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PRODUCTION-TECHNOLOGICAL CHARACTERISTICS OF SOME PROMISING GRAPEVINE SEEDLINGS IN THE CONDITION OF EXPERIMENTAL STATION "RADMILOVAC"

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Abstract: During the period 1982-1991, at the "Radmilovac" site, Experimental Station of the Faculty of Agriculture, Belgrade-Zemun, Yugoslavia, 14 grapevine genotypes were investigated. The experiment included the features as follows: grape yield (q/ha), single bunch weight (g), single berry weight (g), sugar content of must (%) and total acids of must (g/l). Comparison between genotypes was made according to grape features using discriminate analysis, and grape yield and quality being the basis for comparison. Differences between genotypes were expressed in grape yield. Sugar content of must and bunch weight were the next two features essentially influencing the differences, the former negatively and the latter positively to yield.

Key words: genotypes, yield, must quality.

Introduction

Yield is a complex feature consisting of quantitative components, polygenetic in character. As early as in 1927 Sartorius indicated a negative correlation between yield and sugar content of must. According to Eibach (1990), as reported by Bäder the correlation between quantity and quality is not identical for each grapevine variety, the correlation is more expressed between sugar content of must and bunch weight compared to sugar content and number of bunches per vine.

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The aim of our investigation was to single out genotypes having the best characteristics regarding grape quantity and quality. The domestic wine varieties, Black Prokupac, Vranac and Začinak as well as the new variety Tenturier of Župa were crossed with standard introduced varieties: Cabernet Souvignon, Merlot, Pinot Noir, Alicante Bouschet and Gamay Tenturier. The best interspecies genotype, Gamay Tenturier x Rupestris du Lot, was compared with the chosen genotypes of intraspecies hybrids.

Material and Method

Genotypes from eight populations were monitored in the period 1982-1991 at the Experimental Station "Radmilovac", in the vineyard area of Grocka. This area belongs to the Danube region, and it is characterized by the altered east-continental climate, with the year summing temperature in 1951-1991 of 3345 °C, by the length of vegetation period of 190 days and the average precipitation amount of 670 mm. The genotypes are being bred on their own roots with 3 x 0.5 m row spacing. The Guyot system of pruning and standard practices were applied.

Yield per grapevine was established and calculated per unit area expressed in quintals. The characteristics of the fruit include medium bunch weight (g) and medium berry weight. The quality of must is expressed through the content of sugar (%) and total acids (g/l). The date of vintage was determined on the basis of the lower techological ripeness limit of 18%.

Of the 14 selected genotypes, four were from the combination of Cabernet Sauvignon x Tenturier of Župa (Alicante Bouchet x Gamay Noir) (N° 8184 N[2], N° 14633 N, N° 14660 B[3] and N° 14718 B); three were from the combinations with Začinak in which the varieties Pinot Noir (N° 7774 N), Gamay Tenturier (N° 8271 N) and Prokupac noir (N° 13283 N) were used as pollinators. Genotype N° 8214 B was singled out from the combination of varieties Prokupac noir x Tenturier of Župa. Two genotypes (N° 15212 N and N° 16355 N) were singled out from the combinations Alcante Bouschet x Vranac and Tenturier of Župa x Vranac, as well as one interspecies genotype (N° 8448 T[4]) having colored mesocarp.

The data were treated with the application of mathematical-statistical method: factor analysis and discrimination analysis, the grape yield and must quality being the basis for comparison. The sugar content in must, expressed in percents, was transformed into arcsin%.

Results and Discussion

On average, grape yield amounted to 167.4 q/ha, and it was in the range of 136.5 q/ha (N° 8214 B) to 201 q/ha (N° 8448 T). Slight variations concerning this

[2] N black-skinned berry
[3] B white-skinned berry
[4] T colored mesocarp

parameter were established in seedlings from the combinations Merlot x Tenturier of Župa (N° 14618 N) and Cabernet Sauvignon x Tenturier of Župa (N° 14633 N, N° 14718 B and N° 14660 B). This fact is emphasized because the absolute minimal air temperature at the Radmilovac site, in the 1985-1986 period, was -22.5 °C; in 1986-1987 it was -26.0 °C and in 1987-1988 -20.0 °C (Avramov, et al., 1992). This points indirectly to winter hardiness during dormancy period, which is also evident by the results of Pool et al., (1990), Cindrić et al., (1990); Žunić et al. (1990), Branislava Sivčev (1998).

Based on the OIV 502 feature (Anonymus, 1983), which relates to medium-weight bunch, thirteen seedlings belong to the second group and vary from 130-202 g. Medium-weight bunch is characteristic for the seedlings N° 15212 N - 298 g (Tab.1).

