

THE INFLUENCE OF THE TECHNOLOGICAL FACTORS ON THE VEGETATIVE AND PRODUCTION POTENTIAL OF A SERIES OF HIGH QUALITY WINE GRAPE VARIETIES

INFLUENȚA FACTORILOR TEHNOLOGICI ASUPRA POTENȚIALULUI VEGETATIV ȘI DE PRODUCȚIE AL UNOR SOIURI PENTRU STRUGURI DE VIN DE ÎNALTĂ CALITATE

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Abstract: *The researches were carried out at the Station for Research and Development for Viticulture and Wine Production of Iași, during the agricultural year 2007-2008, regarding the varieties Fetească alba and Fetească regala, and the influence of technological factors such as the following was monitored: the bud load (10, 15 and 20 buds/ m²), foliar fertilization and phytosanitary (conventional and minimal) extermination. The measurements carried out focused on the amount of wood removed upon cutting, the vegetation phenological phases, the vegetation state of the vinestock (total number of vine shoots, length of the shoots, the foliar surface), the fertility potential of the soil, the relative and absolute fertility coefficient), the dynamics of the ripening of grapes, the degree of attack of diseases and pests, the production of grapes in kg/vinestock, the average weight of a grape, the content of sugars and acidity. In the circumstances of the year 2008, characterized by a lower thermal regime and a high hydric regime, the best outcomes were obtained in variants with bud loads of 10 and 15 buds/m², foliar fertilization and conventional pest control.*

Key words: Iasi, quality, technological factors, grapevine varieties, foliar fertilization

Rezumat: *Cercetările au fost efectuate la Stațiunea de Cercetare Dezvoltare pentru Viticultură și Vinificație Iași, în condițiile anului agricol 2007 – 2008, la soiurile Fetească albă și Fetească regală, urmărindu-se influența unor factori tehnologici cum ar fi: încărcătura de ochi (10, 15 și 20 ochi/m²), fertilizare foliară și combaterea fitosanitară (convențională și minimală). Determinările efectuate au avut în vedere cantitatea de lemn eliminată la tăiere, desfășurarea fenofazelor de vegetație, starea de vegetație a butucilor (număr total de lăstari, lungimea lăstarilor, suprafața foliară), potențialul de fertilitate al soiului, coeficienți de fertilitate absolut și relativ), dinamica maturării strugurilor, gradul de atac al bolilor și dăunătorilor, producția de struguri exprimată în kg/butuc, greutatea medie a unui strugure, conținutul în zaharuri și aciditate. În condițiile anului 2008 caracterizat printr-un regim termic mai scăzut și un regim hidric ridicat cele mai bune rezultate au fost obținute la variantele cu o încărcătură de 10 și 15 ochi/m², fertilizare foliară și combatere convențională.*

Cuvinte cheie: Iasi, calitate, factori tehnologici, soiuri de vita de vie, fertilizare foliara

INTRODUCTION

The use of technologies differentiated and optimized for the culture of vine is a major problem upon which the wine production depends. The purpose of the “dry” cutting of the vine is not only to maintain in time the guidance shape, but

also to achieve a balance between the growing and fructification in order to obtain optimum quantity and quality productions (Țârdea C., et. al. 1995). The optimization of the fruit load implies the establishment of the number of buds that ensure the development of a foliar surface appropriate to the agrobiological potential of the soil, with the purpose of obtaining large productions with increased accumulation of sugars and with the maintenance of the vigorous growth of vinestocks (Irimia L, 2006). An important role in ensuring a constant and high quality wine production at the level of the production potential of vinifera varieties is played by the mineral nutrition conditions which should have optimum levels during the entire vegetation period.

MATERIAL AND METHOD

The experiences were placed with two high quality varieties of wine – Feteasca alba and Feteasca regala – recommended and authorized by Copou Wine-Growing Center of Iași. Two experimental models were organized: the variety Feteasca alba engrafted on the parent stock Berlandieri x Riparia Kober 5 BB in a plantation set up in 1992, planting distance 2.2 x 1.2 m (3788 vinestocks/ha), guidance shape: bilateral cord, with 0.8 m trunks; the variety Feteasca regala engrafted on the parent stock Berlandieri x Riparia Kober 5 BB, the plantation was set up in 1990, with the planting distance of 3.0 x 1.0 m, ensuring a density of 3333 vinestocks/ha, the grapes being guided in shape of bilateral cords, the trunks being 1.0 m tall. The land is exposed to the south-east, with an 8 – 9% slope and the rows are oriented along the level curves, the soil is alternatively maintained as a farmed soil/ soil durably and naturally overcome with grass. The researches carried out pursued the elucidation of three factors: factor A – combating with the graduations: a_1 – conventional extermination and a_2 – integrated (minimal) extermination; factor B – fertilization with the graduations: b_1 biostimulators and special works related to the vinestock and b_2 foliar fertilizer with microelements responsible for the production quality; factor C – the bud load with the graduations: c_a – 10 buds/m², c_2 – 15 buds/m² and c_3 – 20 buds/m².

