potential impact determined by project implementation

Estimation of potential impact of the project on the zone was carried out by considering the activities promoted by the project and the extent to which these activities through emission migration or in other ways, generate a direct or indirect impact on environment factors, on population health state, on terrestrial or aquatic flora and fauna in the area of project implementation (Virginia Catrina, 2010).

Downstream the storing lake Stâncea Costești on the Prut River there were preserved the habitat and numerous bird species migrating to North in Prut River corridor that needs protection to the would be impact by this economic development, mostly by building in the vicinity of site area that could determine the landscape modification as well as changes of habitat quality that may affect the protected fauna and flora.

Measures of avoiding, reducing/improving the potential impact

The project covers, within the development works of the investment objective, technological measures and preventing measures of environment pollution in the location area and its surroundings by an efficient use of energy (using the newest techniques in the respective field, endowment with heat pumps etc), strictly directed handling of compost at entry and exit out of the system, storage and valuation of exhausted compost, treatment installations of used household waters and installations of collection and recirculation of technological waters (Virginia Catrina, 2010).

The vicinity to NATURA SITE 2000 on the right bank of Prut River determined the analysis of SITE affecting potential starting from the present conditions of the site, a land destined to agricultural use, pastures. The construction on the land with POT of 6.7% and CUT of 0.07 and development on ground floor level determines the reduction of potential impact that the project implementation should have on biodiversity with an emphasis on habitats and species that were based on the Natura 2000 site designation on the right bank of Prut River – site that is located at the limit of the habitat specified in the project.

A special chapter of the project is dedicated to recommendations and measures of reduction of impact on biodiversity.

In the present context, the sustainable development strategy represents the main objective of the EU countries determining taking measures within each project of social and economic development, measures for damage prevention, protection and improvement of ecosystem state, reduction and integral control of pollution.

The project contains these measures and provides the harmonious implementation in the landscape not prejudicing the NATURA 2000 SITE on the right bank of Prut River.

The opportunity of investment objective is determined by including the activity in the agriculture potential of the area by optimal valuation of existing resources and valuation of fowl dejections that are used in compost production (the compost production is provided by BIO COMPOST SRL company on the same location). In the location area, the objective represents an opportunity for development being provided the conditions for valuation of mushroom production potential and valuation on local and external level as natural ecologic products.

Technological measures for limiting the impact included in the project

The technology is based on maximal reduction of raw material losses and harvesting product losses. The technological control of the process, the competitive equipment provides running of minimum impact phases, including here the high pressure pendular system for cleaning the belts.

The complete cleaning of the mushroom cultivation tunnel, in its entire width, is carried out with water at a pressure of 80-100 bars. It should be procured a high pressure based cleaning device of about 100 bars with a capacity of 600 liters per hour such as KARCHER HD895 or PLATZMC135SD products.

The technological measures provided in the project facilitate the charge of depollution, waste waters and waste management.

Protection of water quality

In the technological process, the water is used according to the described phases. The technological measures diminish the engagement into used waters of compost or mushroom remains resulting from processing.

The used waters from the processing procedure should be in compliance with the admitted limits for content in pollutants of biological treated water in independent or city water treatment plants.

The technological waters collected from the mushroom production line should be in compliance with the NTPA 002/2005 provisions regarding observance of described technology and should be used by internal re-usage during compost production, wetting of lands etc.

According to the company's development strategy, improvements should be permanently provided in the run activities by introducing the environment integrated management for limiting the activity impact on the environment in the neighboring areas of the production and processing line and in the site areas of mushroom farms.

Air protection

Pollutant sources for air

The heating of indoor spaces should be carried out by using a system of heat pumps valuating the renewable geothermal energy of the earth. In this way, combustion gases are not produced as well as other pollutant elements specific to fuel combustion.

Protection against radiations – not measures are imposed

Protection of soil and subsoil – it is provided by impermeabilization of the used compost storage platform, tight execution of subterranean works, drainable basins, collecting-recycling tanks, sewage, waste storing in containers on the concrete platform.

Protection of terrestrial and aquatic ecosystems

Identification of sensitive habitats that can be affected by the project

At a distance of about 100 m of the site, delimited the communal road DC 33/1 and the flood control dam, there is NATURA 2000 site entitled PRUT RIVER.

The site is located in the *halt, reproduction and feeding* area for bird species protected by law in the floodable perimeter of Jijia River and of Prut River, migration corridor for some bird species migrating across the Prut valley to places of reproduction and feeding.

The site location is set by the following coordinates 27° 47' 7" E and 47° 12' 53" N under code **ROSCI0213 Prut River** placed at about 100 m from the site, covering surfaces located in eastern Romania, out of which the administrative territory of Prisecani commune covers 16% together with surfaces of the administrative territories of Iasi, Vaslui and Galati Counties.

ROSPA0042 K. Ponds of Jijia and Miletin Rivers

ROSPA0071 E. Lunca Prutului – Vladesti – Frumusita

The near by location of NATURA 2000 SITE requires the analysis of data regarding surface, landscape structure, types of species and habitats that can be affected by project implementation, biotic and abiotic factors with a role in long term preserving of protected species and habitats.

The quality of Prut River waters in the protected area is determined by storing of flood waves in Stânca-Costești Lake providing high quality water downstream the dam thus explaining the diversity and density of species. The pollution sources on the river banks in Romania and Republic of Moldova create a negative impact on the river that is permanently quantified by water management authorities of both riverside countries.

The site vulnerability is conferred by hydrotechnical works respectively by the development of the Stânca-Costești accumulation lake

and of downstream dams that, beginning with the 70s, subjected the entire habitat to strong anthropic pressures whose consequences were unforeseeable. Meadow forests were deforested that were replaced with agricultural cropping or poplar forests. More severe was the almost total drainage of the water slicks (streams) representing a characteristic of this habitat. The isolation of streams from the minor river bed determined the drain and colmatation of streams with aquatic vegetation. The destruction of Prut meadow had consequences also on fish production of Danube Delta by destroying the reproduction biotopes for numerous fish species, pike, carp, bream, crucian carps as well as for birds.

In order to save the fish fauna that resisted to anthropic pressure and modification of NATURA 2000 site habitats, THE PRUT RIVER requires a minute analysis of project development in the near vicinity of the site in order not to allow new anthropic pressures on the habitats. In this respect, the project and its provisions were analyzed from the building stage to the operation stage as well as the potential impact represented by all the running activities.

CONCLUSIONS

According to the technology and equipment provided in the project, described in the documentation, all the conditions for running an activity are provided not generating any impact on the environment. The basic data of the used technology are comparative with available technologies (BAT).

The environment management plan for the building stage sets up the complex of measures to prevent damages, to protect and improve the ecosystem state, to totally reduce and control pollution (C. Ciobanasu, 2010).

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GREEN ARCHITECTURE, FROM UTOPIA TO REALITY

ARHITECTURA VERDE, DE LA UTOPIE LA REALITATE

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Abstract. *From visionary Austrian artist Hundertwasser utopias of the 70s, through fashionable postmodernist projects, to nowadays already built award-winning projects from contemporary ecologic architecture competitions: this is a long road, full of obstacles along, for green architecture concept. The paper analyses the change induced in the designer's awareness by the rise of pollution and the new attitude of some creators, architects-urbanists-landscapers, towards the future life in the urban space. In the development of such projects, landscape architecture has played and plays an important role, both in outdoor and indoor structures, stimulating of a new urban culture – culture of the nature.*

Key words: green architecture, landscaping, urban space, new attitude.

Rezumat. *De la utopiile artistului vizionar austriac Hundertwasser din anii 70, prin moda postmodernistă, până la proiectele contemporane de arhitectură ecologică premiate la concursurile internaționale - iată un drum lung și plin de obstacole, parcurs de conceptul arhitecturii verzi. Lucrarea analizează schimbările produse în conștiința design-erilor de creșterea accelerată a poluării și noua atitudine a unor creatori, arhitecți-urbașiști-peisagiști, față de viitorul vieții în spațiul urban. În evoluția acestui tip de proiecte, peisagistica a jucat și joacă un rol foarte important, atât în spațiile exterioare, cât și în cele interioare, stimulând o nouă cultură urbană: cultura naturii.*

Cuvinte cheie: arhitectura verde, peisagistică, noua atitudine.

INTRODUCTION

We can observe in the history of urbanism and landscape design that two important trends stand out in the green architecture practice and in the sustainable urban applications (Dascălu Doina Mira, 2006).

1. One is the trend of ecological architecture, which means to reduce the overall impact of the built environment on the human and natural environments.

2. The other one is a new wave born from the hard challenge that nowadays many green architects face with: to change the aspect of the urban space, more and more suffocated by concrete, plastic and many pollutants, into a healthy one with a natural aspect.

MATERIAL AND METHOD

The paper analyses the nowadays attitude of the landscape creators towards the urban space and future life, connected to the very stringent mankind necessity to live into a healthy urban space with a natural aspect. Underlining the birth and inspiration from the Hundertwasser's ideas of the new trend in the green architectural

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and urban creations, we link this wave to an essential problem of the contemporary age: the changes induced in the human awareness by the rise of pollution and the birth of the new urban culture of the nature.

RESULTS AND DISCUSSIONS

1. The trend of ecological architecture

The trend of ecological architecture and urbanism bring together a large variety of practices and techniques, like: reduction of waste, pollution and environmental degradation, using local and green building materials, using green energy, using water and other resources efficiently, enhancing indoor and outdoor environmental quality .

Roots of green architecture can be found in some antique utopian and also practical ideas, followed by idealistic projects in medieval, renaissance, baroque, romantic, modernist and postmodernist times (fig. 1) (Dascălu Doina Mira, 2006).



Fig. 1 - Sod roofs on log buildings of Norsk Folkemuseum in Oslo
(wikipedia.org/wiki/Sod_roof)

From visionary Austrian artist Hundertwasser utopias of the 70s-80s new waves, through fashionable postmodernist projects, to nowadays already built award-winning projects from contemporary architecture and urban design competitions - this is a long road, full of obstacles along, for the green architecture concept.

In the development of such projects, landscape architecture has played and plays an important role, initially in outdoor and transition spaces, and now even the indoor structure.

Today green buildings are no longer any utopia or fashion. They constitute an urgently need, a solution imposed by accelerated pollution and the apocalyptic scenario of the future of mankind on earth.

Austrian artist Hundertwasser, one of the first promoters of twentieth century green architecture in the city, carried on the concept not only in the sense of architectural and urban green framework adapted 100% to the natural environment.

These proposals came very close to current urban needs. He created a new trend and a new sustainable univers for the future landscape architecture.

He used, for the first time, the urban land and ground as a resistance structure for buildings and urban circulation.



Fig. 2 - Hundertwasser – green architecture - Waldspirale
(<http://landscapeandurbanism.blogspot.com/2008/09/hundertwasser.html>)

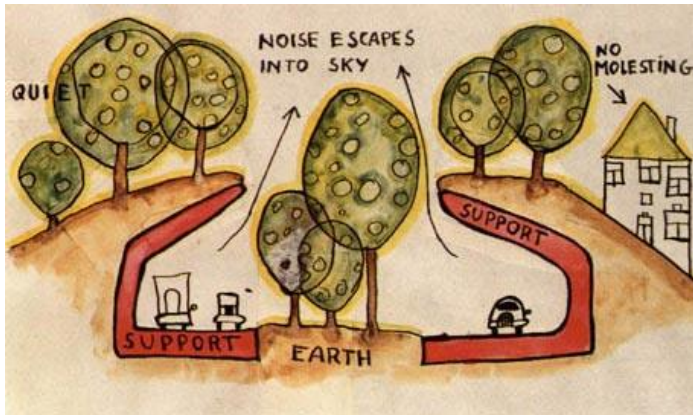


Fig. 3 - Hundertwasser underground green tunnel
(<http://landscapeandurbanism.blogspot.com/2008/09/hundertwasser.html>)

Early 70s, in addition to the promotion and practice of the concept of horizontal garden, Hundertwasser comes with an innovative idea that has revolutionized the architecture and the urbanism: green facades – meaning green verticals of the cities.

Also, he is one of the first creators to promote the ancient and millennial idea of buildings and urban districts embedded in the ground.

Although considered utopian, some of his ideas have been built in the 80s (fig. 2), others remained in draft form only (fig. 3), being a vast source of inspiration for many architects and urban planners, today nicknamed as „green”.

2. A new wave

If initially were considered a caprice, nowadays, new architectural and urban green forms seems to constitute a necessity.

The green shapes can restore, in ours polluted cittyies, the inhabitants self-respect and responsibility to take care and to create new organic/natural aspects (Shri Mataji Nirmala Devi, 1995).

The necessity of natural elements in the built urban space being very stringent, the digital design with smart graphical software (Stevens C. J., 2003) try to face this situation, creating various and futuristic organic shapes.

At first sight, only on the paper, these shapes seemed to be fictions, but finally many of them were built.

A spectacular green design was created by a Netherlands architectural firm as a concept design for a dense future city centre located 35 km south of the Korean capital Seoul - Gwanggyo City Centre (fig. 4).



Fig. 4 – Gwanggyo City Centre Korea-2008
(<http://www.contemporist.com/2008/12/04/mvrdv-wins-gwanggyo-city-centre-competition/>)



Fig. 5 – Gwanggyo City Centre Korea: image of pedestrian circulation
(<http://www.contemporist.com/2008/12/04/mvrdv-wins-gwanggyo-city-centre-competition/>)

In this city, like in Hundertwasser utopian drafts, a series of green hills shaped buildings creates a high urban density and encouragement of further developments.

The buildings volumes are enriched with landscape arrangements, like water games and vegetation, at each level (fig. 5).

These new waves of architectural organic/natural shapes try to prevent the urban metamodernism from becoming dry and sterile.

The natural forms and materials involves the creators into a game of various possibilities, suggested by a beneficiary option or an architect vision.

Technical innovations and digital design with smart graphical software can generate not only new volumetric expressions, but also, a new creative awareness and architectural attitude.

Regarding this new green architectural and urban attitude, its content transmits also to the inhabitants subtle emotions and messages.

In the context of the change induced in inhabitants awareness by the rise of pollution, this new attitude of green architects – urbanists - landscapers towards the future life in the urban space have a deliberate goal: stimulation of a new urban culture-culture of the nature.

CONCLUSIONS

1. Today green buildings are no longer any utopia or fashion. They constitute an urgently need, a solution imposed by accelerated pollution and the apocalyptic scenario of the future of mankind on earth.

2. It is important to observe that the change induced in the designer's awareness by the rise of Earth's pollution created the new sustainable attitude of architects – urbanists - landscapers, towards the future life in the urban space.

3. In the development of such projects, landscape architecture has played and plays an important role, both in outdoor and indoor structures.

4. The harmonious blending of organic/natural shapes, in the urban green and complex volumes, will always create a really calming, comforting and healing refuge.

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BALSH-STURDZA PALACE GARDENS OF IASSY

GRĂDINILE PALATULUI IEȘEAN BALȘ - STURZA

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***Abstract.** Often, the occasion of some buildings rehabilitation or restoration lead to the discovery of important details, far older than the original historical dating. This is the case of the imposing palace Balsh-Sturdza, today the Central Post Palace of Iassy. The main building was located in the middle of a wide enclosure, containing both the annex buildings and the boyar courtyard gardens. Deciphering data of nineteenth century plans, coupled with evidence provided by archaeological researches, led to the reconstitution of the old boyar courtyard plan organization.*

Key words: palace, rehabilitation, boyar courtyard, gardens.

***Rezumat.** De multe ori, cu prilejul unor reabilitări sau restaurări, cercetarea unor clădiri conduce la descoperirea unor detalii importante, mult mai vechi decât datarea istorică inițială. Acesta este și cazul impunătorului palat Balș-Sturza astăzi Palatul Poștei Centrale din Iași. Edificiul principal era situat în mijlocul unei ample incinte care cuprindea atât clădirile anexe, cât și grădinile curții boierești. Descifrarea datelor din planurile veacului XIX, corelată cu indiciile oferite de cercetările arheologice, au condus la reconstituirea în plan urbanistic a organizării vechii incinte boierești.*

Cuvinte cheie: palat, reabilitare, curte boierească, grădini.

INTRODUCTION

Many times, during some rehabilitation and restoration works, the research of some historically dated buildings leads to the discovery of some much older details than the initial dating. This is also the case of the impressive Bals-Sturza Palace, today the Central Post Office Palace of Iasi city. In the old Iasi city, the building was located at the upper limit of the Downtown Borough at the crossing point between the Main lane (today, Stefan cel Mare street) and St. Ilie lane (today Alecsandri street) and Golia's lane (today Cuza-Voda street). In competition with Cantacuzino-Pascanu Palace (today the Civil Registrar's Office Bulding) located on the other side of the crossing, the palace tried to dominate the area by its proportions and its outline. It was located in the middle of a large enclosure covering both outhouses and gardens of the boyar's courtyards.

MATERIAL AND METHOD

In carrying out the work, specific research tools were used: library and historical archive research, overlapping and correlation of plans of 19th and 20th centuries in surveying the urban development stages, comparative analysis and correlation of

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archeological signs with the urbanistic ones. The deciphering of data of 19th century plans, correlated with the signs offered by archeological research, has led to a reconstruction at an urbanistic level of the old boyar enclosure organization of Bals-Sturza Palace. In this paperwork, we had resumed some hypotheses and had extended one of the case studies from the doctoral thesis (Dascalu Doina Mira, 2004).

RESULTS AND DISCUSSIONS

1. Brief history of the palace

The edifice faced a turmoil history (Dascalu Doina Mira, 2004). The historical documents reveal that, at the end of 18th century, the palace belonged to the boyar Iordache Bals. The house is then inherited by Iancu Bals, who sold it to some rich merchants. Constantin Bals, Iordache's brother, bought from them and afterwards gave it in 1850 to the logothete Dimitrie Sturza. In the urbanistic plan of Iasi worked out in 1857, executed by engineer Peytavin, the palace is a property of Sturza. The edifice is then bought by Cantacuzino-Pascanu family who also possessed the opposite palace (the one that today is the Civil Registrar's Office). After 1857, the palace loses its function of aristocratic dwelling and became a public institution: first the Bank of Moldavia, later the City Hall of Iasi and after a while became again the Bank of Moldavia. In 1912, the building was in the property of Weisengrun, the edifice being later bought by Iasi City Hall. Beginning with 1912 and until 1924, it operated as a bank when the building faced a reconstruction-repartition work which leads to the destruction of many walls of historical structure, of the basement, ground floor and first floor. Since 1940, the function of the edifice was of post office and was consequently rearranged. After the war, the function remained as Central Post Office of Iasi. After revolution, ample archeological diggings took place occasioned by the rehabilitation plan of 2000.

2. Archeological research

The oldest archeological vestiges were chronologically framed at end of 17th century and end of 18th century (Cheptea Stela, 2000). Unfortunately, in the 19th and 20th century, the building faced numerous interventions both at basement level and at above ground structure. These interventions either changed or removed many elements of the old palace.

The edifice is impressive even today by its ample dimensions: 33 m x 27 m. Some of the old walls, dated back in 17th and 18th centuries, are 1 m over the present limits of the building (Cheptea Stela, 2000). Therefore, the old palace had longer dimensions even than the one rebuilt in 19th century maintained till today. The archeological research confirmed an important detail, illustrated by the old plans of Iasi City of 19th century: the main entry into the old palace was at the west façade to the present Vasile Alecsandri street. The current access from Cuza-Voda street was made available when the edifice became a bank in 19th century (fig. 1). The spatial amplitude of the palace involved special efforts of indoor organization by tracing two perimeter passing corridors around an ample central space, where today there is the great hall of the post office. Behind this hall, in the

19th century, on the median axis of the posterior façade, a large apse was erected that even today exists (fig. 2) (Dascalu Doina Mira, 2004).

In the central area of the posterior façade, the archeological diggings revealed another important detail certifying the fact that, prior to the construction of the above mentioned apse, there was an access way to outside. The bases of four stone pillars and a small stair head in between the pillars were discovered, a slab covered stair head with apparent bricks, all of them dating back from 18th century (Dascalu Doina Mira, 2004).