Tab. 1.- Yield parameters (Radmilovac, 1982-1991)

Genotype	Yield of grape	Mass of		Must quality	
	(q/ha)	grape (g)	berry (g)	sugar (%)	total acids (g/l)
8448T	201.1	133	1.27	21.9	9.0
14530N	189.3	130	1.42	19.2	7.6
7774N	157.0	133	1.45	21.9	8.1
14660B	177.5	172	1.55	23.8	7.0
14718B	179.8	135	1.69	21.5	6.1
8184B	151.2	181	1.76	21.0	6.8
8417N	137.6	171	1.77	24.2	7.7
14633N	154.8	202	1.84	19.4	7.5
8271N	191.6	166	2.12	21.8	8.6
14618N	182.4	146	2.15	20.8	6.7
16355N	141.3	198	2.26	21.5	7.4
8214B	136.5	177	2.33	23.5	8.3
13283N	153.9	160	2.37	19.7	7.0
15212N	200.8	298	2.87	18.8	7.9

Most seedlings are characterized by a small berry, its weight ranging from 1.27 g (N° 8448 T) to 2.26 g (N° 16335 N) (OIV 503 - score 3, Anonymus, 1983). Medium weight berry is characteristic for the genotypes N 8214 B (Prokupac noir x Tenturier of Župa), 13283 N (Začinak x Prokupac Noir) and N° 15212 N (Alicante Bouschet x Vranac).

Medium sugar content of must was established in five seedlings (N° 15212 N, N° 14530 N, N° 14633 N, N° 13283 N and (N° 14618 N). The number of selected seedlings which produced grapes of better quality was higher, 9 in total. The most prominent among them are the combinations of Prokupac noir and Tenturier of Župa (N° 8214 B), Cabernet Sauvignon and Tenturier of Župa (N° 14660 B), and Merlot and Tenturier of Župa (N° 8417 N).

Concerning total acids content of must, in a ten-year period, seedlings fell within the range of low to mean values for this parameter. This was based on the OIV 506 that understands 5 categories (Anonymus, 1983). Cabernet Sauvignon, a variety that has been used for hybridization, as reported by Avramov et. al

(1996), in the conditions of the Radmilovac site is characterized by medium to high total acids content (10.3 g/l). The results of mentioned Author, where Cabernet Sauvignon was one of the parents too, concern a shorter investigation period (1983-1985), and range from 4.8 g/l (seedling N° 14675 Cabernet Sauvignon x Tenturier of Župa) to 7.7 g/l (seedling N° 14757 Cabernet Sauvignon x Tenturier of Župa). In our investigations, seedling N° 14718 B is the most prominent for the lowest value (6.1 g/l), while seedling N° 8448 T for the highest value of this feature.

Tab. 2. - Matrix structure

Feature	Factor 1	Factor 2	Factor 3
Berry	0.92069	-0.03845	0.02846
Bunch	0.85486	0.27549	-0.4908
Yield	0.04286	0.86670	-0.07615
Sugar	-0.09750	-0.83096	-0.06388
Total acids	-0.01025	-0.00509	0.99635

Factor analysis pointed to variations between the examined features that are common to all the genotypes included in our investigations. Three factors have been singled out: the first factor couples seedlings based on bunch weight and berry weight, i.e. they are highly positively correlated.

The second factor links seedlings according to grape yield and sugar content of must. The results show that quality declines with the increase of yield. The third factor connects seedlings only according to total acids content of must; this point to higher differences between parents in respect of this feature, which effected genotypes of F_1 generation.

Tab. 3. - Arranging genotypes into groups according to grape yield and quality

Combinations of crossbreeding	Identification N°	Color	Yield	Sugar content of must
Cabernet Sauvignon x Tenturier of Župa	8184	N	4[5]	7[6]
Cabernet Sauvignon x Tenturier of Župa	14633	N	4	5[7]
Cabernet Sauvignon x Tenturier of Župa	14660	B	4	7
Cabernet Sauvignon x Tenturier of Župa	14718	B	4	7
Merlot x Tenturier of Župa	8417	N	3[8]	7
Merlot x Tenturier of Župa	14530	N	4	5
Merlot x Tenturier of Župa	14618	N	4	5
Prokupac noir x Tenturier of Župa	8214	B	3	7
Začinak x Pinot noir	7774	N	4	7
Začinak x Gamay Tenturier	8271	N	4	7
Začinak x Prokupac noir	13283	N	4	5
Alicante Bouschet x Vranac	15212	N	4	5
Tenturier of Župa x Vranac	16355	N	3	7
Gamay tenturier x Rupestris du Lot	8448	T	4	7

[5] yield higher than 150 q/ha
[6] 21-22% sugar content of must
[7] 18-19% sugar content of must
[8] yield between 100-150 q/ha

High grape yield (100-150 q/ha) was achieved, on average, with two genotypes, i.e. very high yield was achieved with 12 genotypes. Concerning this criterion of comparison, including all the other parameters, the descrimination analysis was applied.