From the combination of these factors 12 experimental variants resulted, each variant with 3 repetitions, each repetition with three vinestocks. The measurements carried out focused on the amount of wood, the development of the vegetation phenological phases, the vegetation state of the vinestocks (total number of shoots, length of shoots, foliar surface), the fertility potential of the soil, absolute and relative fertility coefficients), the dynamics of the ripening of grapes, the degree of attack of diseases and pests, the production of grapes in kg/vinestock, the average weight of a grape, the content of sugars and acidity.

RESULTS AND DISCUSSIONS

As a consequence of the evolution of minimum temperatures from the winter of 2007-2008, the losses of buds were within normal limits. Their viability was 72% in main buds and 100% in secondary buds in the variety Feteasca alba and in the variety Feteasca regala, 78% in main buds and 100% in secondary buds. In February, the fructification cuttings were carried out differentially according to varieties and variants. Three levels of loads were used: 10 buds/m², 15 buds/m² and 20 buds/m², and different numbers of buds were obtained according to the variety and planting distance. Thus, in the variety Feteasca alba

the loads obtained were of 26 buds, 40 buds and 53 buds per vinestock, and in the variety Feteasca regala, loads of 30 buds, 45 buds and 60 buds. The cutting system used was mixed, represented by fruit chords of 5-6 buds and replacement knots of 2-3 buds. The bud load attributed upon the dry cutting and fertilization influenced the vegetative development of the vinestocks expressed in the wood amount removed upon cutting. Thus, the annual wood amount decreased as the bud load increased, hence the annual amounts of wood increased for the variety Feteasca regala (1.08 kg/vinestock) with the load of 10 buds/m² and decreased with the load of 15 and 20 buds/m².

The vegetation start, given the climatic conditions of the year 2008, was very good, with values between 88 – 94% buds sprung in both varieties. The bud load influenced differently the vegetation start, therefore, as the bud load increase, both the percentage of sprung buds and the percentage of fertile shoots. The obtained data reveal that in the loads of 10 and 15 buds/m², the total number of shoots is larger than the number of buds left on the vinestock, which means that the smaller loads stimulate the vegetation start of the secondary, tertiary and sleeping sprouts (table 1 and 2).

Table 1

Spring and fertility of the variety Fetească albă given the conditions of the year 2008

Experimental variants	Buds sprung		Total no. of shoots	Fertile shoots		Inflorescences no.	Fertility coefficient	
	nr.	%		nr.	%		absolute	relative
V1 a ₁ b ₁ c ₁	24,4	94	32	29	92	41	1,41	1,28
V2 a ₁ b ₁ c ₂	37,6	94	44	41	93	61	1,48	1,38
V3 a ₁ b ₁ c ₃	48,2	91	58	51	88	70	1,37	1,21
V4 a ₁ b ₂ c ₁	24,4	94	36	32	89	47	1,47	1,30
V5 a ₁ b ₂ c ₂	37,2	93	48	45	93	77	1,71	1,60
V6 a ₁ b ₂ c ₃	47,7	90	56	48	86	78	1,62	1,39
V7 a ₂ b ₁ c ₁	23,6	91	31	27	87	41	1,52	1,32
V8 a ₂ b ₁ c ₂	36,8	92	47	42	90	64	1,52	1,36
V9 a ₂ b ₁ c ₃	47,1	89	47	41	88	61	1,49	1,30
V10 a ₂ b ₂ c ₁	23,4	90	33	29	89	43	1,48	1,30
V11 a ₂ b ₂ c ₂	37,2	93	46	41	90	67	1,63	1,45
V12 a ₂ b ₂ c ₃	46,6	88	45	38	85	57	1,50	1,27

As regards the proportion of fertile shoots of the total of shoots on the vinestock, the largest proportion in Fetească albă was in the variants with loads of 15 buds/m² and the smaller in loads of 20 buds/m². In the variety Fetească regală, the percentage of fertile shoots decreased as the bud load increased.

The fertility of the varieties expressed by the absolute and relative fertility coefficient was influenced both by the bud load and by the agrobiological potential of the varieties. Thus, in the variety Fetească albă, given it was more vigorous, the fertility was lower, and higher values of the fertility coefficients were ensured by the variant V5 (15 buds/m²). In the variety Fetească regală, the values of the absolute and relative fertility coefficients were higher in comparison to the variety Fetească albă, between 1.70 and 1.93, and 1.52 and 1.78

respectively, with maximum values in the variants with 15 buds.m², namely 45 buds/vinestock. Moreover, the values of the relative fertility coefficients in both variants were superunitary in all variants, which shows a balance between growth and fructification.