Fig. 1 - Façade of the palace in 1913 (Bogdan N. A., 1997)

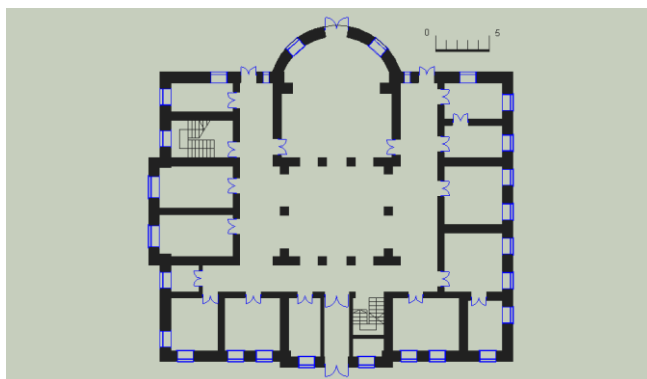


Fig. 2 - Bals-Sturdza Palace, today the Central Post Office of Iasi. Renewed ground floor plane (Dascalu Doina Mira, 2004)

3. Finding out the organization of the old Bals boyar courtyard

The discovery of the old access ways to the palace confirms some important hypotheses regarding the organization of Bals boyar courtyard of 17th—18th centuries (Dascalu Doina Mira, 2004). In order to find out the organization of the old Bals boyar courtyard, firstly it was necessary a study of the organization way of rural and urban boyar courtyards in Moldavia and Wallachia of 17th and 18th centuries (Dascalu Doina Mira, 2004; Nicolescu Corina, 1979; Bratuleanu Anca, 1997). The results of this study are briefly presented below.

As long as the towns of medieval Moldavia increased in size and density (Dascalu Doina Mira, 2004), the organization of the nobility courtyards had to be adapted in time to some smaller and smaller urban surfaces. They lost many important elements of the organization on large estates conferring them a “boyar” character in the large meaning of the word. Evidently, the form and dimensions of an urban boyar courtyard were determined by the surface of occupied land. In organizing the enclosures in the town area, the boyar courtyards followed the model of rural courtyards of estates, as much as the density of zonal urban tissue permitted, transposed in the dimension of the occupied land. Frequently, the enclosure was protected by a perimeter wall. Considering the reduced surface of the occupied land parcels, the urban boyar courtyards did not have a chapel as the countryside estate; the boyars founded and donated many churches in the city. One of the main characteristic of classical boyar courtyard organization was the separation of the dwelling itself as the main building from the outhouses represented by servant’s dwellings, kitchen, barns, stables as well as possible cellars. An important characteristic of the rural courtyard that is hardly maintained in the urban environment is also the orientation and placing of the dwelling. The boyar house was generally placed with the main façade to the south (Nicolescu Corina, 1979). If it was possible, within the rural boyar courtyards, the main façade had a view to a peculiar landscape (a lake, a meadow or a river or a forested hill). In the urban area, these favorite aspects were hard to meet considering the reduced dimensions of the occupied urban land parcel as well as the obliged orientation to the street line of the city. Another important element of the boyar courtyards is the gardens. These were represented by planted areas having a role of protection-leisure-rest-walking but also as useful plantations as vegetable gardens and orchards. Under conditions of densification of urban tissue, the gardens of boyar properties do not reach the dimensions and the number of rural estates.

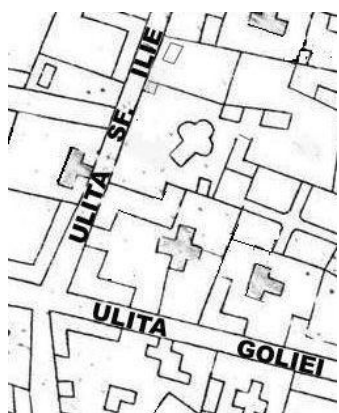


Fig. 3 - The courtyard in Bayardi plan



Fig. 4 - The courtyard in Peytavin plan

Regarding the old Bals courtyard, we may notice that although in 17th-19th centuries, Iasi City considerably developed in area and urban density, the palace

in time kept a large enclosure. This fact can be found out from Iasi planning executed in 19th century by engineer Bayardi in 1819 (fig. 3) and by engineer Peytavin in 1857 (fig. 4). In a detailed analysis we notice from these plans that the palace was retreated from St. Ilie lane (today Alecsandri street) and from Golia lane (today Cuza-Voda street) and located in the middle of the boyar courtyard. This retreat in the boyar courtyard intimacy is characteristic to 17th-18th centuries when the palaces defended their intimacy to the street by walls and areas planted with trees and shrubbery – in Iasi, especially with lilac, acacia and lime trees conferring a charm and perfume (Cantacuzino G. M., 1999). In the 19th century, wishing to expose their richness and rank, the nobility renounced to the protecting walls of the enclosures and brought closer the palace building to the street to make more visible the splendors of the facades. The enclosure and location of Bals palace, retreated from the street in the middle of the boyar courtyard, confirm, alongside the above mentioned archeological signs, the edifice age. By a compared analysis of Bayardi's and Peytavin's plans we notice that the space around the central building was structured in some enclosures: a large court for reception in front of the main western access way and secondary courtyard located to north, south and east. In the Bayardi's plan from 1819 (fig. 3) we may observe a partition of the boyar enclosure in three courtyards: the western courtyard, the northern one as well as a courtyard to south-east. In the Peytavin's plan of 1857 (fig. 4), we can not notice any delimitations of any inside courtyards so that we may emit hypotheses only by examining the site and the neighborhoods. The main access way to the boyar courtyard from St. Ilie lane (present day Vasile Alecsandri street) was flanked by a set of two outbuildings which can be noticed even today on the location (fig. 5).

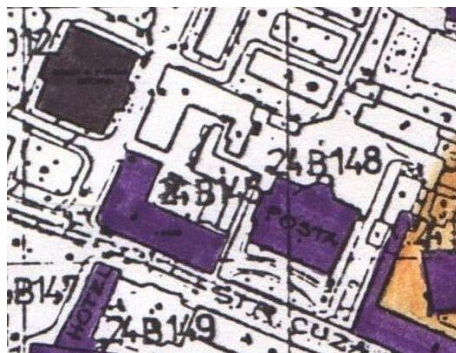


Fig.5 - Nowadays situation

In Peytavin's plan, the two administrative building sets, that flanked the access way to the street, had proper enclosures. In 19th century, according to the époque's style and due to financial needs, the ground floors of these administrative buildings were transformed in commercial spaces bringing income to the palace and the courtyard owners. The commercial function was partly maintained till nowadays at the ground floor of the buildings. As we previously mentioned, the archeological research discovered elements of the main entrance

in the palace, centrally located, on the western façade, e.g. to St. Ilie lane. In both plans of 19th century, we may notice that in front of this entrance, a large reception court was opening. The other entrance, discovered by archeologists to the north side, mentioned in the previous section, offers signs of northern enclosure of the boyar courtyard. From the fact that this secondary entrance was architecturally treated with much care, with decorative pillars and a stair head plated with apparent bricks, we may presume that there was an important access way to an outdoor space of the palace, probably in a landscape arrangement. The placing to the north shows the existence of a shady summer garden intended for relaxation and rest. The only courtyard where it was possible to have existed useful plantations along with other outhouses could be the third courtyard, visible in Bayardi's plan to south-east. However, a small orchard and a vegetable garden could be placed only to the inside of the courtyard; to the street a protection plantation was created. In the context of Peytavin's plans, the location of the southern courtyard to an important lane of Iasi, Golia lane (present day Cuza-Voda street) excludes any utility function that could have offered an unaesthetic image. It is possible that this southern area would be decoratively planted with trees and shrubs. Therefore, only the space from the east, neighboring another property, could have been destined to utility plantations.

CONCLUSIONS

1. Deciphering by a detailed and a comparative analysis of data from 19th century plans, the correlation with 20th century plan of Iasi City and the signs offered by archeological research had lead to the reconstitution at urbanistic level of the old boyar courtyard organization.

2. The hypotheses issued in this paperwork about the gardens of Bals Palace represent a novelty in the field. They take over and continue the research from my doctoral thesis that is pending publication (Dascalu Doina Mira, 2004).

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FUNCTIONAL AND AESTHETIC ADAPTATION OF CONVENTIONAL PUBLIC MEANS OF CONVEYANCE INTO THE URBAN LANDSCAPE

ADAPTAREA FUNCȚIONALĂ ȘI ESTETICĂ A MIJLOACELOR DE TRANSPORT PUBLIC CONVENȚIONALE LA PEISAJUL URBAN

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***Abstract:** Taking into account the principles of eco-design, the present paper speaks of the redesign of a public means of conveyance starting from existing mechanical elements, but having an up-to-date body. The design uses, in a proper way, a part of the main constructive elements, reinventing a new concept, adapted to the urban landscape. The paper presents the manner in which a product can be modernized by maintaining certain landmarks and technologies for maximum economic efficiency and by creating an ecological product.*

Key words: urban, means of conveyance, up-to-date body, design.

***Rezumat:** Având în vedere principiile proiectării ecologice, lucrarea tratează re-proiectarea unui mijloc de transport în comun pornind de la elemente mecanice existente, dar recarosat în trendul actual. Designul folosește cu mult discernământ o parte din principalele elemente constructive, reinventând un nou concept adaptat peisagisticii urbane. Lucrarea prezintă modul în care se poate moderniza un produs prin menținerea unor repere și tehnologii pentru maximă eficiență economică și crearea unui produs eco.*

Cuvinte cheie: urban, mijloc de transport în comun, recarosare, design

INTRODUCTION

The usage of public means of conveyance represents an optimal variant taking into account the respect for the urban landscape, natural environment and for the economy. The price-quality-environment relationship, the comfort and care for the passenger, represent the main objectives of the designer of ecologic products dedicated to public transportation.

MATERIAL AND METHOD

The method used in approaching this theme is based on theoretical and practical research of this subject. The investigation of the main domains of interest on the approach of this theme (Pralea Jeni, 2009), as well as: discussions with the producers, transporters and passengers, the research of the competitive market allowed the approach of this current topic both for the urban landscape, as well as for the socio-economic implications. Thus, according to certain studies, the development and the extension of the great urban centres was noticed, followed by the intensification of the car traffic, as well as by the covering of considerable distances to

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the job or to other interest points of the passenger, represent modifications due to socio-economic and political factors from the last 20 years, modification which impose the rehabilitation of the public electrical means of conveyance. The efficiency of the tram and/ or trolley transportation, due to its speed, to the capacity, to the low phonic pollution, to the low expenditure of electric current, or to the low maintenance costs (Prælea Jeni, Sficlea Magda, 2010), slowly led to the growth of the number of Europeans using public means of conveyance, in exchange with the personal car. The care for the environment by using the public means of conveyance determined the reduction of the traffic jams, the growth of the speed in covering certain distances, the protection of the environment and the reduction of personal expenses for transportation. This ideal of urban behaviour was achieved in countries such as France, Germany, Austria or Spain, where big amounts of money were invested into the infrastructure and new, last generation vehicles, responding to the needs of the passengers of any age, or of those presenting locomotors deficiencies. However, the public transportation systems in the Czech Republic, Slovakia, Latvia, Lithuania, Poland and not only have managed to adapt the existing park of vehicles to the current needs of comfort, safety and of aesthetic aspect (fig. 1).



Fig. 1 – Tatra T3 / Tatra K2 / V3A93 tram modernization, became V3A93CHPPC (photographs source – www.tramclub.ro)

RESULTS AND DISCUSSIONS

In Romania of the last 20 years, a pronounced decline of the public transportation in the big cities was registered. The lack of funds for the restoration of the terrestrial infrastructure, of the wireless network, as well as the advanced wearing of the means of conveyance led to the suppression of tram lines in Constanța (fig. 2) and Brașov and to the suppression of trolley lines in Iași, Sibiu, Slatina, Vaslui and Suceava, in favour of the diesel buses (Prælea Jeni, 2009).



Fig. 2 – Replacement of trams with diesel buses – images from Constanța (photographs source – www.tramclub.ro)

In spite of the deficitary economic context between 1992 and 1997, 24 V2A trams were modernized at Nicolina Iași, 30 Timiș sets at Electroputere Craiova

(1994) and over 500 Tatra T4, V2A and V3A vehicles at URAC București from 1993 to the present moment. Also, in București, Timișoara, Arad, Brăila, Iași, Oradea, rehabilitation programs of the tram railways were conceived, this being the first step towards a civilised transportation, with new vehicles. Oradea is the only city in Romania which bought 10 Siemens ULF units in 2009, for 2,7 million euros/ piece. Due to the high costs, but also to the partially rehabilitated railway, the acquisition of new trams by the transportation systems in Romania is not possible, reason why the modernization of the existing vehicle park remaining the perfect variant for a civilised, modern, low-cost transportation.



Fig. 3 – GT4 tram (photographs source – www.tramclub.ro)

Thus, the modernization of GT4 trams (fig. 3), exploited model in Iași since 1997, is proposed, in this moment, the vehicle park containing 103 such units. The vehicles were bought in a second-hand regime from the transportation systems in Stuttgart, Halle and Augsburg – Germany, 72 of these being modernised in the 90s, both from a technical point of view, as well as from an aesthetic one. The unitary character of the vehicle park, the reliability which they proven in 14 years of exploitation in Iași, even on the less accessible routes in the city (for example, Padurea Street), with a capacity of approximately 140 seats. The GT4 trams were projected to circulate on difficult routes, with steep slopes, having at the same time system of articulation that helps them in making tight turns. From the 104 vehicles only one was quashed (no.330) after an accident in March 2006. The physical and moral wearing leaves a mark, especially on the standard wagons, the retirement of these representative vehicles for Iași not being delayed too long. The difficult financial context excludes the possibility of buying new tram wagons to correspond the current aesthetic and technical requirements.

The modernization of these public means of conveyance represents the ideal solution that implies the combination of the two requirements at a good price.

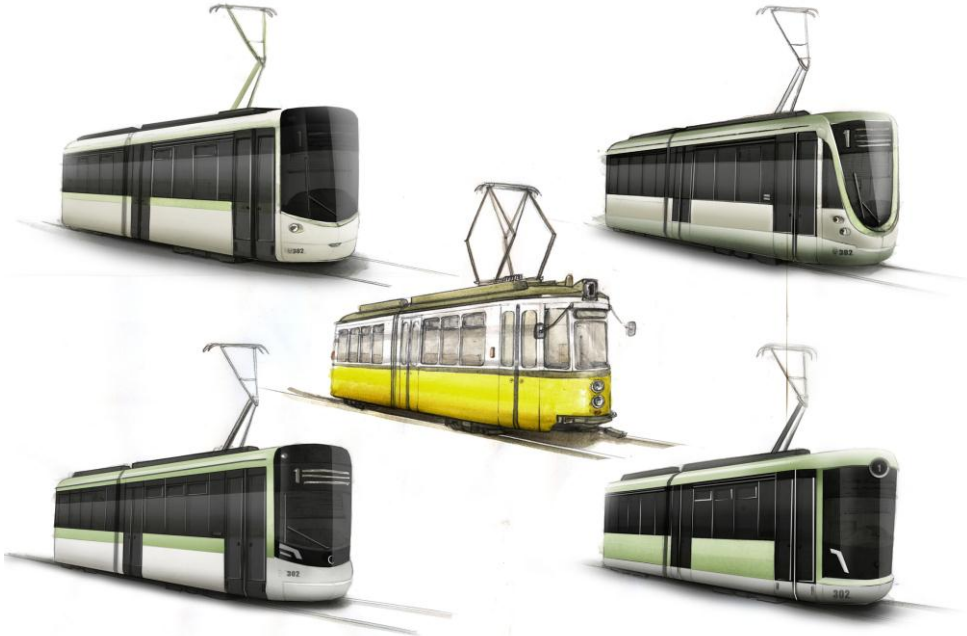


Fig. 4 – Variants of exterior modernization of the GT4 tram
(designer Silviu Teodor-Stanciu)

In order to design a new concept which would correspond the technical data which has to remain unchanged, but would bring many benefits from a functional, aesthetic, ergonomic point of view and for a better harmonization with the environment, one would have to take into account the following (fig. 4):

- Modernization of the front area and posterior one through the interpretation of characteristic elements which provided the identity of the standard vehicle;
- Enlargement of the glass area in order to enlarge the view on the environment;
- Digital display;
- Video surveillance system (outside, inside);
- Passenger protection increase in case of a frontal impact;
- Reconfiguration of the disposing of the seats in the interior for a more efficient interior circulation and comfort;
- A special space for bicycles or perambulators;
- A special warning system for the tramcar driver in case of danger;
- Air conditioning system (tramcar driver’s cabin, interior);
- Efficient system of bearer bars (fig. 5);
- Fluorescent lighting system;
- Trash baskets next to each access door;

- Creation of an ergonomic driver's compartment;
- Usage of washable and resistant to wearing materials to upholster the interior;
- Usage of materials made of linen, hemp, ecologic leather for the tapestry of the seats (fig.5);
- Usage of water- based paint;
- Usage of new motors (alternative electricity), pantograph, efficient braking system;
- Adaptation of a chromatics according to the environment requirements and the aesthetic implications of a product (fig. 5).



Fig. 5 – Variant of interior modernization of the GT4 tram
(designer Silviu Teodor-Stanciu)



Fig. 6 – Chromatic variants
(designer Silviu Teodor-Stanciu)

CONCLUSIONS

The concept represents the result of the modernization of the GT4 tram, released on the market in 1959. The tram became a symbol not only for Stuttgart, the city where it functioned over 40 years, but also for Iasi, the foster urban centre of these vehicles beginning with 1997.

The classic allure of GT4 is in harmony with the architectural elements of the historic centre, but it proves obsolete for modern routes, guarded by imposing steel and glass buildings.

In order to modernize it, the front shape will be an Avant-garde inspired one, which would maintain the characteristic elements of the identity of the vehicle, such as the shape of the headlights and their position, the front display, the lateral drainage board, assumed and adapted elements to the concept which offers it the chance of integration both in ancient, as well as modern areas of the city.

Also, the rounded, organic shape, the large windows and the chromatic variants inspired from the vegetal spectrum, successfully fits the vehicle in the landscape of the environment.

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ERGONOMIC STUDY ABOUT SITTING PLACES IN LANDSCAPE DESIGN DOMAIN

STUDIUL ERGONOMIC PRIVIND LOCURILE DE ȘEDERE DIN DOMENIUL PROIECTĂRII PEISAGISTICE

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Abstract. *Applying ergonomic principles in landscape design may aim to identify areas of interest on both the organization stages of design and implementation of a design concept. The paper highlights both the principles of organization of specific workplace landscape designers and highlight issues related to design rules of a specific area landscape design.*

Key words: ergonomics, landscape architecture, design

Rezumat. *Aplicarea principiilor ergonomiei în domeniul designului peisager poate avea ca obiectiv identificarea zonelor de interes privind atât organizarea etapelor de proiectare, cât și realizarea unui concept de design. În acest sens, lucrarea evidențiază atât principiile de organizare a locului de muncă specific proiectanților peisagiști, cât și evidențierea problematichilor legate de regulile de proiectare ale unui spațiu specific designului peisager.*

Cuvinte cheie: ergonomie, arhitectura peisagera, proiectare

INTRODUCTION

Usability implications are found in all activities that occur in landscape architecture. The designers who work in offices, staff working outdoors and those who enjoy the landscape facilities, they all need different kind of tools, or furniture that is easy to handle so it could potentiate their creativity and provide psychophysical comfort (Enache I., 2002).

Design ergonomics aims through its studies each category involved in the landscape architecture, either in concept or as a beneficiary. The basic idea of the project is to create a common product for desk activities, the ergonomic chair, that totals harmoniously ergonomic, aesthetic and anthroposophic standards and whose design follows specific steps to meet the design process. In pursuit of this product should be carried out both theoretical and practical research.

MATERIAL AND METHOD

The main item of furniture that is found in all areas of activity is the chair. Theoretical research undertaken highlighted the fact that an ergonomic chair should meet certain requirements for a comfortable position: feet supported on the floor; thighs completely seated on seat that is parallel with the floor; back rested against a comfortable backrest to allow a slight tilt back and frequent changes of position; the angle between the thighs and back should be between 90° and 105° (Christopher J.,

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1975; Enache I., 2002). Research conducted for the realization of this project were based on two comparative studies, which concluded in optimal setting size for ergonomic office chairs. The first study summarizes the general ergonomic sizes, as showed in fig. 1. The second study was conducted with people of different genders and different heights. The first subject examined is female and has 1.65 m in height, as showed in fig. 2a. Red arrows, as showed in fig. 2, indicate areas of contact between the back and backrest (for a good analysis milimetric paper was used in the background). The height of the seat used for all subjects (up to the seat) is 45 cm. The second subject examined is male and has 1.70 m in height, as showed in fig. 2b. The third subject considered is male and has 1.75 m in height, as showed in fig. 2c. The fourth subject considered is male and has 1.80 m in height, as showed in fig. 2d.

