SUMMARY

Specialized sour cherry culture is a relatively recent, in the past this culture was represented by single trees. In recent years there has defined a favourable economic environment with a good prospective concretized through increased demand for the fruit industry and for export.

Global trend of fruit increasing consumption creates new opportunities for our geographic area, allowing resizing orchards in the most favourable regions, driven mainly by the appearance of private property, experience and professional tradition.

Food industry development, using the latest technology especially in the areas of eco food and canned juices, increased fruits processing level and therefore the demand for raw materials for this field.

These changes call for fruit growing and fruit growers reconsidering efforts in biotechnology, bioengineering and, in substance, changing attitudes towards holding fruit growing, varieties assortment, malleability to market demand and not least the new techniques and technologies.

Agro biological peculiarities, especially high ecological plasticity, increase the importance of this species growing in temperate climates. Although, worldwide there is a requirement of increasingly large sour cherry production, currently, Romania register a considerable decrease share of this specie, especially for the big size plantations. For this reason the development plan is looking forward to extending sour cherry orchards in large agricultural production units.

Causes that determines low productivity of existing varieties plantations are multiple and poorly known in their interdependence. The problem of increasing productivity in high density intensive orchards is closely related to the establishment of technical operations applied in the management of growth and fructification of the trees. At the same time optimizing the culture technologies such as fertilization, pest control, etc. requires the involvement of specialized disciplines in the study of sour cherry agro biological peculiarities (Darbellay, 1994). From this point of view, based on research of foliar fertilization influence and root growth upon productivity of sour cherry plantations in different culture systems have a special interest.

In this respect, Benedetti (1998) recommends the use of slow leaching fertilizers, nitrification inhibitors, protein hydrolysates and the organo-mineral fertilizers in intensive plantations. Also, according to European Commission directives should be given effective nutrients based on culture requirements, well adapted to its growth conditions and methods of application should not have harmful effects on human health, animals and the environment.

Since sour cherry varieties currently available in the culture are valuable and productive, the present paper propose the assessment of the fertilization methods effects, to ensure trees normal supply of macro and micro elements in integrated production, upon the agro productive character of the main varieties grown in the NE region of Romania.

Analysis undertaken will consist of observations of trees growth vigor, vegetation phenological and fructification elements, quantitatively and qualitatively production, and ways of fruit use.

The purpose of this research has been achieved through the following **objectives**:

- study of sour cherry varieties growth and fruiting biological peculiarities;
- identification and use of new fertilizers and their influence on trees processes of growth and fruition;
- establishment of optimal fertilization variants, with positive effects on growth and fructification;
- increasing sour cherry varieties agro productive potential in terms of natural resource area;
- the influence of foliar fertilization upon flowers fecundation-pollination process;
- determining the optimal timing of foliar fertilizers application in order to maintain the fruit production;
- improving the productive potential and fruit quality using optimal concentrations and times of extra radiculare fertilizers application.

Activities that led to the achievement of these objectives were:

- analysis of the varieties in terms of fertilization methods effect on the growth vigor (trees height, average diameter and volume of the crown, the trunk cross-sectional area, number and length of annual increases);
- assessing the influence of chemical fertilizers on the fructification particularities;
- the study of vegetation phenological and fructification elements;
- the evaluation of productive potential in terms of fruit quantity and quality, ways of use etc;
- estimation of trees average leaf area under different methods of fertilization;
- pollen viability and germination capacity;
- determination of macro and micro in leaves;
- analysis and correlation of results to underline fertilization methods influence on sour cherry agro productivity .

The thesis is presented on 187 pages, experimental data are shown in 26 tables, 19 figures, 51 color photos, 8 correlations, conclusions and references including 147 sources.

Part I provides an overview of the current state in Romania and abroad in terms of interaction between climatic and technological factors on sour cherry agro productivity.

Researchers references on the importance, origin, trends and national and international guidelines of cherry, are also presented in Chapter I.

Part II is the personal research that includes: characterization of the natural environment, material and methods of research, organization and description of the experimental protocol and results.

Eco-pedologic conditions in which the research were conducted are presented in Chapter II, these highlighting the fact that Iasi fruit growing area has high favorability for sour cherry culture.

Chapter III presents the biological material and research methods were used, observations, determinations and measurements proposed to assess the influence of chemical fertilization upon all ten studied varieties.

In the experiments conducted there were taken under study, comparatively, extra radicular fertilized variants (b1) using liquid fertilizers with bio stimulator effect; combined variants, foliar and root fertilization (b2); root fertilized variants (b3) with advanced solid fertilizers; and unfertilized variants (b4), the latter being the control variant.

The studied biological material consisted of ten sour cherry varieties grafted on *Prunus mahaleb* L. rootstock, of all were four foreign varieties and six Romanian varieties, planted according to their vigor:

- 5 m planting distance between the rows and 4 m between trees in a row (500 trees/ha), varieties: ‘Scuturător’, ‘Engleze timpurii’, ‘Crişana 2’, ‘Mocăneşti 16’;

- 4 m between the rows and 2 m between trees in a row (1250 trees/ha), varieties: 'Northstar', 'Oblacinska', 'Ilva', 'Nana', 'Schattenmorelle', 'Pitic de Iaşi'.

The study of climatic factors influences on the beginning and ongoing of growth and fructification behavior and the influence of fertilization upon growth and fructification of sour cherry varieties was conducted during 2009-2011. The experience was located in an organized sour cherry orchard, in XXVIII year after planting.