Table2

Spring and fertility of the variety Feteasca regala given the conditions of the year 2008

Experimental variants	Buds sprung		Total no. of shoots	Fertile shoots		Inflorescences no.	Fertility coefficient	
	nr.	%		nr.	%		absolute	relative
V1 a ₁ b ₁ c ₁	27,6	92	33	30	93	57	1,90	1,72
V2 a ₁ b ₁ c ₂	41,4	92	46	42	91	81	1,92	1,76
V3 a ₁ b ₁ c ₃	54,0	90	54	48	89	86	1,79	1,59
V4 a ₁ b ₂ c ₁	27,9	93	33	31	93	57	1,83	1,72
V5 a ₁ b ₂ c ₂	41,8	93	50	47	94	83	1,76	1,66
V6 a ₁ b ₂ c ₃	55,2	92	56	50	89	85	1,70	1,52
V7 a ₂ b ₁ c ₁	27,6	92	37	35	95	63	1,80	1,70
V8 a ₂ b ₁ c ₂	42,7	94	55	51	94	95	1,86	1,72
V9 a ₂ b ₁ c ₃	53,4	89	53	49	92	85	1,73	1,60
V10 a ₂ b ₂ c ₁	27,6	92	35	33	94	62	1,87	1,77
V11 a ₂ b ₂ c ₂	41,8	93	51	47	93	91	1,93	1,78
V12 a ₂ b ₂ c ₃	52,8	88	54	48	90	86	1,79	1,59

The results of the measurements regarding the influence of the bud load on the foliar surface of the vinestocks reveal that in the variety Fetească albă, the largest foliar surface was 4.83 m²/ vinestock in the variant V5 (15 buds/m²) and the smallest 3.28 m²/ vinestock in V1 (10 buds/m²) and in the variety Fetească regală the foliar surface maximally developed on vinestock was 5.70 m²/vinestock in V8 (15 buds/m² and minimum of 3.95 m²/ vinestock in variant V1 (10 buds/m²). For the fertilization, the product ATONIK was used as a biostimulator, which is a growth and fructification stimulator and contains 0.2% sodium orthonitrophenolate, 0.2% sodium paranitrophenolate, 0.1% sodium nitroguaiacolate. This is a systemic product and determines the activation of the cytoplasmic flow, the faster circulation of the gross sap and assimilated substances. Its effect on the plants is of stimulating the vegetative growth, the increase in the chlorophyll content, the increase in the degree of fertility of flowers, the increase in the resistance to stress factors (drought, frost). Atonik product is compatible with most phytosanitary products and foliar fertilizers. It was applied in a dose of 0.75 L/ha, in 800 L/ha solution and two treatments were administrated, one before blooming – on June 6th – and the second at the beginning of the formation of the grapes (June 24th). The NOVA product was used as a foliar fertilizer with microelements, containing 11%, organic natrium (N), 5%phosphor (P), 8% potassium (K) and microelements (0.04% iron, 0.04% manganese, 0.32 magnesium, 0.02% borine, 0.03% zinc, 0.01% copper and 0.02% molybdenum). NOVA is an entirely organic fertilizer made of free compounds of heavy metals and toxic substances, harmful to men. This fertilizer ensures the increase in the grape production and in the content of sugars, the enhancement of the resistance to drought and frost, the correction of chlorosis and microelements, the gradual clearance of toxic

salts from the soil, the control of the heavy metals in the plants, fruits and soil. It also leads to the enhancement of the rhythm of development of the microflora and microfauna of the soil. Three treatments were administrated, the first before the blooming (June 6th), the second after the blooming (June 20th) and the last during the intense growth of the grapes (July 14th) with doses of 2 liters/ ha in 250 liters of water.

Within the phytosanitary protection factor, 9 treatments were administrated in conventional extermination and 7 treatments were administrated in (minimal) integrated extermination. The intensity, frequency and degree of attack of the main diseases (blast, mildew, must) were monitored. The data obtained revealed a higher degree of attack of blast on the leaves, of 26.36% in the variety Feteasca alba and 24.28% in Fetească regală in the minimal extermination. In the variety Feteasca regala the degree of attack of mildew on the leaves (18.07%) was higher than in the variety Feteasca alba (1.3%).

As regards the grape production, it was influenced by the bud load, the lowest production was that of the variants with 10 buds/m² and the highest in the variants with 15 buds/m². Thus, in the variety Fetească albă, the production was between 2.5 and 3.1 kg/ vinestock and in the variety Fetească regală between 3.2 – 4.2 kg/ vinestock (table 3 and 4).