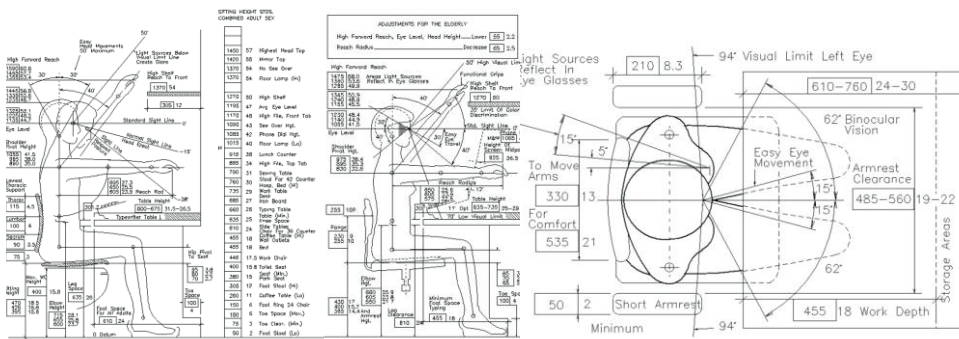


Fig. 1 – Ergonomic dimensions synthesis

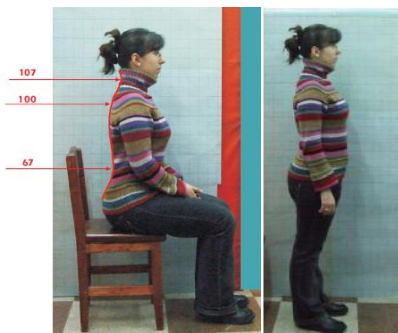


Fig. 2a - Female H=1,65m



Fig. 2b - Male H=1,7m

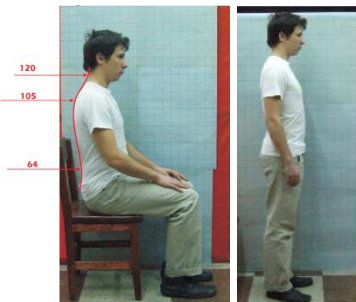


Fig. 2c - Male H=1,75m

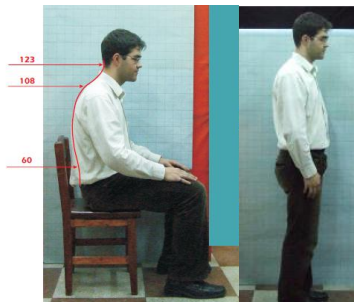


Fig. 2d - Male H=1,80m

As a result of the comparison of both studies it was noticed that minima and maxima of the analyzed dimensions provides similar information as showed in table 1. The unit used is cm.

Table 1

Comparative dimensional analysis

areas	First study			Second study		
	Minim	Maxim	Variation	Minim	Maxim	Variation
cervical	94	118	20	107	123	16
thoracal	85	105	20	100	107	7
lumbar	61	73	12	58	67	11

RESULTS AND DISCUSSIONS

The basic idea is to create an ergonomic furniture (Enache I., 2002), that incorporates in a harmonious way, ergonomic, anthroposophic and aesthetic standards. The main elements taken into account are:

- The backrest: should be folding so as to enable the user to adopt different positions depending on the work performed (eg. keyboard writing, text reading, etc.); to allow vertical sliding to accommodate curvature of the spine depending on the height of the user; to ensure proper sizing of lower back to prevent discomfort and spine deformities.
- The seat: it is possible to adjust the height of the seat position to permit the feet to rest perpendicular to the floor; provide seat angle changes in relation to the floor to allow the takeover of the upper body weight to reduce the weight pressing on inter-vertebral discs; adjusting the depth of the seat to allow both to higher and shorter people to seat comfortable.
- The handles: height adjustment to suit users anatomy and to be lowered when executing a task requiring free movement of arms; changing the distance between the handles is important to prevent the elbows from slipping which would lead the wrist to one side while working at the computer; convenience to avoid pressure side of the elbow and forearm, which is why upholstered handles are recommended.
- The rollers: are important to ensure easy movement of the seat in different positions. For this is recommend to use a minimum number of five wheels.

Following this research were established gauge dimensions for the chair. To check the accuracy of the scale, a virtual model of 1:5 scale (a chair and a model that respects human proportions) was made, as showed in fig. 3. In making of the model the dimensions used were of appropriate size for a 1.90 m person, the manikin used in compliance with the appropriate size for this height. Seat dimensions can be changed using various mechanisms to adapt to smaller stature persons.

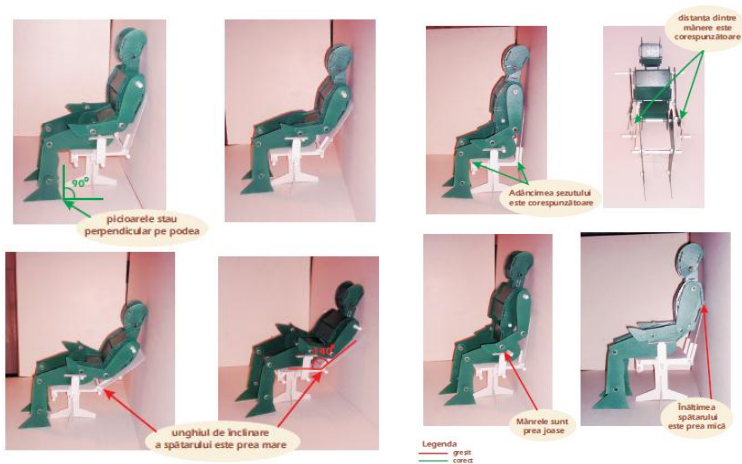


Fig.3 – Analysis of the model

As a result of the analysis of the model some elements were crystallized.

What is correct: the seat height is appropriate because, according to the model, user's feet will sit perpendicular to the floor; distance between handles is appropriate because it will allow the user to support the arms, assuring them the necessary space for movement; depth and seat width are proportional to the corresponding human scale.

What has to be changed: height of the back, being too small does not provide full coverage of the back (this can cause discomfort and deformity of the spine); the maximum angle of inclination of the backrest is too high (being an office chair is not justified to use an angle so large for the backrest); height of handles should be modified to provide the necessary support. An inadequate position of the hands can lead to pain, muscle spasms and cramps. All this leads to reduced yields.

After analyzing the proposals named above, a new model to correct malfunctions was made. Thus a 1:1 scale polystyrene model was made, as showed in fig. 4. At this stage it is proposed a more compact form, to support the entire width of the back. The thoracic cushion was reduced in length, and a curve was added on top to support the shoulder without limiting the free movement of the arms. Adding this curve led to a larger backrest. To balance backrest's size, the pillows will be reduced until a balance is reached. It was noticed that the bulge in the lumbar area should be reduced in order not to hamper the spine, and the cushion supporting the neck should be modified. Its dimensions are too large and limit the natural movement of the head. Seat cushion is provided with an angle of inclination towards the rear to help distribute pressure on the inter-vertebral discs. Also it was noticed that this angle is too sharp at the front, and it's uncomfortable for the legs. The ascended sides of the seat have a supporting role.

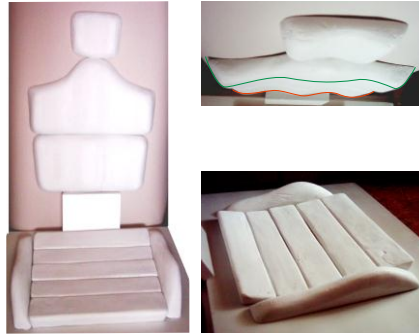


Fig.4 – Polyester model, 1:1 scale

The final concept has the following types of adjustments:

- seat height allows lifting or lowering the seat to allow user's feet to sit perpendicular on the floor; the seat depth allows the user to move forward and backward to enlarge or shrink the sitting space; the angle of rotation of the seat allows the inclination of the seat with approx. 10° . This helps distribute partial upper body weight, easing the weight pressing on the intervertebral discs. This type of control can be used when the backrest is inclined to maintain a constant angle between the spine and legs.
- rotation angle of the backrest permits inclination of the backrest with approx. 20° to allow the user to adopt different positions depending on the type of activity.
- the height of the handles can be adjusted depending on the size of user's arms.
- handles angle: the upholstered part of the handles can be rotated so that when the backrest is rotated at a certain angle it allows repositioning the handles.
- Height adjustment will be made by lowering and lifting each pillow individually. This allows each user to match corresponding back cushions to their spine curvature (cervical, thoracic and lumbar curves). The pillow corresponding with the cervical area has an extra possibility to be adjusted also in depth (front-to-back).



Fig. 5 – Final concept

The following materials are recommended for the final ecological version: textile (natural fibers) or natural/ecological leather. Chair legs can be

made of plastic (for economic models) or chrome. Rubber rollers can have different colors matched with seat cushions. The cushions will be attached in the plastic housings of neutral color (gray). Plastic material will be used for the sliding casing of the back cushions. The axis on which the handles are mounted will be made of plastic or chrome. The final concept is presented in fig. 5.

CONCLUSIONS

1. Using non-ergonomic chairs can create both physical and psychological discomfort in the office which may ultimately lead to various diseases.

2. Ergonomic chairs should prevent and diminish health problems especially the ones affecting the spine. The main purpose of this chair is to facilitate work and to maintain proper posture to reduce the risk of muscles and joints pain, deformation of the spine and in particular to reduce stress.

3. The results of the ergonomic study can be extended to landscape designing of seating places in the landscapes and outdoor spaces.

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TREE FOLIAGE, AS MAIN SOURCE OF COLOR IN LANDSCAPE COMPOSITION

FRUNZIȘUL POMILOR, PRVIT CA PRINCIPALA SURSĂ DE CULOARE FOLOSITĂ ÎN COMPOZIȚIILE PEISAGERE

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Abstract . Colour is a controversial topic. In fact there are not two people to perceive colours the same, and therefore the harmony of colours can be easily applied in landscape arrangements. To this end in this paper we conducted a study on how the leaves colours provides a decorative effect that lasts more in gardens than in other compositional elements. Colour, although it is fleeting and capricious, can generally be used as a good background for proper closure of a perspective, could be an important focal point, also well-placed decorative masses through the foliage, creates a pleasant garden, decorative, throughout all twelve months of the year.

Key words: colour, harmony, accents, foliage, design

Rezumat. Culoarea este un subiect controversat. Într-adevăr, nu sunt două persoane care să perceapă culorile la fel și, din această cauză, armonia culorilor nu poate fi foarte ușor aplicată în amenajările peisagistice. În acest scop, în lucrarea de față am efectuat un studiu cu privire la modul în care culorile funzelor oferă în grădini un efect decorativ mai îndelungat decât celelalte elemente compoziționale. Culoarea, deși este trecătoare și capricioasă, poate fi în general utilizată ca un fundal bun pentru închiderea adecvată a unei perspective, poate constitui un punct focal de importanță, de asemenea mase bine plasate decorative prin frunziș, crează o gradină care este plăcută, decorativă de-a lungul tuturor celor douăsprezece luni ale anului.

Cuvinte cheie: culoare, armonie, accente, frunziș , amenajare

INTRODUCTION

Colour is neither the beginning nor the end of a garden. It is only a means to create special compositions. Colour has to be taken into consideration along with the other principles used to create a successful artistic expression. Colour by itself cannot influence the landscape. Colour should be used to offer accents, create balance, order and rhythm, compositional frames and centres. These are more useful in the landscaping of a pleasant garden than all the subtle colour harmonies that have ever been tried.

The positioning and proportion of colour groups are also important. The colour, for any season, should not be focused on a single flower bed to lead to the elimination of others. The basic colour used for a layout has to be found in the entire garden, so as to create the illusion of abundance.

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The simplicity of the effect is always important. Because we cannot control the effects of the sunlight and shadow, we must always consider the competition of green in the surrounding landscape and the blue of the sky, as colour in gardens cannot be used as in the other arts (Posedaru Elena-Alina, 2008).

MATERIAL AND METHOD

Colours can be placed in such a way so as to draw our attention away from that places where certain tree groups are approaching the end of the vegetation period, or have not started to vegetate yet.

The balance can be underlined through the appropriate assignment of colours. When we use species with a leafage of a stronger colour, these should be positioned near a group with a simple green, abundant foliage in order to draw attention to the basic colour. When larger groups of a lighter, brighter colour are used, you should add several smaller groups of a darker or stronger colour, in order to bring more harmony to the whole setup.

For a more proper decorative effect, we will avoid placing bright colours focused on a single location, and the dull ones separately, except for the cases when the bright colours are partially located in the shade.

When strong colours are placed near lighter ones, the strong ones lose part of their expressivity and appear to be more discrete, while the lighter ones take on part of the brightness of the others.

The dominating colour is green, in a variety of shades, as you can clearly see in figure 1, to which a series of other colours: red, yellow, blue-silver, in uniform or varied forms, are added, depending on the species or variety.



Fig. 1 - Example of landscaping setup where various shades of green from the foliage of various *Cornus* species dominate the landscape (www.flicker.fr)

During certain periods throughout vegetation, from spring to autumn, transitory colours should be considered. The apple tree *pumila*, namely "*Niedzwetzyana*" has red young leaves which then turn brown-bronze, while only the median nerve and petiole remain red (Băltărețu A., 1980).

In a landscaping setup, the correct association of colours is essential, so that, the following species have been taken into consideration in order to create a total balance of colours in a setup, depending on the colour of the leaves:

Corylus avellana 'Zellernus' with large leaves, purple in spring, get dark green at the beginning of summer.

Corylus annys has large, dark-red – cherry, red leaves.

Cornus mas with oval leaves, raw green in the middle with silver margins, become scarlet during autumn.

Cornus californica with leaves usually green, raw green during the year, which become pink with purple shades during autumn.

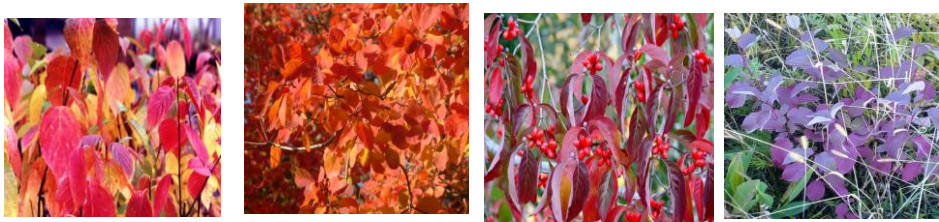
Cornus alba 'Spaethii' with golden-green young leaves and dark green mature leaves, gets a bright red and crimson colour during autumn.

Cornus stolonifera has prolonged opposed leaves, dark green on the upper side and blue-green on the lower side, in the winter they become red or scarlet.

Malus ionensis 'Plena' variety has leaves that are dark green on the upper side and yellow-green on the back side, and in autumn they become yellow or dark red. Such a rich colour variety allows the creation of some special painting-like effects.



a) *C. alba* 'Spaethii' b) *C. californica* c) *C. mas* 'Variegata' d) *C. florida* 'Rubra'



e) *C. stolonifera* (autumn) f) *C. floribunda* (autumn) g) *C. florida* (autumn) h) *C. sericea* (autumn)

Fig. 2 (a-h) - *Cornus* species variety (www.rizreyes.com)

Prunus avium has large leaves, green in autumn that turn red.

Pyrus communis has green shiny leaves in summer that turn brown-red in autumn.

Pyrus nivalis with oval, tomentose leaves, on both sides, in autumn they get dark red, beautifully illustrated in figure 3.

As a working method, observations have been made on decorative species, and people have studied the way the leafage of trees influence the aspect of a setup. Thus it has been established, that the most beautiful and subtle colour associations are found separately from complementary colours in the tretads and triads of tree groups (Posedaru Alina, 2000).



a) *Pyrus calleryana*
(autumn)



b) *Pyrus amygdaliformis*
(autumn)



c) *Pyrus nivalis* 'Catalia'
(summer)

Fig. 3 (a-c) - Leaves colour at pear ornamental varieties (www.wikimedia.org)

Each colour has a complementary one situated right on the other side of the chromatic circle that does not have the same pigment portions. They are thus opposed; they strengthen and mutually strengthen their effect.

It is interesting to know that each colour of the spectrum has its complement in other colours of the spectrum. To create a well balanced setup, the neighbouring colours also play an important part (Starmer Anna, 2009).



Fig. 4 – 1. Primary colors, 2. & 3. Secondary colors

There are people for whom a single colour brings them pleasure, and there are others that seek the harmony of a multitude of colours. For the latter, the creation of harmonious contrasts between two or more colours is the ideal of happiness, the pleasure to enjoy watching.

Various harmonious combinations can be found on the chromatic circle, following the different position of some geometrical shapes such as: isosceles triangle, square, rectangle, and hexagon.

As shown, the harmony of colours is the successful combination of more colours. The aim is to make a colour stand out, as opposed to another.

To this purpose, the nature gives us an important lesson in art and good taste.

The sense of colour, especially that regarding the harmony of colours, can be gained after a certain education, and the one that creates a landscaping setup has to do its best to develop his or her sense of colour.

It is important to note that you can never get a harmonious setup unless the three primary colours can be found in the same landscaping setup, and that for obtaining a degrade of shades in a garden; you should select one primary colour, never two primary colours (fig. 4).

RESULTS AND DISCUSSIONS

The study will focus on the leaves of decorative tree species during the vegetation period, a special attention being offered to the changes that these go through in every season.

In connection to the surroundings, the colours that differ draw attention the most. Any colour seems stronger, the less it is present in the surrounding area of the visual field, as you can clearly see in figure 5. The stronger the difference between it and the surroundings, the higher the colour contrast.



Fig.5 - Image where the red of the *Cornus* leaves, contrast with the dark green of *Lonicera* and the yellow of the *Pyrus* (photo taken in arboretum Hemeius, original)

The way to perceive colours is influenced by the quantity of colour, the light, the surroundings etc.

If the light dims, the way we perceive colours changes as well. They lose brightness, but not to the same degree. This is why, at dawn, the purple leaves that had the strongest effect, seem almost black; the blue flowers begin to shine, and green seems lighter than yellow (Starmer Ana, 2009).

Rarely, in nature, the foliage of trees includes pure colours. Moreover, the bright colours on one side and the light colours on the other enlarge the range of colours.



Fig. 6 - The special chromatic effect created through the contract of ornamental trees' colours (original)

The quantity of colour plays an important part in landscaping. Yellow has the greatest brightness, violet the slightest. In such an association, the second colour would have to be in a higher quantity (fig. 7).

Goethe sees complementary colours as the perfect harmony (Goethe, 1995).

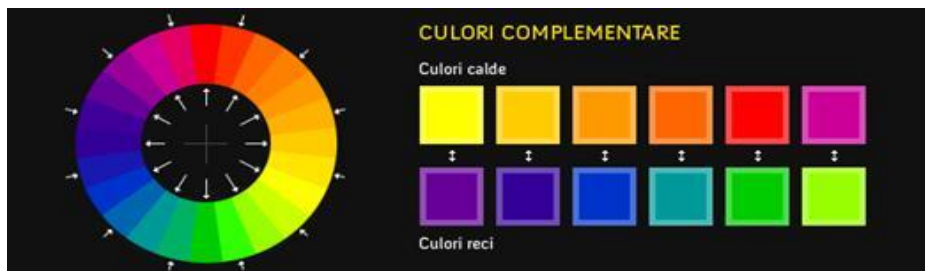


Fig.7 - Complementary colours

The highest colour effect is that of red, since it excites the eye to the highest extent and draws the most attention. In nature, red is rarer than blue and yellow.

When it comes to colour harmony, the colours are most harmonious when, if put one next to the other, they pleasantly impress the eye (Şelaru Elena, 2004).

CONCLUSIONS

1. The spatial volumetric compositions of tree groups have to also consider colour relations in which green, the dominant colour is enhanced by various chromatic accents with special effects, as you can clearly see in figure 6.

2. It has been noted, many times, that a one-colour setup should be preferred to one with a discordant contrast, with disharmonious combinations.

3. The harmony of colours in a landscaping setup can be largely influenced not only by the shade but also by the line and texture of the leaves.

4. The chromatic effect of darker leaves creates the impression of compactness, thickness and weight, and the light leaves create the impression of raveling.