Since the study was focused on knowledge of chemical fertilization influence on trees crown particularities and fructification, the observations and measurements were conducted in two directions:

1. To assess the influence of chemical fertilization on biometric features of the tree crown there were performed measurements after each cycle of vegetation and were calculated mean values of growth and development indicators for each variant.

Measurements and biometric measurements were focused on crown diameter on the row line and perpendicular to it, measured individually for each variant using the roulette; trunk cross-sectional area (SSTT) which was determined by caliper (measurements were made at 50 cm above the ground at varieties planted in classical system and at 30 cm above the soil for the varieties planted in intensive system); crown volume (V); the number and length of annual increases; and leaf surface.

2. To assess the influence of chemical fertilization on fructification particularities and capacity, were determined: the length, number of vegetative and flowering buds on the fruit branches, varieties productive potential (production is calculated per tree, kg/tree and per hectare, tons/ha); productivity index (kg/cm^2), fruit quality (fruit and stone average weight (g), fruits height, large and small diameter (mm), peduncle length and weight).

Chemical analysis were focused on soluble dry matter (% S.U.), reducing sugars (%) titratable acidity (g malic acid/ 100 g fresh substance). Samples were taken at harvest maturity.

Physiological analysis followed the pollen viability and germination capacity, macro-and microelements content in leaves and the fertility rate by free pollination.

In Chapter VI are presented the research results undertaken to meet the proposed objectives.

The phenological observations found that the beginning of growth and fruiting pheno phases ongoing did not register large variations from year to year. The differences mainly explain varieties different origins and the influence of climatic factors during vegetation period, specific to each year and secondly the agro techniques.

Fertility coefficient by free pollination was influenced by the varieties development stage, planting distances, branches position in the crown, climatic conditions during flowering,

bees presence for pollination, but also by extra radicular fertilization (4l/ha) with Fertileader B (1%), P (6%), K (12%) applied when 90% of petals fell down , which brought additional increase of this variants.

Observations made during the study highlight the fact that extra radicular fertilization does not adversely affect pollen germination; however, their application increases the percentage of germinated pollen comparing with unfertilized variant.

The increase of trunk cross-sectional area registers oscillating values varying from year to year for each of the studied varieties, that can be attributed to pedo-climatic conditions variability and the production level achieved. Annual fertilization at the ten sour cherry varieties in all variants determined a slight upward trend in almost all cases, concerning the trunk cross section.

Both for small-middle and middle-large vigor varieties, planting distances between trees are not sufficient to ensure an optimum nutrition area, which may be increased to at least 3 m at high density planting system, respectively 5 m for smaller densities. Analysis of the obtained data proves that crown parameters of sour cherry varieties from different vigor groups; depend primarily on ecological area, biological characteristics of the variety and nutrition area.

In terms of fertilization factor graduations, the studied varieties respond favorably to mixed fertilization. The other fertilization methods have influenced the crown production volume; constructive parameters remained constant close to the values registered at mixed fertilization.

Trees growth potential at the ten sour cherry varieties, expressed by average length, number and total length of annual increases was differently influenced by the methods and extra radicular fertilizers application moment, due to increased photosynthetic processes.

The recorded foliar surface values were under the optimal values XVIII years after planting, this is due undifferentiating new fruit buts and fructification permutation at crown periphery. At studied varieties the macro and micronutrients content in leaves and also the leaf area increased in the same time while trees were supplied by extra radicular fertilization (4l/ha) with Fertileader N (9%), P (5%), K (4%) plus micronutrients, radicular applied (0,3 kg/tree), with Timac plus 37 (5% N, 10% P, 22% K).

The effect of the analyzed factors upon the length and bud differentiation on the fruit branches, degree of flowering and fruit binding and finally the number of fruits per tree in all ten varieties of sour cherry was reduced. A maximum characteristic oscillation was obtained with the combination of two factors graduations, but the variety character is the determining factor in defining these parameters. There was not noted the existence of a strong interaction between the effects of solid chemical fertilization radicular application and these parameters.

The commercial value raised the need of studying the chemical fertilization influence on fruit quality. This feature improved by applying different fertilization methods, allowing not only increased and constant yields, but also equable fruit size, pulp/seed ratio and fruits chemical characteristics (S.U., sugar/acidity ratio).

Genotypic factor is solely responsible for the quantitative completion of bud number/cm^2 S.S.T., the obtained values were indirect proportional to varieties vigor.

Productivity index values were influenced by fertilization applied annually. Trunk cross-sectional area is correlated with trees productivity and is considered one of the main indicators for assessing and planning trees rational fruit load.

Although leaf area increased in the same time with tree production, trees were overloaded comparing to the foliar possibilities, due to the photo assimilates synthesis for the production destination and less to trees vegetative growth and development.

Experimental technological factors of does not significantly influence productivity ratio values/crown volume, although with a slight increase in variants fertilized.

Biodiversity of fruits characteristics meets consumer tastes and processors demands, both for fresh consumption and processing.

In the last part of the thesis are developed the conclusions and recommendations which provide the possibility of increasing sour cherry varieties agro productivity, under the influence of chemical fertilization, with special advantages if there is applied supplementary extra radicular fertilization on root fertilized background. This method provides optimal biotope, which are closer to the sour cherry varieties biological requirements, positively influencing the level of production.

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