Table 3

**Quantitative and qualitative grape production
in the variety Fetească albă**

Variant	Average number of grapes per vinestock	Weight of one grape, g	Kg/ vinestock	Sugars, g/L	Acidity, g/L H ₂ SO ₄	Mass 100 grape berries, g
V1 a ₁ b ₁ c ₁	33,6	83,3	2,8	191	3,3	144
V2 a ₁ b ₁ c ₂	35,4	84,8	3,0	175	3,7	142
V3 a ₁ b ₁ c ₃	38,8	80,0	3,1	170	4,0	151
V4 a ₁ b ₂ c ₁	31,2	86,5	2,7	175	3,7	143
V5 a ₁ b ₂ c ₂	39,4	76,2	3,0	172	4,0	147
V6 a ₁ b ₂ c ₃	38,9	74,5	2,9	170	4,2	150
V7 a ₂ b ₁ c ₁	28,7	87,0	2,5	193	3,7	152
V8 a ₂ b ₁ c ₂	33,7	86,1	2,9	182	3,9	151
V9 a ₂ b ₁ c ₃	31,7	85,3	2,7	175	3,6	145
V10 a ₂ b ₂ c ₁	29,7	87,5	2,6	175	4,0	153
V11 a ₂ b ₂ c ₂	39,6	78,2	3,1	170	4,1	152
V12 a ₂ b ₂ c ₃	37,5	77,4	2,9	172	3,8	150

It was asserted that the weight of grapes decreases when the load increased. In the variety Feteasca alba, the grapes had a maximum weight of 87.0 g in variant V7 (10 buds/m²) and a minimum weight of 74.5 g in variant V6 (20 buds/m²). The grapes of the variety Fetească regală weighed on an average between 72.0 and 99.3 g, with the maximum value in variant V4 (10 buds/= and the minimum value in the variant V3 (20 buds/m²). From the production quality standpoint, both varieties had the highest content of sugars in the variants with lower loads (10 buds/m²) and the lowest in the variants with higher loads (20 buds/m²). Therefore, the content of sugars in the variety Fetească albă ranged between 170 and 193 g/L and in Fetească regală between 174 and 204 g/L. The acidity content increased as the bud load increased. In the variety Fetească albă, it was between 3.3 abd 4.2 g/L H₂SO₄ and in Fetească regală between 4.8 and 5.8 g/L H₂SO₄.

Table 4

**Quantitative and qualitative grape production
in the variety Fetească regală**

Variant	Average number of grapes per vinestock	Weight of one grape, g	Kg/vinestock	Sugars,g/L	Acidity, g/L H ₂ SO ₄	Mass 100 grape berries , g
V1 a ₁ b ₁ c ₁	40,0	85,0	3,4	204	5,4	182
V2 a ₁ b ₁ c ₂	53,6	74,6	4,0	197	5,3	204
V3 a ₁ b ₁ c ₃	58,3	72,0	4,2	182	5,6	187
V4 a ₁ b ₂ c ₁	35,2	99,3	3,5	204	4,9	203
V5 a ₁ b ₂ c ₂	46,0	82,6	3,8	200	5,3	205
V6 a ₁ b ₂ c ₃	48,4	76,4	3,7	188	5,8	187
V7 a ₂ b ₁ c ₁	37,0	86,4	3,2	195	4,8	197
V8 a ₂ b ₁ c ₂	46,0	82,6	3,8	188	5,1	182
V9 a ₂ b ₁ c ₃	46,1	78,1	3,6	178	5,3	180
V10 a ₂ b ₂ c ₁	39,6	91,0	3,6	191	5,3	204
V11 a ₂ b ₂ c ₂	46,4	90,5	4,2	188	5,4	195
V12 a ₂ b ₂ c ₃	49,5	82,8	4,1	174	5,8	187

CONCLUSIONS

1. The bud load left after the cutting influences decisively the vegetative development of the vinestocks. The data obtained reveal that in the variants with loads of 10 and 15 buds/m², the number of shoots is larger than the number of buds left on the vinestock, which means that the smaller loads stimulate the spring of the secondary and sleeping sprouts.

2. The foliar surface of the vinestocks varies depending on the variety and the bud load/m². The variety Feteasca regala had the largest foliar surface, in the variants with 15 buds/ m².

3. The fertility of the varieties expressed in absolute and relative fertility coefficients was influenced both by the grape load and by their agrobiological potential. The values of the coefficients were superunitary in both varieties, which indicates high fertility.

4. The quantitative production expressed in kg/vinestock increased as the grape load increased, the lowest production was obtained by the variants with loads of 10 buds/m² and close values by the variants with 15 and 20 buds/m². The content of sugars in the must varied depending on the variety and the grape load. In both varieties, the variants with the load of 10 buds/ m² had the highest content of sugars. The acidity content increased as the grape load increased.

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