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PRACTICAL SOLUTIONS IN CHOOSING PLANT COMPOSITION FOR LANDSCAPING

SOLUȚII PRACTICE ÎN REALIZAREA UNOR COMPOZIȚII VEGETALE PENTRU AMENAJĂRILE PEISAGISTICE

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Abstract. *In the landscaping can be used several types of plants designed to give the space a dynamism in shape and colour, a pleasant ambience, ensuring unity of the whole overall. One way to influence the image of a planted area is by creating a game between colour and texture, shadow and light. Thus, the methods used in determining the plant composition for landscaping may be used seasonal planting schemes or planting schemes using dominant colours. The effect is that we get a focal point but other colours than the dominant one can be placed in smaller, contrasting groups using species with decorative foliage or fruits. When used in this way, the colours used quantitatively less do not compete but increase the decorative effect. For each planning the approach is different because the environment is unique, so the solution will be unique. The present paper wants to offer concrete solutions to create harmonious plant compositions more easily addressed by practitioners.*

Key words: landscaping, plant compositions, colouristic effects

Rezumat. *În cadrul amenajărilor peisagere se pot folosi o serie de tipuri de plante menite să confere spațiului jocuri de formă și culoare, ambianță plăcută și unitatea întregului ansamblu. Un mod de a influența imaginea unui spațiu plantat este prin realizarea unui joc între culoare și textură, umbră și lumină. Astfel, ca metode folosite în determinarea compozițiilor vegetale pentru amenajările peisagere se pot utiliza scheme de plantare sezoniere sau scheme de plantare utilizând culori dominante. Efectul este că se obține un punct de interes în care alte culori decât cea dominantă pot fi introduse în grupuri mai mici, contrastante cu specii decorative prin frunze sau fructe. Atunci când sunt utilizate în acest mod, culorile cantitativ mai puține nu concurează, ci accentuează. Pentru fiecare amenajare abordarea este diferită pentru că mediul înconjurător este unic, deci și soluția va fi unică. Lucrarea de față dorește să ofere soluții concrete de realizare a unor compoziții vegetale armonioase mai ușor de abordat de către practicieni.*

Cuvinte cheie: amenajare peisagistică, compoziții vegetale, efecte coloristice

INTRODUCTION

Plant colour in garden design is immensely important and can be utilized to create focal points in the landscape. Dark-coloured plants contrasted with light-coloured plants draw one's attention in a planting composition. For instance,

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unique, colourful foliage, like the reddish bronze of the smoke bush, stands out among the various greens of garden

Garden designs which rely on few elements in terms of plant species, form, colour and texture often produce the most successful compositions. One basic design principle is to group plants into massings that contain three, five, or seven shrubs rather than placing individual plants here and there. As individual plants grow together they become visually read as clusters of colour or textures and not single specimens (Hubhouse Penelope, 1997, Hackett B., 1979).

One way to influence the image of a planted area is by creating a play between colour and texture, shadow and light. Thus, in terms of compositional contrast or harmony, colour or volumetric configuration, we can get interesting and spectacular effects. We can create a composition whose background is made from a tree with light green leaves. These trees are well located, in rhythmic repetition, and in front of them, in the near foreground can be added decorative trees with yellow to red-brick foliage, placed in different size groups. In the front may be planted flower species and ornamental shrubs. All this will be true colour spots on a fresh green lawn. Imagination is the key to a successful solution, and the possibilities are endless (Iliescu Ana Felicia, 2006).

MATERIAL AND METHOD

If we rely on nature's seasonal colours, yellow and white for spring, pink for early summer, blue and gold for mid-summer, dark-pink for late summer and blue, purple and gold for the fall, will not be too difficult to have a abundant colour throughout the year. Although nature has not subtle harmonies, still has a generous offer.

In the present paper we have tried several variations of plant composition using **plantation schemes using dominant colours**. Thus, large groups of flowers are spread over each flowering season. The effect is that you get a single color, but other colors can be placed in smaller groups with contrasting decorative foliage and species as the dominant element. When used in this way, the colors less quantity do not compete but increase the decorative effect.

Planning should start from an analysis of existing situation and starting with having a vision of the final product. There can be set a main concept of the garden, such an approach to romantic or informal compositions. Than the planting has to be made according to the needs of each plant individually. The combinations are virtually infinite and unique.

RESULTS AND DISCUSSIONS

The first step in planning a garden is to determine whether or not we need a fence. Garden can be surrounded by an artificial or natural fence or just can be an open garden. An interesting solution and very easy to be put into practice could be a wooden fence in combination with shrubs and flowers in bright colours that would blur the fence stiffness (fig. 1). To this end we may use the following species: *Forsythia*, *Aster*, *Hibiscus*, *Astilbe*, *Gazania*, *Tagetes*, *Lavandula*. If already exists a built fence, we can mitigate its austerity using with climbing plants: *Ipomoea*, *Clematis*, *Wisteria*, *Parthenocissus*, *Lonicera*, *Bignonia*, *Tecoma* etc. (Bernardis R., 2010; Draghia Lucia, 2004; Şelaru Elena, 2007)

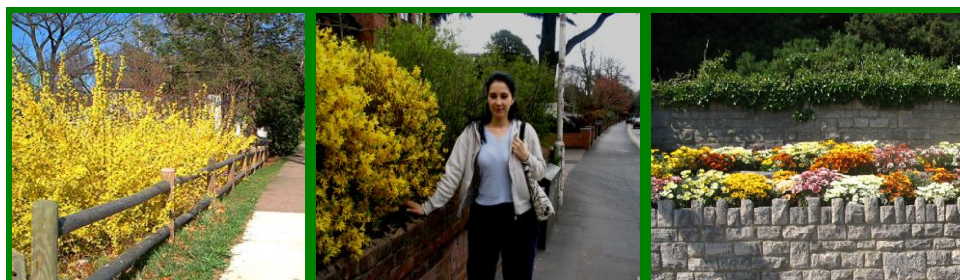


Fig. 1 - Using shrubs and flowers in the construction of a fence to mitigate its sobriety (original)

The next step is choosing the wood species and must not forget that by planting trees, they will stay put for a long time. No garden can be so small that it does not fit at least one tree in it. In the absence of sufficient space can opt for medium-sized species.

Juxtaposition creates visual interest in the garden and is most often achieved with plant form, texture or colour. For example, a tall, upright shrub planted within a shrub border of spreading and round shrubs will stand out. Columnar and pyramidal-shaped plants, such as *Taxus baccata* or *Thuja*, have visual characteristics that suggest vertical edges in an outdoor space. They create a major contrast with the more common rounded or spreading plants.



Fig. 2 - Medium size vegetation used in small gardens as dominant elements (original)

Emphasising one element in the composition can create a focal point in the garden. Size, such as a large shade tree, can achieve this. Contrast and the juxtaposition of colours, forms or textures can also draw attention to a feature in the landscape. For example, *Corylus avellana* 'Contorta', with its tortuous branches becomes a focal point if it is planted among shrubs with straight branches and fine foliage such as *Ligustrum* or *Hibiscus*.

Another decorative specie is Japanese cherry tree, which gives a real show in the flowering period. White-pink petals falling as a rain and pleasant scent will assail your senses and human emotions.

Medium size vegetation may be composed of decorative small trees and shrubs as: *Malus pumila*, *Magnolia* sp., *Cercis siliquastrum*, *Sorbus aucuparia* (fig. 2.), *Syringa vulgaris*, *Forsythia x intermedia*, *Buxus sempervirens* etc. Depending on the personality of each garden owner we will choose different species. Customization is an important factor in this field, as in architecture and urbanism.



Fig. 3 - Climbing plants used to cover pergolas – *Wisteria* sp. (original)

Decorative items, are almost always present in garden design. Pergolas creates a wonderful natural roof, tempting cool areas for terraces and gardens, is our invaluable ally in the hot summer days. On a terrace or a garden can be used a wooden or metal structure, which may be covered with a cloth or braided cane (Hessayon D.G., 2005). But, for a more effect is used a natural arrangement of climbing plants, often fragrant (fig. 3.). To cover pergolas can be used *Wisteria*, *Rosa*, *Clematis*, *Lonicera* (decorative through flowers) and *Parthenocissus*, *Hedera* (decorative through the leaves).

Colouristic schemes. Colour scheme will help create an overall feeling in the garden, green is a constant in the landscape and will dominate the garden, especially through spring and summer. A variety of greens has more visual appeal than a uniform shade of green. A common mistake gardeners make is to use too many different colours. Try to choose few colours and one as an overall theme. This will help to tie all the elements of you garden together, creating unity (Dumitraş Adelina et al, 2008).

Single colour themes could also give a wonderful effect, and it is interesting that different colour themes may be suited to different locations and conditions: yellow tones bring vitality in the shade of buildings and many yellow flower and foliage plants prefer the low light of such locations. Most blue flowered and silver or grey foliated plants, on the other hand, need full sun and warm conditions to grow well and develop their most effective foliage colours. This is because the grey or silver leaf colour that arises from a woolly or 'tomentose' leaf surface is usually an adaptation to moisture stress or intense sunlight in the plant's natural habitat.

In the following figures (fig. 4 and 5) are presented some planting schemes using dominant colours. The effect of one colour scheme will be even stronger when, by juxtaposition of rightly placed complementary colours are added.

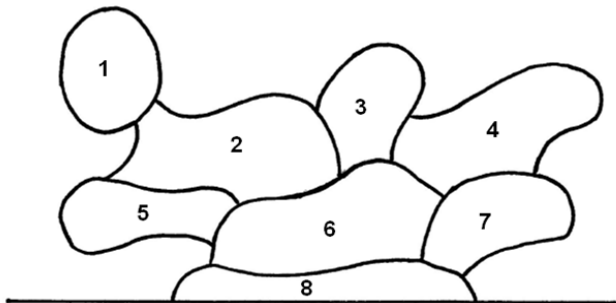


Fig. 4 - Planting scheme using blue as dominant colour

1. *Rosa* sp. – variety with white flowers
2. *Myosotis alpestris*
3. *Iris germanica*
4. *Veronica longifolia*
5. *Clematis alpina*
6. *Coreopsis lanceolata*
7. *Delphinium chinensis*
8. *Dianthus barbatus* – variety with white flowers

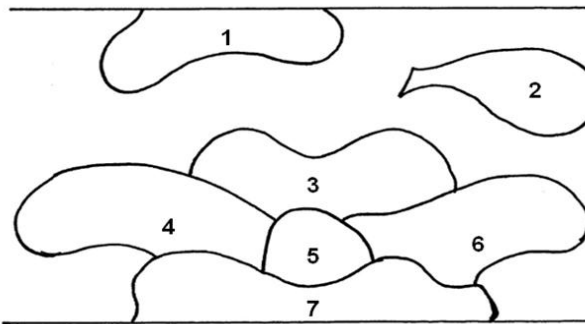


Fig. 5 - Planting scheme using orange as dominant colour

1. *Phlox paniculata* – variety with blue flowers
2. *Helenium autumnale*
3. *Chrysanthemum* sp. – variety with yellow flowers
4. *Chrysanthemum* sp. – variety with orange flowers
5. *Salvia farinacea*
6. *Rudbeckia hirta*
7. *Aster alpinus*

A richly coloured scheme would create character of summer intensity and would work well in the clear bright light. *Hibiscus*, *Bougainvillea* and *Cannas* all look their best and belong together in the brilliant light and strong shadows of summer days.

Repetition is a planting design principle which can create a feeling of rhythm when moving the landscape (Muja S., 1994). This can be achieved by planting the same or similar plants in different parts of the garden. Repeating patterns in the design can also help create unity in the composition.

In the garden, composition includes planning for season changes in the landscape. That's why we have to try to incorporate, in our design, plants which have year-round decorative aspect. A good example is planting several small trees and shrubs that will flower in the spring, offer lush foliage through the summer, provide colour in the fall with its foliage and form fruits which can last through the winter.

The success of the restricted colour themes like white gardens is partly thanks to the variety and emphasis the foliage add to the scheme. This is strongest for a red colour theme in which the red flower hues are complemented by the

foliage greens, but in other colour themes as well there will still be enough variety in the foliage to liven up the composition and have unity.

Well balanced, dual colour themes can also unify a planting scheme. The contrast and enhancement of complementary colours is most powerful when each hue is restricted to a narrow range. Colour composition can be based on value (darkness or lightness) and intensity (richness of colour) rather than just on hue – light colour flower and grey foliage are given unity by the grey or white that is found in all the pastel hues.

CONCLUSIONS

Successful gardening design requires learning certain skills and following some simple principles, but the final result can be perceived differently, after all, a garden's beauty is in the eye of the beholder. There are no fixed rules to garden design. But there are a few elements of composition that will serve the garden designer well, when combining plants. And the only way to get good at garden design is to do it.

In order to have a pleasant decorative effect in planting colour schemes we have to keep in mind some aspects:

- for monochromatic combinations choose one hue and using it in its various shades, tints and tones;
- for contrasting combinations favour one colour and use the other as an accent or focal point;
- use texture and form for variety, rather than too much colour.

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THE ROLE OF IMAGINARY IN THE TRANSITION FROM MODERNISM TO POSTMODERNISM

ROLUL IMAGINARULUI ÎN TRANZIȚIA DE LA MODERNISM LA POSTMODERNISM

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Abstract. The transition from modernism to postmodernism represents a long and complex process that characterizes contemporary western culture, especially art and aesthetics. With in such a complex process that involved important changes in attitudes towards multiculturalism and questioning of some basic concepts like “reality” and “identity”, imagination plays an important part. The present paper intends to emphasize the way in which artistic imaginary is involved in the transition from modern to postmodern paradigm in art and aesthetics.

Key words: aesthetics, artistic imaginary, knowledge society, postmodernism.

Rezumat. Tranziția de la modernism la postmodernism reprezintă un lung și complex proces ce caracterizează cultura occidentală, în special arta și estetica. În cadrul unui asemenea proces ce a presupus importante schimbări de atitudine față de multiculturalism, antrenând totodată punerea în discuție au nor concepte fundamentale, cum ar fi cel de „realitate” sau cel de „identitate”, imaginația joacă un rol important. Lucrarea de față își propune să evidențieze modul în care imaginarul artistic este implicat în tranziția de la paradigma modernă la cea postmodernă.

Cuvinte cheie: estetică, imaginar artistic, societatea cunoașterii, postmodernism.

INTRODUCTION

The present paper aims to emphasize the role of imaginary in the transition from modernism to postmodernism. In order to do that, we are going to use the concept of descriptive imaginary. Initially, we introduced this concept in association with philosophy of science problems. In that context, the concept of descriptive imaginary referred to the use of imaginative faculty within the limits of rationality in scientific discourse. This way, the concept could be used for investigating the dynamics of scientific representations responsible for the major changing moments in the history of natural sciences. However, giving the fact that the applicability area of descriptive imaginary is much wider, this time we are going to develop its links to aesthetics.

MATERIAL AND METHOD

First of all, we have to justify the necessity of using this concept which relates human imagination to rationality. Traditionally, the two areas have been opposed for a long time, at least in Western culture (Védrine Hélène, 1990). Starting from Plato,

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imagination was regarded as having a difficult relation with scientific knowledge. Such reluctances prolonged through whole Ancient and Medieval history of Western culture (Bodinier J.L., Breteau J., 2000). In times of Reform also, any imaginative excess has been regarded as dangerous for any religious or scientific attempt of establishing a knowledge base about the world (Culianu I.P., 1994). However, the birth of modern natural sciences could not have been possible without an imaginative effort of describing the laws on nature in a rational manner, which implied also the effort of conceptualizing natural phenomena. Hence, the use of imaginative faculty takes place within the limits of rationality, in the descriptive effort of depicting the structure of natural causes that determine natural phenomena. Moreover, as part of the effort of establishing the ontology about the "real" world, human imagination plays an important role in the endeavor of producing the "image of the real world" that we use to call "reality". But imagination also plays an important part in art. Of course, artistic imagination has a weaker relation with human rationality than scientific imagination (Barbour Ian G., 1990). Still, that relation exists and we believe one can trace a connection line between the two. That is why we consider descriptive imaginary could be used as a tool concept for investigating the relation of artistic imagination with rationality throughout the recent history of art, namely modern and postmodern times.

RESULTS AND DISCUSSIONS

To better understand the specificity of using the artistic imagination in modern art, one has to uncover the philosophical roots of modernity. In this respect, Friedrich Nietzsche was maybe the first one to observe the profound changes that took place in Western culture at the end of Enlightenment period. The most visible one regards the attitude towards religion. At the basis of such an attitude lay the positive attitude towards human reason and its capacity of providing a trustful basis for developing science. In fact, the late Renaissance witnessed a reorientation of Western culture from theological problems, dominant in the Middle Age, to more pragmatic problems that favored the maturation of different scientific disciplines, including the humanistic ones.

Human Being became an obsessive investigation subject for Renaissance writers, scientists and artists, while human reason became the distinctive attribute of mankind (Russ Jacqueline, 2002). We could say that in Renaissance took place a veritable „Socratic Turn” in cultural areas, similar to the much later „Linguistic Turn” in analytical philosophy or „Social Turn” in philosophy of science. Such a phenomenon has been accompanied by important scientific discoveries and artistic innovations which contributed significantly to the rise of artistic realism. Among them, we could mention the three dimensional perspective in painting, introduced by Brunelleschi, the *sfumatto* technique introduced by Da Vinci or the careful treatment of anatomical details in painting and sculpture mastered by Michelangelo.

Moreover, human body started to be used in an allegorical manner for representing the Universal Creation. Gradually, the old image about Nature has been replaced by a completely different one. Altogether with the rise of the Enlightenment ideas about a more democratic society (Macfarlane A., 2002), the enthusiasm regarding the possibility of reflecting not only about the appearances of natural phenomena, but merely about the hidden causal chain that determined the manifestation of phenomena in the surrounding world was the main aspect that gave humans a special status in comparison with Nature. Thus, Human Being became privileged in comparison with

any other part of nature because human rationality gave it descriptive powers. Basically, knowledge was seen as being certain, objective and good (Grenz S., 1996). People like Galileo, Newton and many others demonstrated the power of human descriptive faculties by developing natural sciences, while Comte and his followers developed social sciences starting from the same conviction. Gradually, for modern scientists rationalism and empiricism became the basic ingredients of modern science and starting from here the modern paradigm was conceived as a unitary one.

This character of the modern paradigm remained fundamental as regards the artistic component of modernism. Therefore, in modernity the artistic descriptive imaginary has a strong relation with rationality. It helps choosing the forms, volumes, lines and colors suitable to individualize a specific artistic expression compatible with modern artistic values. Modern artistic paradigm is a unitary one, being usually perceived as a rationalistic project that gave birth to a special type of cultural anthropology. This anthropology was a Eurocentric one, initializing a hierarchy of cultures, imposing the western analytical manner of understanding reality to other cultures (Grenz S., 1996). There are no alternative or multiple modernistic realities. There is only *one* modern reality for any artist that intends to express himself within that paradigm. Modernism was characterized by a commonly shared enthusiasm regarding the possibilities of science to solve the most important problems of Humanity.

All this enthusiasm started to vanish at the end of the Second World War, as a consequence of the atomic bomb and of the huge casualties determined by modern warfare. Knowledge by itself proved not to be good in all the ways. It became obvious that science and technology alone are not capable of solving the most stringent problems of Humanity. Even worse, science and technology alone can be used to increase dramatically the negative consequences of military conflicts, namely to increase dramatically the number of casualties and to widely spread terror and suffering. Philosophers, artists and specialists in humanistic sciences began to understand that moral neutrality is a dangerous characteristic of science and technology. Science alone cannot solve social problems having cultural causes. Therefore, cultural diversity cannot be ignored any more, especially if one takes into account that technological “superiority” of western culture didn’t generate the long expected social harmony. As a consequence, cultural diversity could not be ignored any more, reality itself becoming plural and diverse in postmodern era. The new anthropology gave up the superiority complex of western culture in favor of a more objective attitude towards other cultures. Their identity became an interesting alternative to the western way of building and understanding reality, no matter what technological level characterizes those cultures.

As a consequence, postmodern paradigm is a decentralized one, cultural diversity being assumed as a form of richness. There is no unique postmodern reality. There are multiple postmodern realities, culturally embedded. Even the concept of “objective real” is questioned in postmodern philosophy and postmodern Art. Correspondently, postmodern Art favors the pluralism of expression, artistic descriptive imaginary playing a much more important role here, because each cultural space, with its own identity, is characterized by its own artistic imaginary that determines the general axiological matrix used in generating a specific reality, or a

specific way of interpreting reality. Connoting the objective reality is the rule of game that makes possible the intercultural postmodern dialog in Art.

In the same time, there are enough features of postmodern paradigm that are inherited from modernism: for example, the use of reason in configuring artistic discourse and the problematic of ideology. But the ideological use of reasoning is carefully analyzed in deconstructivism. On one hand, ideology is rejected and considered dangerous. On the other hand, ideology is unavoidable in the process of culturally structuring the postmodern reality. Social ideologies are important, but in the same time, the deconstructivist vocation of some postmodern philosophers favors the continuous critical use of human reasoning for unveiling the hidden axiological assumptions embedded in any work of art. New forms of aesthetics, like the relational aesthetics, emphasize the fact that artistic imagination is used in a specific way in postmodern paradigm, enhancing new forms of artistic communication (Bourriaud N., 2002). In fact, postmodernism cannot be separated by networking communication that gave birth to information society: the very basis for what is called today knowledge society (Himanen P., 2001).

CONCLUSIONS

1. The role of artistic descriptive imagination is more complex in postmodern paradigm, in comparison with modern paradigm, implying a more refined attitude towards rationality.

2. Postmodern cultural identity is built and could be understood starting from its imaginative component that generates in the same time the ontological framework for the postmodern concept of reality.

3. Artistic descriptive imaginary is intensely used today for connoting postmodern works of art, for making them to catalyze reflection regarding the possibility of creating alternative realities as expressions of postmodern identity.

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**PARTICULARITIES OF THE MORPHOLOGY AND THE
BIOCHEMISTRY OF THE GRAPE BERRIES OF VINE
INTER-SPECIFIC HYBRIDS OF 4th BACKCROSS
(*VITIS VINIFERA* L. X *MUSCADINIA ROTUNDIFOLIA*
MICHX) AND OF *VITIS VINIFERA* SUBSP.
SYLVESTRIS GMEL.**

**PARTICULARITĂȚILE MORFOLOGICE ȘI BIOCHIMICE ALE
BACELOR HIBRIZILOR DE VIȚĂ DE VIE INTERSPECIFICI
(*VITIS VINIFERA* L. X *MUSCADINIA ROTUNDIFOLIA* MICHX.) DE F₄
ȘI *VITIS VINIFERA* SUBSP. *SYLVESTRIS* GMEL**

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Abstract. *Physico-chemical analysis carried out on berries vine distant hybrids (*V. vinifera* L. x *M. rotundifolia* Michx.) of the IV generation showed that the concentration of phenolic substances, resveratrol, pectin, etc. is relatively higher than in the vine varieties of crop (*V. vinifera* L.). However, forest vine (*V. sylvestris* Gmel.), has concentrations of phenolic substances, resveratrol, pectin etc. much more than distant hybrids of vine (*V. vinifera* L. x *M. rotundifolia* Michx.) of the IV generation.*

Key words: berries, distant hybrids, phenolic substances, resveratrol, pectin.

Rezumat. *Analizele fizico-chimice efectuate asupra bachelor hibrizilor distanți de viță de vie (*V. vinifera* L. x *M. rotundifolia* Michx.) de generația a IV-a au demonstrat faptul că concentrația substanțelor fenolice, resveratrolilor, pectinelor etc. este relativ mai mare decât în soiurile viței de vie de cultură (*V. vinifera* L.). Vița de vie de pădure (*Vitis sylvestris* Gmel.) deține însă concentrații de substanțe fenolice, resveratrol, pectine etc. cu mult mai sporite decât hibridii distanți de viță de vie (*V. vinifera* L. x *M. rotundifolia* Michx.) de generația a IV-a.*

Cuvinte cheie: bacă, hibridi distanți, substanțe fenolice, resveratrol, pectină.

INTRODUCTION

Scientific research has shown that some plants such as grape, blueberry, pomegranate etc. contain a substance called *resveratrol*, a phytoalexin, whose function is involved in protecting the plant against various environmental factors that have a negative influence on the development of the plant organism. Resveratrol is a powerful antioxidant with anti-inflammatory properties found in significant concentrations in the wine.

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MATERIAL AND METHOD

The plant material was composed of grapes interspecific hybrids of the fourth backcross (*Vitis vinifera* L. x *Muscadinia rotundifolia* Michx.) (The hybrids were obtained in the Laboratory of Dendrology of the Botanical Garden (Institute) of Academy of Sciences of Moldova), the *Muscadinia rotundifolia* Michx., of *Vitis vinifera* L. (or vines planted), *Vitis vinifera* subsp. *Sylvestris* Gmel. (or wild grape or vine wood). Morphological and biochemical tests were according to methods approved by the International Office of Vine and Wine (1999). The morphological analysis were performed in the Laboratory of Dendrology of the Botanical Garden (Institute) of the Academy of Sciences of Moldova, such biochemical were performed in the laboratory control of the quality of the wines on the National Institute of Vine and Wine of the Republic of Moldova and the National School of Agronomy of Montpellier, France.

RESULTS AND DISCUSSIONS

Morphological and biochemical elements and clusters of grapes that have reached maturity, are shown in table 1.

Table 1

The morphological particularities of the grape berries of inter-specific hybrids of the 4th backcross (*V. vinifera* L. x *M. rotundifolia* Michx)

Nr.d/o	Hybrid	Morphological particularities
1.	DRX-M ₄ -502	Gapes of cylindrical shape, length 12 cm. Bay of medium size. Length - 20 mm. Shape - elliptical short. Color yellowish-green film.
2.	DRX-M ₄ -510	Bunch of grapes very short. Number of bays from 90 to 120. Small bay. Length of 16 mm. The shape is a truncated cone. Color yellowish-green film.
3.	DRX-M ₄ -515	Grapes of cylindrical uniaxial, with one wing, of small size (10 cm in length). Bay average (20 mm long), elliptical and short. The membrane is pink. The consistency of the pulp is dense.
4.	DRX-M ₄ -520	Grapes of cylindrical biaxial, small, 20 cm long. Very small bay. Yellowish-green color.
5.	DRX-M ₄ -537	Grapes of medium size. Bay of yellowish-green, elliptical short. Growing season 180 days.
6.	DRX-M ₄ -541	Grapes of small dimensions. Bay of yellowish-green color. elliptical short. Growing season 180 days.
7.	DRX-M ₄ -542	Grapes of medium size, 19 to 22cm in length. Cylindrical, uniaxial, single wing, with 110 to 120 seeds. The bay is shaped like a truncated cone. Yellowish-green color. Length from 16 to 18 mm. The pulp is juicy and not very consistent.
8.	DRX-M ₄ -545	Grapes of short dimensions of 18 cm length. Cylinder-shaped cone, uniaxial, a compactness of 80 seeds. The bay is small, of uniforms elliptical, with the color yellow. Growing season about 180 days.
9.	DRX-M ₄ -660	Bay of medium size, 21 mm in length. The uniform size. Form of a truncated cone. Circular cross section. Color of the blue-violet film. Succulent flesh. Consistency pulp very hard.
10.	DRX-M ₄ -678	Grapes form, cylinder cone, uniaxial. Small, 10 cm in length. Bay of medium size, 20 mm in length. Cylinder-shaped cone. Yellowish-green color. Consistency of the pulp very hard.
11.	<i>Vitis sylvestris</i>	Very small grapes, 10 cm in length. Berry small, round, 6 to 10 mm in diameter. Color of a blue-violet shade.

The biochemical composition is very different from one genotype to another, both quantitatively and qualitatively. The following materials were assayed in grape berries: total polyphenols, resveratrol, pectin, organic acids, pH.

The biochemical analysis demonstrated a concentration of total polyphenols compounds, which varies among genotypes: 1970 mg/kg for hybrid purple-blue berries (DRX-M4-660), 597 mg/kg for hybrid pink peppercorns DRX-M4-515), and for hybrid yellow-green berries in the intervals of 219 mg/kg (DRX-M4-520) until to 309 mg/kg (DRX-M4-545). This important biological index is a characteristic of resistance against fungal attack by parasites, bacteria, etc. of phylloxera. Concerning hybrid DRX-M4-660, with purple-blue berries, containing 1970 mg/kg of polyphenols compounds, it should be noted that over the content of those noted in the varieties Kismis of Bujac (481 mg/kg), Kismis Moldova (399 mg/kg) and Pamyat Juraveli (511 mg/kg), determined in the years 2003-2007 at the National Institute of Vine and Wine of the Republic of Moldova (Gaina B. et al. 2007; Odageriu G. et al. 2007; Heroiu Elena et al. 2005).

Compared with the inter-specific hybrids and species mentioned above, the wild grape (*Vitis silvestris* Gmel.) With purple-blue berries contains 2019 mg / kg of phenolic compounds, which is absolutely remarkable. Figure 1 shows the overall results and highlights the hybrid DRX-M4-660 and *Vitis silvestris* Gmel.

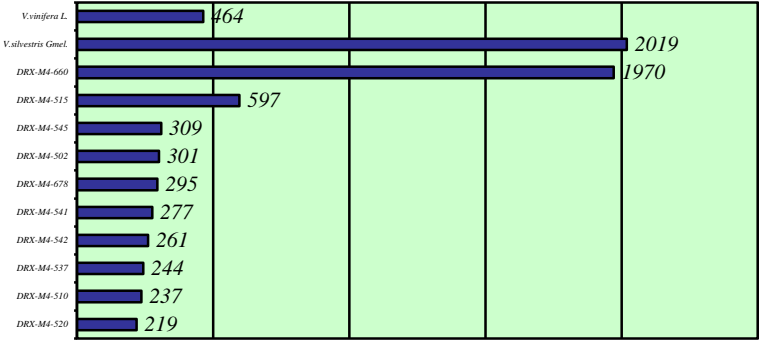


Fig. 1. Content of grape berry total polyphenols compounds (mg/kg) of inter-specific hybrids *V. vinifera* x *M. rotundifolia* and of *V. silvestris*.

It should be noted that in inter-specific hybrids of the fourth generation of backcrosses, there is also a relatively high concentration of resveratrol, from 4.9 mg/kg (DRX-M4-510) to 14.0 mg / kg (DRX-M4-660).

Resveratrol is also involved in resistance to pests and pests, as well as trap free radicals in the human body. In the hybrid grapes to dark purple-blue color, along with high concentrations of polyphenols compounds of 1970 mg/kg (DRX-M4-660), relatively high concentrations of resveratrol of 14.0 mg/kg were detected (DRX-M4-660). As polyphenols compounds, resveratrol content, it also very important, more than twice that of *Vitis vinifera* grapes. If we consider the

following varieties in the South of wine from Moldova during the years 2005-2007 concentrations between 5 and 7 mg/kg were found for Cabernet Sauvignon, Merlot and Pinot-Noir (Heroiu Elena et al. 2005).

The wild vine *Vitis silvestris* in the bays has 16.0 mg/kg of resveratrol, which is again quite significant, while the highest values are those of *Muscadinia rotundifolia*. Figure 2 shows the overall results.

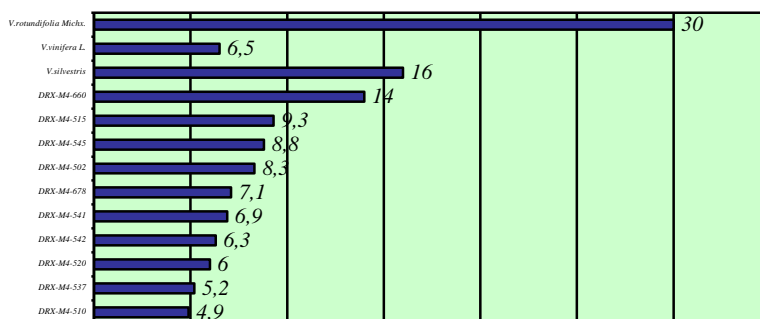


Fig. 2 - Content of grape berry total resveratrols (mg/kg) of inter-specific hybrids *V. vinifera* x *M. rotundifolia*, of *M. rotundifolia* and of *V. silvestris*.

An equally important element for use in products œnothérapie inter-specific hybrids for the consumption of pectins, which are dietary fiber, and are responsible for some balance in the blood of the human body, including the reduction of absorption through the intestinal wall of the first saturated fat and LDL cholesterol (that of oxidized lipids that induce various adverse effects, according to Mr. Montignac, 2010).

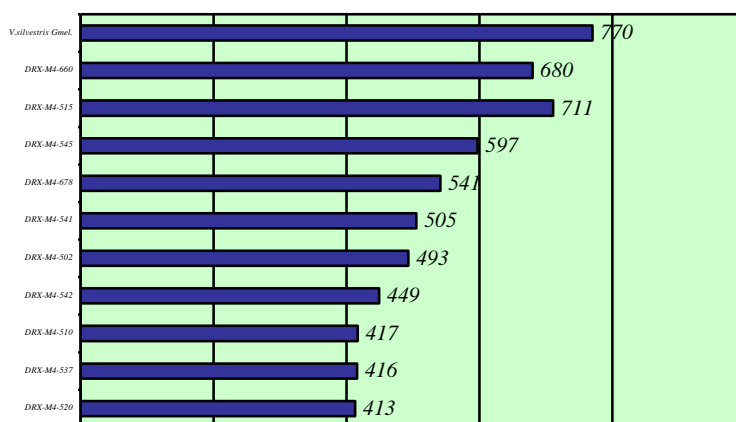


Fig. 3 - Content of total pectins of inter-specific hybrids *V. vinifera* x *M. rotundifolia* and of *V. silvestris*.

In interspecific hybrids it was found that the concentration in the bays of pectin's varies in the range of 413 mg/kg (DRX-M4-520) up to 711 mg/kg (DRX-M4-515). The values of *Vitis sylvestris* here as remarkable. Figure 3 shows the results.

The human body receives almost 50% more fiber needed by consuming an amount of 250-360 g of grapes (the rest of the contribution comes from the bread, vegetables etc.).

The analysis of the potential of the main organic acids in grapes - malic acid and tartaric acid - as well as those of titratable acidity and pH, show a normal presence of these in the total range of biological substances that influence taste, freshness and balance sensory components of the grapes of inter-specific hybrids of the fourth generation of backcrosses *Vitis vinifera* L. x *Muscadinia rotundifolia* Michx., *Vitis silvestris* is here in the usual standards. Figure 4 shows these values.

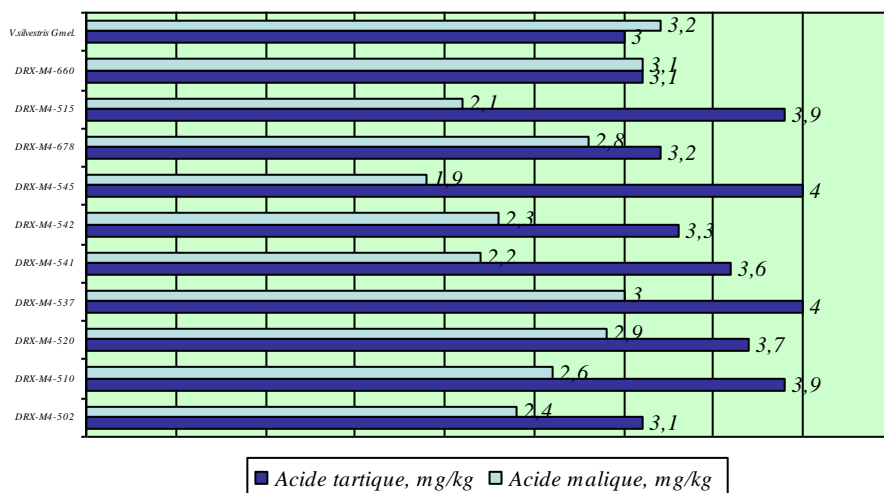


Fig. 4 - Content (mg/kg) of malic acid and tartaric acid of inter-specific hybrids *V. vinifera* x *M. rotundifolia* and of *V. silvestris*.

According to the results of biochemical analysis performed on the berries of inter-specific hybrids of grapevine (*V. vinifera* L. x *M. rotundifolia* Michx.). Fourth generation of backcrosses, it was found that their contents of polyphenolic compounds, resveratrol or pectin is relatively higher as in vine varieties cultivated (*V. vinifera* L.).

The American vine (*M. rotundifolia* Michx.) has an absolute resistance against phylloxera snout and that of leaves (gall), and a series of resistance to major fungal parasites. It is logical to observe that the concentration of total resveratrols reaches the limit of 30 mg/kg, and also that the levels of total polyphenolics and total pectins are higher than in the European vine (*V. vinifera* L.) n's is not resistant to phylloxera pest or fungal.

Interspecific hybrids (*V. vinifera* L. x *M. rotundifolia* Michx.) are not attacked by the phylloxera gall or snout, or by the major fungal parasites. Their

contents of the above compounds is higher than for vines cultivated sless may, however, that the progenitor of resistance *M. rotundifolia* Michx.

But the result perhaps the most original on the wild grape (*V. silvestris* Gmel.) Which is not known to possess significant resistance to biological pests, parasites and pests before. However it is suitable for environments often difficult, and therefore probably has genes for abiotic stress tolerance of the environment. In any case, it contains concentrations of polyphenolic compounds, resveratrol and pectins much higher than inter-specific hybrids, and therefore *Vitis vinifera* L.

CONCLUSIONS

1. Inter-specific hybrids of grapevine (*V. vinifera* L. x *M. rotundifolia* Michx.) arrays with yellowish-green color have total polyphenolic contents within: from 219 g / kg (DRX-M4-520) to 309 mg/kg (DRX-M4-545), resveratrol total of 4.9 mg/kg (DRX-M4-510) to 8.3 mg/kg, and total pectin 413 mg/kg (DRX-M4-520) to 597 mg/kg (DRX-M4-545), inter-specific hybrids with pink berries (DRX-M4-515) holds: the total polyphenolic concentrations of 597 mg/kg, resveratrols total of 9.3 mg/kg, and total pectin 711 mg/kg, and inter-specific hybrids with berries blue-violet (DRX-M4-660) have total polyphenolic content of 1970 mg/kg of resveratrol total of 14.0 mg/kg and total pectin 680 mg/kg.

2. The wild grape (*V. sylvestris* Gmel.) berries with a hint of blue-violet holds: the total polyphenolic content of 2019 mg/kg of resveratrol total of 16.0 mg/kg and 770 mg/kg of total pectin.

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THE INFLUENCE OF WINDTHROWS ON ECOPROTECTIVE FUNCTIONS OF THE FORESTS. CASE STUDY IN THE FOREST DISTRICT TOMNATEC, SUCEAVA COUNTY

INFLUENȚA DOBORÂTURILOR DE VÂNT ASUPRA GRADULUI DE EXERCITARE A FUNCȚIILOR PĂDURII. STUDIU DE CAZ ÎN OCOLUL SILVIC TOMNATEC, JUDEȚUL SUCEAVA

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***Abstract.** Wind damage is one of the major natural disturbances that can occur in most types of forests worldwide. In the last decades, we have witnessed a serious surge in windthrow occurrence caused by wind and snow which has resulted in damage to our forests. Wind damage results in both direct costs (serious financial loss, additional cost of harvesting and reduced timber value) and indirect costs (increasing erosion, impact on water regime, disappearance of original biotopes and species). This paper presents the calculus method of the EEF index as a way to quantify the impact of wind damages concerning the Norway spruce forests. This index can reveal real information concerning the forest ability to exert its ecoprotective functions and can be used as a additional index in the wind damages characterization.*

Key words: windthrow, EEF index, ecoprotective function.

***Rezumat.** Doborâturile de vânt reprezintă un factor disturbator natural ce afectează majoritatea tipurilor de pădure la nivel mondial. În ultimele decenii am asistat la o creșterea daunelor provocate de vânt și zapada. Daunele provocate de vânt se pot traduce prin costuri directe (pierderi financiare, costuri suplimentare pentru exploatare, reducerea calității lemnului) dar și costuri indirecte (eroziunea solului, schimbări în regimul de apă, dispariția unor specii). Articolul prezintă modul de calcul al indicelui EEF ca modalitate de a cuantifica impactul doborâturilor de vânt asupra pădurilor. Acest indice poate furniza informații reale privind capacitatea pădurii de a-și exercita funcțiile ecoprotective și poate fi utilizat ca indice suplimentar în caracterizarea doborâturilor de vânt.*

Cuvinte cheie: doborâturi de vânt, indicele EEF, funcția ecoprotectivă

INTRODUCTION

Wind damage is one of the major natural disturbances that can occur in most types of forests worldwide (Gardiner et al. 2008). In the last decades, we have witnessed a serious surge in windthrow occurrence caused by wind and snow, which has resulted in damage to our forests. The first windthrow mentioned in records was the one in 1828 which took place in Sinaia followed by the one from the forests of Bukovina from December 1843 (Ichim, 1988). Since then until 2002

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a number of about 40 ample windthrows have rushed upon the forests of Bucovina, among which the biggest were in 1947-1948, 1964, 1969, 1975, 1982, 1995 and 2002 (Popescu Zeletin, 1951, Dissescu, 1962, Marcu et al., 1969, Ichim, 1976, 1988, Barbu, Cenușă, 1987, Popa, 2002). On 6th-8th March 2002, because of some storms which affected especially the upper basin of Moldavia River, Moldovița basin and mainly Upper Suceava basin, there were wind throws and breaks of 4.000.000 cubic meters.

Studying the condition under windthrows occurred help us to know the relations between forests and environment (Popa, 2002). Less known, due to the quantification difficulties are the effects of this phenomenon on the remaining stands and their functions.

The aim of this paper is to study the influence of windthrow on ecoprotective functions of the forests. Starting from the necessity to quantify the structure-function relation, a global index was searched – EEF index.

MATERIAL AND METHOD

The study area is situated in Northern Romania, in the Tomnatec Forest district - Production Unit VI Tomnatec (47°25' N, 25°30' E) (figure 1) which experienced storms in March 2002. The investigations were carried out in protected, even and uneven aged spruce and mixed forests. Most of the stands are located between 800 and 1000 m a.s.l. Norway spruce is the dominant tree species (77%). The forest was previously under protection and no intensive management had been carried out in the area for decades. The stands ages ranged from 1 to 120 years.



Fig. 1 - Research area

Starting from the need to quantify the structure-function relation, a global index was necessary - **EEF index** – ecoprotective effectiveness index. This index was proposed by ICAS (Cenușă, 2000) based on Gundermann index (Gundermann, 1974).

To compute EEF index different stand characteristics were used: crown density, stand structure, composition, rooting, snow/wind/insects damages, age, successional dynamics and anthropic damages. Each of them had received a general share and a special share as it is presented in table 1.

EEF index formula is:

$$EEF = \sum_{i=1}^8 P_i \times p_i \quad \text{where: } P_i \text{ represent the general share, } p_i \text{ is the special share.}$$

The EEF index was computed for each compartment of production unit VI Tomnatec before windthrows, immediately after windthrows and ten years after windthrows. The rating scales for EEF index are presented below:

EEF<15 unsatisfactory,
EEF 15-20 satisfactory,
EEF 20-25 optimum.

Table 1

The quantification of ecoprotective effectiveness – EEF index (after Cenușă, 2000)

Description	General share (P)	Special share (p)					
		0.9	0.8	0.7	0.5	0.3	0.1
Crown density	4	>0.9	-	0.7-0.8	0.5-0.7	0.3-0.5	<0.3
Stand structure	5	Uneven-aged	-	-	Even-aged	-	-
Composition	3	>2 species	2 species	1 species	-	-	-
Rooting	3	Deep-rooted	Intermediate-rooted	Shallow-rooted	-	-	-
Damages % (snow, wind, insects)	4	<20%	-	20-40%	40-60%	60-80%	>80%
Developing stage (age)	2	Old stand	-	Young stand	Young plantation	-	-
Successional dynamics	3	Terminal stage (klimax)	-	Transition stage	Initial stage	-	-
Human made damages (effects on % of surface)	4	<10%	10-30%	30-50%	50-70%	-	>70%

RESULTS AND DISCUSSIONS

EEF index was computed for 202 compartments with a total surface of 2107.3 hectares. Before windthrow the mean value for this index was 21.1, decreasing after windthrow to a mean value of 19 points. Regarding the distribution of the study area related to the EEF index scale before and after windthrow, the situation is presented in table 2 and figures 2-4.

Table 2

Distribution of the study area related to EEF index scale

EEF index	Before windthrow	After windthrow	10 years after windthrow
	(percent of study area surface)		
<15 unsatisfactory	0	10	8,6
15-20 satisfactory	5,2	28,2	29,7
20-25 optimum	94,8	61,8	61,7

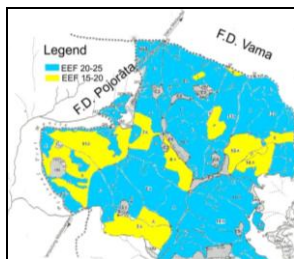


Fig. 2 - EEF index values before windthrow

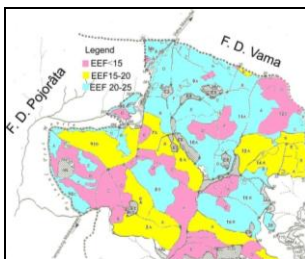


Fig. 3 - EEF index values after windthrow

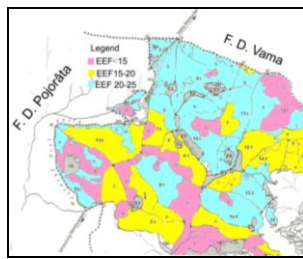


Fig. 4 - EEF index values at 10 years after windthrow

Before windthrows for 95 percent of the studied area ecoprotective effectiveness had been in optimum domain – EEF values between 20 and 25. After windthrows these values are to be found only for 62 percent. Likewise, after windthrows 10% of the studied area show unsatisfactory ecoprotective effectiveness – EEF < 15.

- EEF index values related to forest type and stand composition

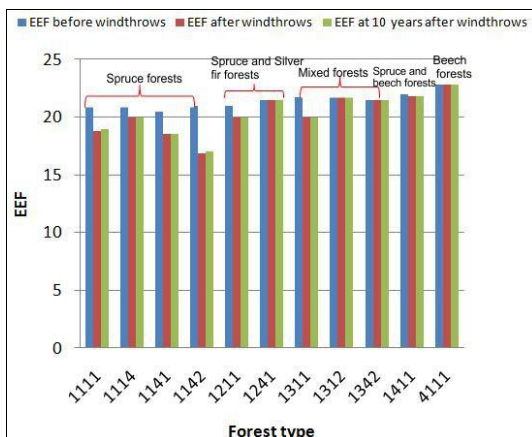


Fig. 5 – Mean values of EEF index before and after windthrow related to forest type

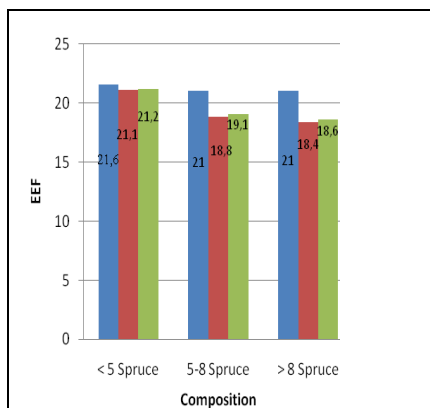


Fig. 6 – Mean values of EEF index before and after windthrow related to composition

Before windthrows, EEF values were between 20.5-21 (with an average of 21) in pure Norway spruce stands, between 21 and 22.2 in mixed forests and 22.8 in pure beech forests. After the windthrows EEF values decrease with 1.5 - 4 points in spruce stands and with 1-1.5 points in mixed forests (figure 5). For spruce stands the effect of this decrease is the change of the ecoprotective effectiveness from optimal to satisfactory. For the other forest types the decreasing of EEF index values doesn't lead changes in ecoprotective effectiveness. Because the Norway spruce stands represent about 65% of the total studied forest area, the average figures presented ahead give a more realistic picture of the degree to which the EEF index decreased from the optimal range to

the satisfactory range. At the same time, the favorable impression shaped when analyzing the EEF for mixed and beech forests shall be also amended since these types of forest stand for 10% of the forest area only; pure Norway spruce forests represent the major share of the forest.

Related to stand composition, before windthrows occur, in all three cases the EEF index mean values were situated in the optimum. After the windthrows, in the stands where the proportion of spruce was higher than 50% the EEF index values decrease with 2-2.5 points (figure 6). The effect of this decrease is the change of the ecoprotective effectiveness from optimal to satisfactory. At ten years after the windthrows the EEF index values remain in the same register.

- EEF index values related to age classes

In the studied area age classes III (41-60 years), IV (61-80 years) and V (81-100 years) represent 68% of the total surface, the stands included in these cases being most affected by windthrows.

The stands from class I are below 15 meters height and are not vulnerable to wind but to snow. Stands included in VI and VII age classes have, usually, uneven aged structure, which is more resistant, and a high capacity of recovery.

As for EEF index values, before windthrows all stands irrespective to age class show the optimal effectiveness (EEF>20); after windthrows these values are to be found only for II, VI and VII age classes (figure 7).

We can conclude that for 68 % of the studied area ecoprotective effectiveness had decreased from optimal to satisfactory.

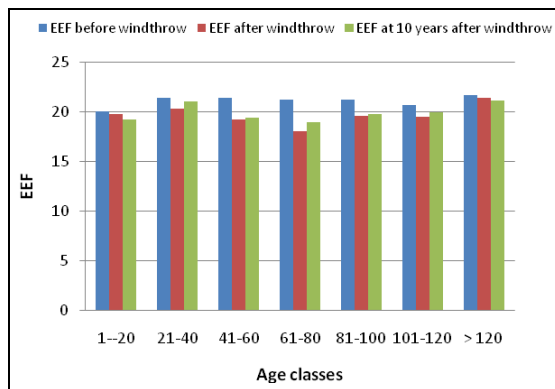


Fig. 7 – Mean values of EEF index before and after windthrow related to age classes

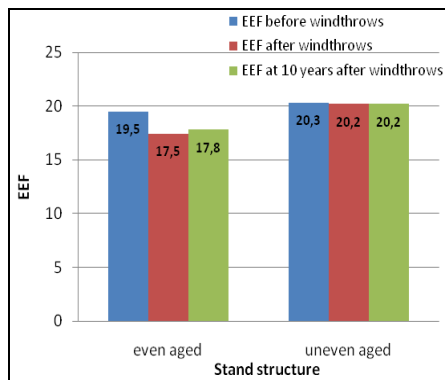


Fig. 8 – Mean values of EEF index before and after windthrow related to stand structure

- EEF index values related to stand structure

In even aged stands the ecoprotective effectiveness is satisfactory both before and after windthrows with the remark that after windthrows the EEF mean value decreases with 2 points (from 19,5 at 17,5). In uneven aged stands the

ecoprotective effectiveness is maintained in optimal domain before and after windthrows (figure 8).

CONCLUSIONS

1. Before windthrow, for all studied area, the mean value for EEF index was 21.1, decreasing after windthrow to a mean value of 19 points.

2. At a windthrow that affected 12.1% of the growing stock the ecoprotective effectiveness decrease with 9%.

3. Before windthrow for 95 percent of the studied area ecoprotective effectiveness had been in optimum range. After windthrows these values are to be found only for 62 percent. At ten years after the windthrows, the EEF index values remain in the same register.

4. The largest decreasing of EEF index values that lead to the change of the ecoprotective effectiveness from optimal to satisfactory occurred in pure spruce stands, stands from III an IV age classes and even aged stands.

5. EEF index can be used as additional index in windthrow description.

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GREENHOUSE HEATING WITH BIOMASS

INCĂLZIREA SERELOR CU BIOMASĂ

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Abstract. *In cold season, the greenhouses can provide local market with fresh vegetables at competitive prices if production costs are low, especially for fuel production. From economic and environmental considerations it will be studied a vegetable greenhouse heated with hot air generator that burn biomass with an almost null CO₂ balance. Biomass used can be in the form of pellets of corn stalks, creeping stalks or other wooden materials, and corn kernels. Burning is done with a multifunction burner for granular biomass - pellets or corn kernels, burner developed in recently research. The aim is to conduct a greenhouse microclimate for a cold winter day through simulated experiments with the CLIMASERE software developed in Free Pascal 2.1.2 at U.P.B. It makes a comparison between heating with biomass and LPG or diesel economic both legally and environmentally.*

Key words: greenhouse, heating, biomass, simulation

Rezumat. *În anotimpul rece serele pot asigura piața locală cu produse vegetale proaspete la prețuri competitive dacă costurile de producție sunt mici, în special cele pentru combustibil. Din considerente economice și ecologice se studiază un modul de seră pentru legume încălzit cu un generator de aer cald, în care se arde biomasă și cu un bilanț aproape nul de CO₂. Biomasa utilizabilă poate fi în forma de pelete din tulpini de porumb, vrejuri sau orice alt material lemnos, precum și porumb boabe. Arderea se realizează cu un arzător multifuncțional pentru biomasă granulară – pelete sau boabe de porumb recent dezvoltat în activitatea de cercetare. Se studiază microclima din seră pentru o zi geroasă de iarnă prin experimente simulate cu softul CLIMASERE dezvoltat în Free Pascal 2.1.2 la U.P.B. Se face o comparație între încălzirea cu biomasă și cea cu GPL sau motorină atât din punct de vedere economic cât și ecologic.*

Cuvinte cheie: seră, încălzire, biomasă, simulare

INTRODUCTION

In cold season, the greenhouses can provide fresh vegetables to local market with at competitive prices if production costs are low, especially for fuel production. In actual conditions of instability of fossil fuel prices and of the requirement to reduce CO₂ emissions the focus is laid on renewable energy use in greenhouses, especially biomass because it can provide lower costs for heat production. For this, the easiest way is the burning or gasification densified biomass, wood pellets or other agricultural biomass: corn stalks and sunflower, stalks, miscellaneous, etc. In terms of the primary costs, chopped and dried local biomass is much cheaper, but it requires a surplus of labor for processing, which can provide more jobs and can contribute to sustainable development of agriculture through the increasing of a energy

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independence, too (Adams S. et al., 2008; Garcia J. L. et al., 1998; Murad E., 2002.; Murad E. et al, 2008; Popovska-Vasilevska Sanja, 2007).

In this paper the microclimate is studied in a mini greenhouse of vegetables heated with hot air that is distributed through a flexible tube with slots for jets, suspended near the ridge of the greenhouse profile. Thus, the hot-water heating system to reduce both was given up initial investment and to increase the controllability of the microclimate from greenhouse with controlled ventilation. We chose to study one cold winter day from Ilfov area, in order to make comparison between heating with biomass and LPG or diesel, both of economically and ecologically. Simulated experiments were conducted with the CLIMSERE program of microclimate simulation in greenhouses. This software was developed in Free Pascal at the Biotechnical Systems Department from University POLITEHNICA Bucharest.

MATERIAL AND METHOD

The greenhouse of tunnel type under study is about the size 6m (breadth) x 25m (length) x 2,7m (max. height), with galvanized pipe frame with circular profile that is coated with a double presurized polyethylene film. The placement of heat generator group is presented in figure 1.

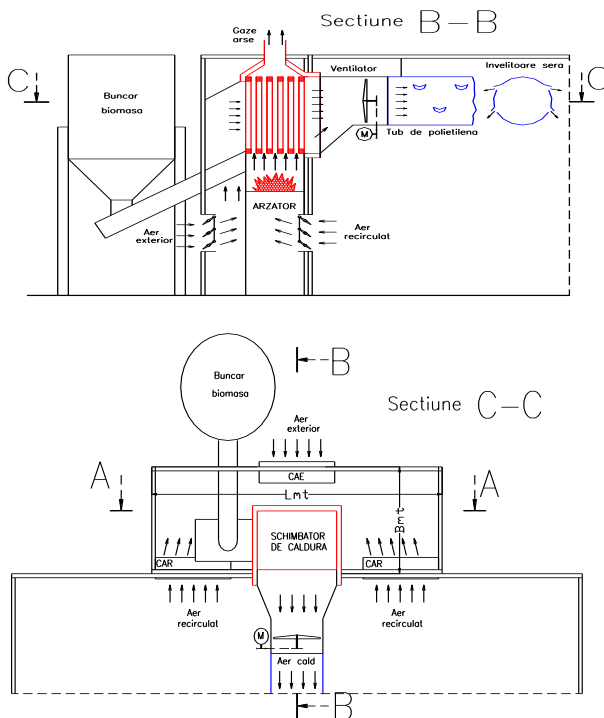


Fig. 1 – Scheme of the heat generator group:
B-B vertical section; C-C horizontal section

The greenhouse has a soil surface of $S_{sol}=150 \text{ m}^2$ and a volume of $V_{ser}=271 \text{ m}^3$. It is heated with hot air distributed by a flexible polyethylene tube with cuts for hot air jets.

The air is heated with a heat exchanger: burned gases-air of ignitubular type with cross current with an exchange area of 3.6 m^2 . The input air in greenhouse is obtained by mixing a D_{arec} recirculated air flow adjusted with CAR valves, with an external air flow D_{aex} adjusted with CAE valves to ensure both the concentration of O_2 and CO_2 and indoor humidity, in the greenhouse.

The $D_{aev}=D_{aex}$ air flow exhausted from greenhouse can ensure the maintenance of humidity in the greenhouse. To achieve controlled and stable distribution of hot air the version with $D_{av}=ct.$ was adopted constant flow of air for heating.



Fig. 2 - Granular biomass burner

For heat production is used a multifunctional burner for granular biomass - pellets or corn, a newly developed system in research at the Department of Biotechnical Systems of the UPB, shown in figure 2 (Murad E. et al., 2008; Murad E. et al., 2008). The thermal power can be varied through continuous adjusting of the flow of D_{vcomb} granular material distributed in the chamber for burning.

The inferior calorific power for pellets is $q_{pel}=17$ MJ/kg and for maize is $q_{pb}=15$ MJ/kg. For this case a burner was chosen a burner with a nominal hourly volume flow of $20 \text{ dm}^3/\text{h}$; which ensures a nominal power $P_{arzn}=60$ kW.

The heat exchanger has a very simple construction, especially designed for this type of application where the flame temperature does not exceed 900°C . This results in a low cost an essential aspect for the initial investment in a greenhouse. Effective balance of the heat exchanger is at least 85% and NTU (Badea A. et al., 2003) type analysis shows that it remains almost constant throughout the range of use because the greenhouse is heated with a D_{av} constant flow of hot air to maintain the jets speed and the uniformity of temperature.

For the alternative economic study and greenhouse heating was also analyzed with a two-stage diesel burner of RIELLO ECO 7/2 type as well as and with an LPG burner with continuous adjustment of power between the minimum and maximum flow rate of RIELLO 40GS10/M type.

Automatic internal temperature adjustment is done with digital PID algorithms for biomass burner and LPG burner and with an extended bipositional algorithm for diesel burner. For diesel and LPG the real combustion temperature is higher and hence the SC balance rises to 88%. To adjust the indoor humidity was used a PID adjustment algorithm which controls the D_{aev} air flow exhausted from greenhouse (Ramírez-Arias A., 2005; Yildiz I., 2006).

In order to determine the quantities that characterize the microclimate as well as energy consumption in a cold winter day with outside temperature between $-5\dots-25^\circ\text{C}$, simulated experiments were conducted with the CLIMSERE simulation program in which the following sizes changes were analyzed: $T_i(^\circ\text{C})$ inner temperature, $U_i(\%)$ relative indoor humidity, $P_{srad}(\text{W}/\text{m}^2)$ solar radiation, evaporation of the water from soil and on plants ($\text{kg}/\text{s}\cdot\text{m}^2$), CO_2 concentration ($\text{kg}\cdot\text{CO}_2/\text{m}^3$).

For the simulation model were used the energy and mass balances were used for indoor air, indoor humidity and CO_2 concentration (Ramírez-Arias A., 2005; Yildiz I., 1993; Yildiz I., 2006).

For solar radiation model a mathematical model was chosen of the following form:

$$P_{srad}(t)=C1+C2\cdot time+C2\cdot time^2 \text{ (W/m}^2\text{)} \quad (1)$$

where: *time* is time in hours.

The coefficient values were determined by linear regression from meteorological data for the South region, in Bucharest - Ilfov area.

For mass flow of water evaporation from the soil and leaves surface leaves was used a relatively simple model (Yildiz I., 1993; Yildiz I., 2006):

$$D_{aptr} = K_{tr} \cdot P_{srad} \cdot S_{sol} \text{ (g/h)} \quad (2)$$

where: K_{tr} is evapotranspiration coefficient [$(\text{g}/\text{m}^2\text{h})/(\text{W}/\text{m}^2)$].

RESULTS AND DISCUSSIONS

Results of simulated experiments are presented in graphs in figures 3 and 4, which correspond to the heating with pellets and diesel.

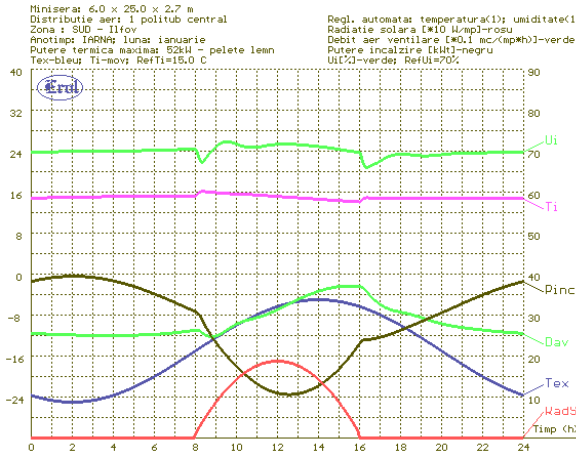


Fig. 3 – The results of simulated experiment for heating with pellets

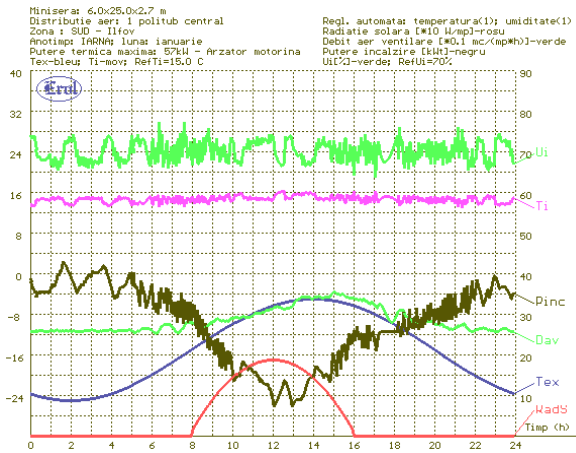


Fig. 4 The results of simulated experiment for heating with diesel

It appears that when using the diesel for heating, because of the adjusting algorithm used to control two-stage burners, thermal power required for heating has relatively large variations because hot air heating system has a very low thermal inertia. As a result it is found that both the indoor temperature and indoor humidity have relatively more large variations from the imposed reference.

When biomass is used there are very good performances by adjustment, which indicates that the studied acclimatization system has a high level of controllability, which allows rigorous maintainance of the parameters of the greenhouse microclimate and thus the production increasing in terms of quality and quantity.

Table 1 summarizes the performance of the control of greenhouse microclimate parameters. It appears that changes indoor temperature and humidity are higher for diesel use because bipositional

algorithm with cannot achieve more with the PID control algorithm better performances are obtained as it applies to the burners adjustable fuel flow. Better dynamic performance is obtained with LPG burner because it has a much faster response to commands than the biomass burner which has a much higher inertia.

Table 1

Performances of adjustment of the microclimat parameters

Size	UM	Fuel			
		Diesel	LPG	Pellets	Maize
Indoor temperature	°C	12,8/16,3	14,9/15,1	14,2/16,1	14,3/15,9
Indoor humidity	%	64/78	68/71	66/72	66/72
Temperature of the hot air jet	°C	16,8/44	19,7/38,3	19,7/38,2	19,7/38,3
Heating power mim/max	kW	6,8/43,0	10,6/39,5	10,6/39,5	10,6/39,5

Table 2

Fuel consumption an heating costs

Size	UM	Fuel			
		Diesel	LPG	Pellets	Maize
Inferior calorific power	MJ/kg	42	45,7	17	15
Density	kg/dm ³	0,86	0,56	0,45	0,8
Fuel Unit Price	lei/kg	5,93	4,18	0,77	0,65
Fuel Unit Price	€/kg	1,4	0,98	0,16	0,15
Specific primary energy price	€/GJ	33,22	21,52	9,41	10,2
Daily energy requirement	kWh/day	667	673	672	672
Daily consumption	kg/day	64,9	61,3	176,2	199,7
Fuel Cost	€/day	90,55	60,29	28,19	30,54
Specific Fuel Cost	€/m ² day	0,6	0,4	0,19	0,2
Price relative specific	%	100	66,58	31,13	33,73
Specific CO ₂ emission	kg/kg	2,74	2,89	0	0
Daily emission	kg/day	177,83	177,16	0	0

Table 2 summarizes the results of experiments for fuel consumption heating costs and CO₂ emissions. It appears that the use of biomass in the form of pellets or maize grain is more convenient both economically, up 33% compared to the costs for diesel fuel and ecologically reducing CO₂ emissions by about 178 kg/day to a daily average temperature -15°C. Taking into account the average temperature of the heating period of 190 days, which is the sample area of 2,3°C, a reduction can be estimated of at least 14,3 tons of CO₂ in cold season or of 93,35 kg.CO₂/m².

CONCLUSIONS

1. We studied the heating of a vegetable greenhouse with biomass compared to the use of diesel or LPG to determine both the quality parameters of microclimate adjustment and economic and environmental aspects. The greenhouse of 150 m² is heated with hot air and for a very cold winter it day requires a maximum heating power of only 40 kW, which is about 0,27 kW/m².

2. For heating, we used a burner of granular biomass, with continuous adjustment of the flow of biomass, developed at the Department of Biotechnical Systems of the U.P.B. in the PNCD-I 2007-2011 national research program.

3. It appears that using biomass for heating reduces the daily heating expens with around 67%. For the heating period of 190 days with average temperature of

2,3°C the specific cost is 16,07 €/m² compared to 32,17 €/m² for LPG and 48,26 €/m² for diesel. In the past five years the price of maize grain was 0,5 lei/kg, which makes that this to can ensure the lowest costs for heating.

4. The performances in microclimate adjustment are also very good when using and in of biomass burner which makes the heating costs be the crucial parameter for selecting a heating system.

5. In the frosty day we studied, the emission of CO₂ reduce by about 178 kg/day for a daily average temperature of -15°C. So, can be throughout the heating period a reduction of emission of at least 93,35 kg.CO₂/m² can be estimate.

6. It was realized a simulation program of the greenhouses heated by hot air generators in which biomass is burned. This software can be used and improved for other greenhouse sizes and and heating systems.

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EFFECT OF FOLIAR FERTILIZER „FLORAVIT” ON WINE QUALITY IN THE DEALU BUJORULUI VINEYARD

EFFECTUL FERTILIZANTULUI FOLIAR „FLORAVIT” ASUPRA CALITĂȚII VINULUI ÎN PODGORIA DEALU BUJORULUI

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Abstract. *The quality of wine is a growing concern of the winemakers on the competitive market in terms of increasing of demands consumer. Through the performed studies at SCDVV BUJORU using the product, "FLORAVIT" a foliar fertilizer produced by Original Process-France, ECOCERT certificate, natural, effective, adapted to the new European rules, allowed in organic culture technology, was analyzed its effect on the accumulation the compounds of the grapes. The administration of FLORAVIT product was achieved in cultivated vineyards in ecological system (re. EC 889/20080) of Merlot variety. Grape vine becomes resistant to the external aggressions: cold, heat, stress of any kind. FLORAVIT product is efficient in planting of Merlot cultivated in ecological conditions under high temperature and high humidity (the precipitation over multiannual average of the area). This foliar fertilizer, used on Merlot variety, gives good results, enhancing the quality of the grapes and therefore wine quality.*

Key words: fertilizer, climate, grapes, wine, polyphenols, anthocyanins.

Rezumat. *Calitatea vinului este o preocupare tot mai mare a vinificatorilor pe piața concurențială, în condițiile de creștere a exigențelor consumatorilor. Prin studiile efectuate la SCDVV BUJORU, folosind produsul „FLORAVIT”, un îngrășământ foliar produs de Original Process - Franța, certificat de ECOCERT, natural, eficace, adaptat noilor norme europene, permis în tehnologia de cultură ecologică, s-a analizat efectul lui asupra acumulărilor de compuși din struguri. Administrarea produsului FLORAVIT s-a realizat în plantațiile viticole cultivate în sistem ecologic (re. CE 889/20080) al soiului Merlot. Vița de vie devine rezistentă în fața agresionilor externe: gerul, arșița, stresurile de orice natură. Produsul FLORAVIT este eficace în plantația de Merlot cultivat în condiții ecologice în condiții de temperatură și umiditate ridicată (precipitații peste media multiannuală a zone). Acest îngrășământ foliar, administrat la soiul Merlot, dă rezultate favorabile, potențând calitatea strugurilor și implicit calitatea vinului.*

Cuvinte cheie: fertilizant, clima, struguri, vin, polifenoli, antociani.

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INTRODUCTION

Dealu Bujorului vineyard is located in south-eastern of Moldova, Romania, and has a high win-growing potential especially for producing quality wines.

To the development of an indigenous foliar fertilizer formulations for use in field crops and plantations hortiviticole exposed by drought were made by Borlan Z. and collaborators (1999).

Researches on the effect of autochthon foliar fertilizer on vigor vineyards were made by John M. and collaborators (2000).

A representative high-quality wine for Bujoru Station is obtained from Merlot variety grown in the ecologic system (Simion Cristina et al., 2003).

To obtain quality horticultural production and increase soil fertility, the use of foliar fertilizer is a major goal of modern horticulture. In agrochemical practice of foliar fertilization is determined accurately the need of nutrient consumption and fertilizer of plants nutrients and achieve of concentration of these substances is based on leaf area per unit area (M. Rusu et al., 2005).

MATERIAL AND METHOD

Experimentation FLORAVIT product was achieved in organically grown vineyards (re.CE 889/20080) on an area of 3 ha of Merlot variety.

Experimental versions:

- V1-control, unfertilized (1 ha).
- V2-fertilized FLORAVIT product in the first year (1 ha);
- V3-fertilized FLORAVIT the product two years in a row (1 ha);

As a foliar fertilizer was used FLORAVIT product at a dose of 5 L/ha/phenophase administering solution to 400 liters/ha at the first treatment because of reduced foliage, then the other treatments received 750 liters of solution / ha / phenophase. There have been performed the determinations on the dynamics of quantitative accumulation from grapes in maturation process of grape and of wines in terms of general composition, but predominantly the black compounds.

RESULTS AND DISCUSSIONS

Application of FLORAVIT product was performed mechanically on phenophase of vegetation to the following dates: flower buds (06 May), flowering (04 June), flower in fruit processing (03 Julie) and ripening (05 August).

In 2010 the average temperature of the air was 10.6°C and during the growing season it was 18.5 °C. The maximum average monthly temperature was recorded in August (24.0°C). Compared with the multiannual average, annual average air temperature has decreased by 1.0°C. Throughout the growing was recorded a heat deficit, except for August which showing a surplus of 0.9°C heat (figure 1).

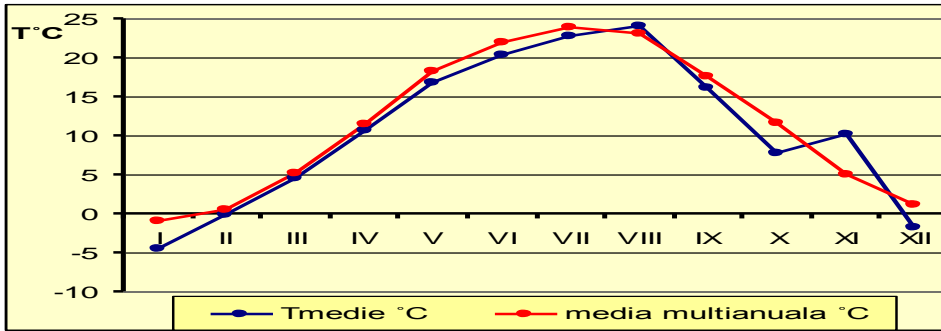


Fig. 1 - Evolution of average air temperature in 2010 SCDVV Bujoru

Year 2010 shows a contribution of 639.8 mm of rainfall with 431.4 mm during the growing season. Compared with the multiannual average, on vegetation during the precipitation deficit was about 38.5 mm (10.9 mm / IV, 9.8 mm / VIII, 17.8 mm / IX) and in winter about 30.8 mm (9.6 mm / I, 14.5 mm / III, 9.7 mm / XI). In the vegetation period is noted in April, August and September by low rainfall and May and June with a surplus intake compared to annual average rainfall (figure 2).

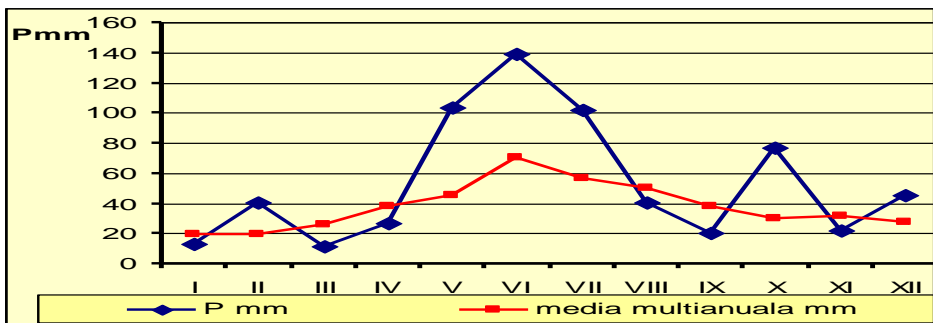


Fig. 2 - Evolution of monthly rainfall SCDVV Bujoru-2010

The evolution of humidity was dynamic determined by taking soil samples in every month, on 0-100cm profile, from 20 to 20 cm (fertilized / unfertilized). As a result of weather conditions from 2009, the vegetation period of 2010 begins with a poor reserve of water in soil, the humidity of soil at the beginning of vegetation standing at the 2048 and 1627 m³/ha/fertile m³/ha/unfertile (Figure 3). Insufficient rainfall from April accentuate the deficit of water from soil, in early June the humidity was much lower than at the beginning of the season of vegetation (1805 m³/ha/fertilized and 1589 m³/ha/unfertilized). Against of rainfall deficit since 2009 of reduced rainfall winter and diurnal average consumption of the grape vine on during of the vegetation season, humidity of soil in 2010 showed a downward trend since July. The torrential character of rains and reduced capitalization of these led to conservation of their small kept the water shortage throughout the vegetation season.

In August, when the grape vine begins to mature ripe and consumption is significant, the humidity of soil placed at level by 51.11% of the IUA/fertilized and 38.84% respectively of the IUA/unfertilized (IUA = active humidity range).

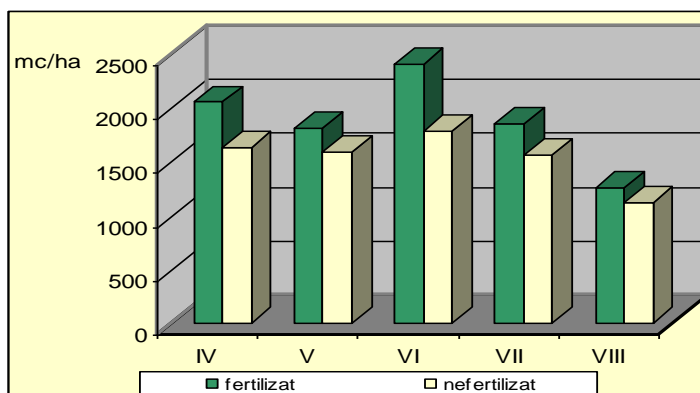


Fig. 3 - Dynamics of soil moisture-2010 (m³/ha)

There have been determinations concerning the quality of production through evolution of dynamics ripening grapes (anthocyanins from the epicarp of the grapes, the content in grape sugar and total acidity)

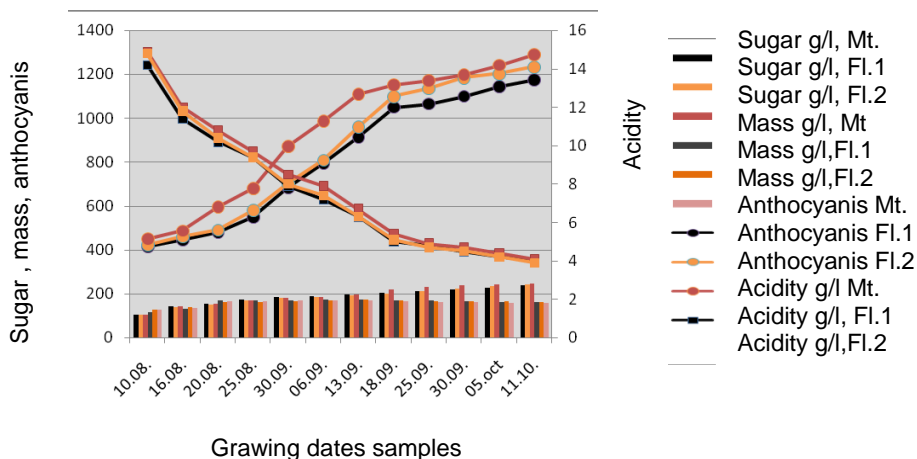


Fig. 4 - Dynamics of ripening grapes

After noticeable as in figure 4 all determined compounds from grapes are quantitatively higher in variants treated with FLORAVIT.

The Merlot variety and Merlot with FLORAVIT (V2-fertilized in the first year of administration) has reached full maturity on the 13.09. at a sugar content of 195 g/L total acidity of 6.3 g/L H₂SO₄, 100b mass of 172 g, the amount of anthocyanins in epicarp of grapes by 915 mg/kg and 193 g/L sugar, 6,7 g/L total acidity, mass 100 b 171 g and 960 mg/kg anthocyanins from epicarp of grapes.

The Merlot variety with FLORAVIT (V3-fertilized two years in a row) made full maturity earlier, namely on 06.09. with a sugar content of 186g/L, acidity of 7,4g/L, mass of 100d by 170 g and anthocyanins from epicarp of grapes at a rate of 986 mg/kg.

Among variants of Merlot variety, at harvest, the Merlot - FLORAVIT version (V3) obtained higher values, namely at the sugar content of 245 g/L and anthocyanins in the skin of grapes of 1,289 mg/kg, so there is a difference between experimental variants. At harvest, the quantity of grapes by Merlot with FLORAVIT was 4395 kg/ha and the quantity of grapes by Merlot was about 3675kg/ha. The rate of must from grapes was 70.5% at FLORAVIT - Merlot and about 69.7% at Merlot.

Compositional characteristics of the wines are presented in table 1.

The content of wine in alcohol presents depending on the accumulated amount of grapes sugar at harvest is between 13.9% - 14.1% vol. The total volatile acidity and the pH of wines are within normal limits.

The unredder extract at the vinified Merlot wine in wooden tubs is between 28.4 to 29.6g/L, respectively blank version is about 28.4g/l, at FLORAVIT variant (V2) it was values of 29,4g/L and FLORAVIT variant (V3) have values of 29.6 g/L, so there is a quantitative increase in variants treated with FLORAVIT. The same character of wine has the unredder extract at Merlot wine variety vinified in tanks rotating, lower values Merlot wine - stag (29.6 g/L) than that treated with FLORAVIT (30.9g/L).

Table 1

Compositional characteristics of wines

Variant	Alcoh %vol.	Total acidity g/l C ₄ H ₆ O ₆	Volatile acidity g/l H ₃ COOH	Extract g/l	Sugar reduc. g/l	Intensity color. 420+520+620 1 mm	Anthocyanins mg/l	Total polyphenols g/l	pH	Free SO ₂ mg/l	Total SO ₂ mg/l	Organoleptic apreciation
Merlot-control, tub	13,9	6,9	0,40	28,4	1,6	6,45	320	1,70	3,30	32	98	good
V2-Merlot FLORAVIT, tub	14,1	7,0	0,36	29,4	7,1	6,59	365	1,77	3,47	35	105	very good
V3-Merlot FLORAVIT, tub	14,1	7,1	0,36	29,6	7,4	6,84	379	1,91	3,45	34	102	very good
Merlot control, Roto	13,9	7,1	0,36	29,6	1,3	7,77	410	2,15	3,29	31	99	very good
Merlot FLORAVIT, Roto	14,1	7,1	0,39	30,9	4,5	8,31	460	2,22	3,51	38	80	very good

So, the wines made by maceration-fermentation in rotating metal container are more extractive, more intensely colored, more rich in anthocyanins and total polyphenols because more often placed in contact of the solid phase with the liquid phase than those obtained by maceration-fermentation in open vats.

The analyzed compounds of color (anthocyanins, colour intensity total polyphenols) presents quantitative values superior to variants of wine rotating metal tanks such as: the content in anthocyanins at version Merlot – flag gives values of 410 mg/L and at flag version Merlot vinified in the wooden tubs is 320 mg/L. Also, the colour intensity is 6.45 at the flag variant and about 7.77 to vinified version in rotating tanks of wine and total polyphenols 1,70 g/L at variant with tubs compared with the variant of the vinified version in rotating tanks which is 2.15 g/L. So, from effectuated researches result that at the Merlot variety the favorable results were obtained in variant V3-two years consecutively fertilized with foliar fertilizer FLORAVIT.

In terms of taste, all the wines are considered good and with a high alcohol potential, extractive and with a appreciable intensity of color.

CONCLUSIONS

1. The water supply in soil is influenced both by rainfall in the previous year as well as those registered during the growing season, and the frequency of torrential rainfall, leading to increased of the water deficit during the growing season.

2. The administration of FLORAVIT foliar fertilizer at Merlot variety give favorable results about wine quality, such quantity of colored compounds (anthocyanins, polyphenols) is superior compared with flag as result of stimulating of the physiological processes under the impact of fertilizer.

3. Wines obtained in rotating metal tanks are appreciated in terms of organoleptic and physical-chemical composition, having a extractivity and color better than wines in wooden tubs.

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LEPIDOPTERA (INSECTA: LEPIDOPTERA) IN THE COLLECTION OF EUGEN WORELL FROM NATURAL HISTORY MUSEUM OF SIBIU, COLLECTED FROM "DUMBRAVA SIBIULUI" FOREST

LEPIDOPTERE (INSECTA: LEPIDOPTERA) DIN COLECȚIA LUI EUGEN WORELL EXISTENTĂ LA MUZEUL DE ISTORIE NATURALĂ DIN SIBIU ȘI COLECTATE DIN PADUREA "DUMBRAVA SIBIULUI"

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Abstract. *In the present work was studied the Lepidoptera collection of Eugen Worell, and the paper presents a systematic list of species collected Macrolepidoptera since 1907-1958 in Forest "Dumbrava Sibiu". This paper can be considered a tribute and memory of Eugen Worell entomologists, who through his collection has contributed substantially to the knowledge of this group of insects. The data obtained and to join the collections of personal data between 2000-2011 we intend to achieve a more comprehensive study, which will be subject to further research on the evolution Macrolepidoptera over more than 104 years of research in the area of Forest "Dumbrava Sibiu".*

Key words: Eugen Worell collection, *Macrolepidoptera*, oak forest "Dumbrava Sibiu", Natural History Museum of Sibiu.

Rezumat. *Lucrarea de față prezintă lista sistematică a speciilor de Macrolepidoptere colectate în intervalul 1907-1958 din Padurea "Dumbrava Sibiu", specii existente în Colecția de lepidoptere a lui Eugen Worell. De asemenea, lucrarea poate fi considerată un omagiu adus memoriei entomologului Eugen Worell, care prin colecția sa a contribuit substanțial la cunoașterea acestui grup de insecte. Datele obținute se alătură datelor personale colectate în intervalul 2000-2011. În viitor ne propunem realizarea unui studiu cât mai amplu care va avea ca obiectiv al cercetărilor evoluția Macrolepidopterelor începută în urmă cu 104 ani în Padurea "Dumbrava Sibiu".*

Cuvinte cheie: colecția lui Eugen Worell, *Macrolepidoptere*, pădurea Dumbrava Sibiu, Muzeul de Istorie Naturală din Sibiu.

INTRODUCTION

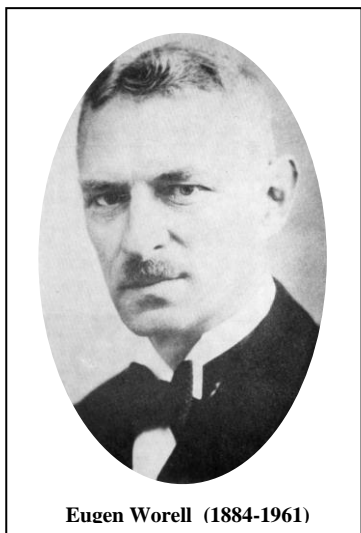
Butterflies (Insecta:Lepidoptera) belong to the best studied group of invertebrates in Romania. Data about their distribution appear in many papers concerning particular parts of the country, especially national and landscape parks, nature reserves, and other areas which are attractive as far as nature is concerned, as well as in the vicinity of cities (Schneider-Binder, E., 1973, Stancă Moise C., 2002, 2003, 2004, 2005, 2006, 2007, 2010). In the present investigation was studied and indexed collection above mentioned species were caught only from

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Forest "Dumbrava Sibiului" in 1900-1958 in Sibiu. Research has been conducted on the material currently existing in the collection of Lepidoptera from Eugen Worell collection which is located at the Natural History Museum in Sibiu. Besides the analyzed material was walking and literature and all the papers published by Worell scientific papers in the volume of the museum "Verhandlungen und Mitteilungen des siebenbürgischen Vereins für Naturwissenschaften zu Hermannstadt" (Popescu-Gorj A., 1970).

Dr. Eugene Worell was born on 15 October 1884 at Râșnov. After graduating High School in Kosice (where his father was a military doctor) falls to law school in Vienna, shortly after it entered the medical school and continuing her family tradition (Ungar, 1981). In 1908, the doctor is called the Adriatic port of Pula. As a physician has the opportunity to travel, where they return with a rich and lepidopterists entomological material.

In 1919 Sibiu comes to the Military Hospital where he is appointed



Eugen Worell (1884-1961)

director, and since 1920 active member of the Transylvanian Society of Natural Sciences, was appointed curator of the entomological collections of beetles and Lepidoptera, is considered one of the largest collectors and hobbyists entomologists the country during the two world wars. The material is collected across the country, and collected from Transylvania Sibiu and its surroundings. The "Collection of Dr. Eugene Worell Lepidoptera" is not only the great number of copies of which contribute to the knowledge instead of collecting a large number of species spread, but also that it includes rare, less known but also new scientists from all over Transylvania. The collection was donated to the Museum of Natural Sciences

of Sibiu in 1958. Part of the entomological collection is also at the Natural History Museum "Grigore Antipa" in Bucharest and one in Ploiesti.

MATERIAL AND METHOD

The material presented comes from the entomological collection of Eugen Worell preserved in the Natural Instore Museum in Sibiu. The 6646. three specimens were collected during the years 1900-1958 by Eugen Worell from Transilvania, around Sibiu specifically from the Forest Grove area of Sibiu. After consulting the collection, the determination was made after the copyright material, some species being updated bibliographic material and works by Koch M.(1991), Popescu-Gorj A.(1980), Laszlo Rakosy (200), and reference works in Romania, which includes Catalog butterfly Laszlo Rakosy, Marian Goia, Zoltan Kovacs (2003).

After studying and inventorying the Collection of Eugene Worell was prepared following list is included only species systematically collected from Forest "Dumbrava Sibiu":

SYSTEMATIC LIST OF SPECIES IN
THE COLLECTION OF EUGEN
WORELL MACROLEPIDOPTERE
COLLECTED FROM FOREST
"DUMBRAVA SIBIULUI"

CLASA INSECTA
(HEXAPODA)*

Order LEPIDOPTERA
SupraFamily BOMBYCOIDEA
Family LASIOCAMPIDAE

Genus *Malacosoma* Hübner, [1820]

(sin. *Trichodia* Stephens, 1827; *Clisiocampa* Curtis, 1828)

1. *Malacosoma neustria* Linnaeus, 1758: (18.VII.1955)

FAMILY DREPANIDAE

Genus *Drepana* Schrank, 1802
(*Drepania* Hübner, [1819]; *Syssaura* Hübner, [1819])

2. *Drepana falcataria* Linnaeus, 1758: (1 ♂ 21.V. 1939; 2 ♀♀ 1.VI.1938)

FAMILY SPHINGIDAE

Genus *Acherontia* Laspeyres, 1809
(sin. *Brachyglossa* Boisduval, [1828])

3. *Acherontia atropos* Linnaeus, 1758: (2♂♂ 10.VIII.1938)

Genus *Hyloicus* Hübner, [1819]

4. *Hyloicus pinastris pinastris* Linnaeus, 1758: (6 ♂♂, 15.VIII.1938)

Genus *Deilephila* Laspeyres, 1809

5. *Deilephila porcellus* Linnaeus, 1758: (2 ♂♂ 15.V.1938)

FAMILY ARCTIIDAE

Genus *Setina* Schrank, 1802
(*Endrosa* Hübner, [1819]; *Philea* Zetterstedt, [1839])

6. *Setina irrorella* Linnaeus, 1758 : (2 ♂♂, 2.VII.1932; 2 ♂♂ și 2 ♀♀, 8.VIII.1940)

Genus *Eilema* Hübner, [1819]
(sin. *Systropha* Hübner, [1819]; *Piesta* Billberg, 1820; *Ilema* Hampson, 1900; *Colinia* Agenjo, 1977, nec *Cossmann*, 1906, nec *Nuttall*, 1832)

7. *Eilema complana* Linnaeus, 1758: (1 ex.; 20.VI.1953)

Genus *Atolmis* Hübner, [1819]
(*Gnophria* Stephens, 1829)

8. *Atolmis rubricollis* Linnaeus, 1758: (1 ex.; 13.VI.1938)

Genus *Cybosia* Hübner, [1819]
(sin. *Ecteina* Rambur, 1866)

9. *Cybosia mesomella* Linnaeus, 1758: (1 ♂, 2.VI.1932; 5 ♂♂, 7.VI.1945, 1 ♀ 8.VI.1938)

Genus *Miltocrista* Hübner, [1819]
(*Calligenia* Duponchel, 1844)

10. *Miltocrista miniata* Forster, 1771: (1 ♂ 6.VII.1953; 1 ♀ 6.VIII.1939; 2 ♀♀, 12.VIII.1940)

Genus *Spilosoma* Curtis, 1825
(*Spilarctia* Butler, 1875)

11. *Spilosoma menthastri* Denis & Schiffermüller, 1775: (2 ♂♂, 15.V.1938)

Genus *Callimorpha* Latreille, 1809
(*Euplagia* Hübner, 1820; *Panaxia* Tams, 1939)

12. *Callimorpha quadripunctaria* Poda, 1761: (16.V.1939, 10.VI.1945; 13.VI.1938, 27,28.VII.1953, 17.VIII.1953)

FAMILY CTENUCHIDAE

(sin. SYNTOMIDAE ; AMATIDAE)

Genus *Syntomis* Ochsenheimer, 1808
(sin. *Glaucopis* Hübner, [1809], nec *Gmelin*, 1788; *Amata* auct.)

13. *Syntomis phegea orientalis* Daniel, 1951: (2 ex.; 7.VII.1908, 9.VII.1907)

FAMILY NOCTUIDAE

Genus *Agrotis* Ochsenheimer, 1816
(sin. *Scotia* Hübner, [1821]; *Agronoma* Hübner, [1821]; *Georyx* Hübner, [1821]; *Noctua* Boisduval, 1828, nec *Linnaeus*, 1758; *Psammophiila* Stephens, 1850)

14. *Agrotis segetum* Denis & Schiffermüller, 1775: (21.VIII.1938)

FAMILY HESPERIIDAE

Genus *Carcharodus* Hübner, 1819
(sin. *Spilothyrus* Duponchel, 1835; *Reverdinus* Ragusa, 1919; *Lavatheria* Verity, 1940)

15. *Carcharodus laevatae laevatae* Esper, 1783 : (6♂♂ 20.V.1953; 3 ♂♂ 6.VII.1953; 1 ♂ 27.VII.1952)

16. *Carcharodus laevatae laevatae* Esper, 1783: (6♂♂ 20.V.1953; 3 ♂♂ 6.VII.1953; 1 ♂ 27.VII.1952)

Genus *Hesperia* Fabricius, 1793
(sin. *Pamphila* Fabricius, 1807; *Urbicola* Tutt, 1905; *Augiades* auct.)

17. *Hesperia comma comma* Linnaeus, 1758 : (1.IX.1939)

Family P A P I L I O N I D A E

Genus *P a p i l i o* Linnaeus, 1758

(sin. *Pterourus* Scopoli, 1777; *Aernauta* Berge, 1842)

18. *Papilio machaon machaon* Linnaeus, 1758 : (1♂ 17.V.1939; 9.VII.1904; 1♂ 25.VII.1939)

Genus *I p h i c l i d e s* Hübner, 1819

19. *Iphiclides podalirius podalirius* Scopoli, 1763 : (1♀ 27.V.1925)

Genus *C o l i a s* Fabricius, 1807

(sin. *Zerene* Hubner, [1819]; *Eurymus* Horsfield, nec. Rafinesque, 1815)

20. *Colias crocea crocea* Geoffroy in Fourcoy, 1785

(sin. *C. edusa* Fabricius, 1787):

(23♂♂, 2 ex. 2.VIII; 6.VIII; 3 ex. 9.VIII; 2 ex. 11.VIII; 7 ex. 18.VIII; 22.VIII; 26.VIII; 18.IX.1953)

21. *Colias crysotheme* Esper, 1780 : (8.IX.1947)

Genus *G o n e p t e r y x* Leach, [1815]

(sin. *Rhodocera*

Duponchel & Leconte, [1830]; *Earina* Speyer, 1839; *Goniapteryx* Westwood, 1840 nec. Perty, 1833)

22. *Gonepteryx rhanni transiens* Verity, 1913 : (13♀♀, 7.IV; 16.IV; 2 ex. 1.V; 3 ex. 5.V; 26.V; 29.VI.1948)

Family N Y M P H A L I D A E

Genus *A p a t u r a* Fabricius, 1807

(sin. *Aeola* Billberg, 1820)

23. *Apatura ilia ilia* Denis & Schiffermüller, 1775: (1♀ 1.VII.1950)

Genus *N y m p h a l i s* Kluk, 1802

(sin. Scudder, 1873,

nec. Stål, 1873; *Euvanessa* Scudder, 1889)

24. *Nymphalis xanthomelas* Denis & Schiffermüller, 1775: (9.VI.1947)

Genus *I n a c h i s* Hübner, [1819]

25. *Inachis io io* Linnaeus, 1758 : (23.VI.1953)

Genus *V a n e s s a* Fabricius, 1807

(sin. Pyrameis Hübner, [1819])

26. *Vanessa atalanta atalanta* Linnaeus, 1758 : (5♀♀, 10.V; 27.V; 2 ex. 15.VII; 15.VIII.1951)

27. *Vanessa cardui* Linnaeus, 1758: (1.IX.1952)

Genus *A g l a i s* Dalman, 1816

(sin. *Ichnusa* Reuss, 1939)

28. *Aglais urticae urticae* Linnaeus, 1758 : (4.VI.1941)

Genus *P o l y g o n i a* Hübner, [1819]

(sin. *Eugonia* Hübner, [1819])

29. *Polygonia c-album c-album* Linnaeus, 1758 : (17.VIII.1953; 27.IX.1953)

Genus *A r g y n n i s* Fabricius, 1807

SubGenus *M e s o a c i d a l i a* Reuss, 1926

30. *Argynnis (Mesoacidalia) aglaja aglaja* Linnaeus, 1758

(sin. *M. charlotta*

Haworth, 1803): (2.VII:1953; 13.VII.1953; 6,10.VIII.1938)

SubGenus *F a b r i c i a n a* Reuss, 1920

31. *Argynnis (Fabriciana) addipe addipe* Denis & Schiffermüller, 1775

(12.VII.1938; 16.VII.1956; 12.VIII.1938; 25,29.VIII.1938; 25.VIII.1940; 29.VIII.1948)

32. *Argynnis (Fabriciana) niobe niobe* Linnaeus, 1758: (2.VIII.1938)

SubGenus *A r g y n n i s* Fabricius, 1807

33. *Argynnis (Argynnis) paphia paphia* Linnaeus, 1758: (29.VI.1948; 22.VII.1953; 31.VII.1952; 17.VIII.1953)

Genus *P a n d o r i a n a* Warren, 1942

34. *Pandoriana pandora pandora* Denis & Schiffermüller, 1775

(sin. *P. maja* Cramer,

1775)

24.VII.1953; 17.VIII.1953; 18.IX:1953

Genus *I s s o r i a* Hübner, [1819]

(sin. *Rathora* Moore, [1900])

35. *Issoria lathonia lathonia* Linnaeus, 1758

(sin. *Argynnis lathoria* Linnaeus, 1758): (25.VIII.1938)

Genus *M e l i t a e a* Fabricius, 1807

(sin. *Schoenis* Hübner, [1819]; *Cinclidia*

Hübner, [1819]; *Didymaeformis*

Verity, 1950; *Mellicta* Billberg, 1820, parti)

36. *Melitaea athalia athalia* Rottenburg, 1775: (1♀, 16.VI.1953; 3♀♀, 2.VII.1953)

37. *Melitaea didyma didyma* Esper, [1779]: (1♀, 10.VI.1954; 2♀♀, 10.VII.1938, 1948; 1♂, 16.VII.1953)

Family S A T Y R I D A E

Genus *M e l a n a r g i a* Meigen, [1828]

(sin. *Agapetes* Billberg, 1820, nom. reject. 1956)

38. *Melanargia galathea scolis* Fruhstorfer, 1917: (4♀♀, 10.VI.1948; 2♂♂, 25.VI.1938)

Genus *P a r a r g e* Hübner [1819]

39. *Pararge (Pararge) aegeria tircis* Butler, 1867: (16.V.1948; 22.V.1938; 6.VIII.1939)

SubGenus *L a s i o m m a t a* Humphreys & Westwood, 1841

40. *Pararge (Lisioommata) megera megera*

Linnaeus, 1758: (4♂♂1.V; 8.V; 15.V; 16.V.1939)

Genus *Caenonympha* Hübner,[1819]
(sin. *Chortobius* Dunning & Pickard, 1858;
Sicca Verity,1953)

41. *Caenonympha pamphilus pamphilus*

Linnaeus, 1758: (12.VIII.1940)

42. *Caenonympha arcania arcania*

Linnaeus, 1761 (sin. *C. amyntas* Poda, 1761): (15.VI.1938; 3♀♀, 1.VII.1954; 2♀♀, 6.VII.1953)

SubFamily L Y C A E N I N A E

Genus *Lycena* Fabricius, 1807

(sin. Heodes Dalman, 1816; Chrysophanus Hübner, 1816, Palaeochrysophanus Verity,1943;)

43. *Lycena phlaeas* Linnaeus, 1761:

(4♂♂,24.VII.1952; 2♂♂, 1♀, 25.VII.1938; 26.VII.1953)

44. *Lycena virgaureae virgaureae*

Linnaeus, 1758: (1♂,27.VII.1953)

45. *Lycena argiades* Pallas,1771:

(1♂,10.VII; 1♀, 8.VII.1938; 2♀♀, 8.VIII.1940)

SubFamily P L E B E J I N A E

Genus *Glaucopsyche* Scudder, 1872

(sin. *Apelles* Hemming,1931)

46. *Glaucopsyche alexis alexis* Poda, 1761

(sin. *Lycena cyllarus* Rottenburg, 1775): (17.VII.1940; 19,20.VI.1938)

Genus *Maculinea* von Ecke, 1915

(sin. *Argus* Boisduval, [1832], nec Scopoli,1763)

47. *Maculinea alcon* Denis &

Schiffermüller,1775 : (12.VIII.1940)

48. *Maculinea arion* Linnaeus, 1758: (3♂♂, 12.VIII.1840)

Genus *Polyommatus* Latreille,1804

49. *Polyommatus icarus icarus* Rottemburg, 1775: (27.VII,2.X.1952)

Genus *Philotes* auct.

51. *Philotes baton baton* Bergsträsser, 1779:

(1♂și 1♀,14.V; 21.V.1939; 27.VII.1943; 2♂♂,28.VII.1938)

RESULTS AND DISCUSSIONS

Data processing and their centralization in the form of systematic list of species collected in the past Macrolepidoptere perimeterl existing forest and now as a museum collection was the purpose of this paper. By centralizing alert fauna species in the forest since 1900-1958, which will add the personal collections are studying a further communication, this paper updates the state of knowledge of this group of insects around Sibiu and is aimed at achieving a "Red List" endangered and extinct species in the forest area of Sibiu Grove. Also on bibliography, add new data on these species Macrolepidoptere area around Sibiu.

The paper contains a systematic list of species collected Macrolepidoptera Forest Grove area of Sibiu, which are grouped into 11 Families 50 species and 184 copies respectively. For each species, besides the systematic in Gender and Family, are the year, month and day of collection.

The oldest copy coming from Sibiu and Forest Grove in the collection of Eugene Worel was collected in 1907 and is *Syntomis phegea orientalis* Daniel, 1951: (2 ex.; 7.VII.1908, 9.VII.1907).

CONCLUSIONS

The high level of diversity of Lepidoptera fauna in Romania is reflected not only by different published studies, but also by the collections kept in the Natural History Museum in Sibiu of Romania. Collection of Eugene Worell with other collections of Lepidoptera is a valuable source of documentation for current and future research. You must remember once again that the vast majority of the

thousands of collection of this data collection are unpublished. Therefore in this paper we have continued research work, helping their publication and thus being able to get to reach all those interested in this group of insects. Beside common species, the collection of Lepidoptera preserved in Natural History Museum also contains rare and endemic species for Romanian fauna. These taxa are very important from scientific and biogeographical point of view.

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