Partial correlation coefficients of canonical discriminant function point out that differences between genotypes are highest in respect of yield ($\rho_{yield} = 0.77567$) as compared to partial correlation coefficients referring to bunch weight ($\rho_{bunch} = 0.51567$) and to sugar content of must ($\rho_{sugar} = 0.49285$). Genotype N° 8214 B (Prokupac x Tenturier of Župa) was originally placed into the group of genotypes producing a very high yield, however, after the conducted analysis it belonged to a lower category, which is the consequence of higher variation per study year. In the selection process, particular attention is given to establishing narrow and wide adaptability for some features. Further work implies monitoring of genotypes at several locations, which is also evidenced by the results of Avramov (1980), Spryng and Maygre (1996). The rest of 11 genotypes actually belong to the group of a very high grape yield. The accuracy of grouping was achieved at the 91.7% level.

The starting point of grouping genotypes according to the quality was confirmed at the 100% level after the analysis had been applied. During a ten-year period, 5 genotypes produced medium sugar content of must and 9 genotypes produced high sugar content of must.

Conclusion

The chosen genotypes differed from each other by the observed characteristics, which was to be expected, concerning divergenity and geographical origin of the parental partners.

The aim of selection: increase of yield potential was achieved in 11 genotypes of the 14 selected, i.e. the increase of quality potentials in 9 genotypes.

In the crossing group Cabernet Souvignon x Tenturier of Župa three genotypes N° 8184 B, N° 14660 B and N° 14718 B are characterised by high yield and quality. They have the qualities of perspective seedlings intended for distillate.

In the crossing group Merlot x Tenturier of Župa one perspective genotype N° 8417 N was selected.

Genotypes Začinak x Pinot Noir N° 7774 N and Začinak x Gamay tenturier N° 8271 N have the characteristics of the perspective wine variety of high quality.

Genotypes Alicante Bouschet x Vranac N° 15212 N and Tenturier of Župa x Vranac N° 16355 N meet only one criterion each: yield, i.e. quality. They can serve as the material in the process of selection.

Genotype Gamey tenturier x Rupestris du Lot is very perspective for the processing grapes into juices.

In further actions, the wine and distillate characteristics of perspective genotypes will be examined.

REFERENCES

1. Avramov, L. (1980): Važnije perspektive oplemenjivanja vinove loze. Jugoslovensko vinogradarstvo i vinarstvo, No 11-12, god. XIV, 2-4. Beograd.
2. Avramov, L., Žunić., D., Todorović Natalija, Gašić, N., Puljiz, M., Bjekić Slađana (1992): Kretanje prinosa i kvaliteta radmilovačkih novih varieteta u zavisnosti od veoma niskih temperatura u gročanskom vinogorju. VI Vinogradarsko-vinarski kongres Jugoslavije. Zbornik naučnih radova. 291-301. Beograd.
3. Eibach, R. (1990): Investigation about the influence of some physiological and phonological characteristics on the quality and their heredity. Proceeding of the 5th International Symposium on Grape Breeding, Vitis, Special Issue, 149-158. Siebeldingen.
4. Bäder, G. (1990): Einflus des Anschnittes auf Menge und Gute des Ertrages bei den wichtigsten Rebvarietyen auf 128 Standorden der deutschen Weinbaugebiete. Diss. Univ. Giebe.
5. Cindrić, P., Korać Nada (1990): Frost resistance of grapevine cultivars of different origin. Proceeding of the 5th International Symposium on Grape Breeding, Vitis, Special Issuue, 340-351. Siebeldingen.
6. Golodrga, P. Ya., Troshin, L.P., Florova, L., I. (1975): Genetic of the alternative characteristics in the grape. Bulletin of Applied Botany, Genetics and Plant Breeding, Vol. 54. Fasc. 2, 112-128. Leningrad.
7. Pool, M.R., Reisch, M., J. (1990): Use of differential thermal analysis to quantify bud cold hardiness of grape selection and clones. Proceeding of the 5th International Symposium on Grape Breeding, Vitis, Special Issue, 318-329. Siebeldingen.
8. Sivčev Branislava (1998): The results of investigation of white wine cultivars in the "Radmilovac" collection vineyard. Review of Research Work at the Faculty of Agriculture. Vol. 43, No 2, 7-23. Belgrade.
9. Spring, J.L., Maigre, D. (1996): Comportment du nouveau cepage Garanoir sur deux sites axperrimenaux. Revue sinuses de viticulture, d'arboriculture et d'horticulture, Vol. 28, No 5. 287-290. Nyon.
10. Wagner, R. (1990): Study of phenotypic variation by analysis data gathered together by O.I.V. on new varieties of table grape. Proceeding of the 5th International Symposium on Grape Breeding, Vitis, Special Issuue, 178-188. Siebeldingen.
11. Žunić, D., Avramov, L., Todorović Natalija (1990): Winter frost resistance of grapevine varieties belonging to different ecological and geographical groups. Proceeding of the 5th International Symposium on Grape Breeding, Vitis, Special Issuue, 330-339. Siebeldingen.

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PROIZVODNO-TEHNOLOŠKE KARAKTERISTIKE PERSPEKTIVNIH SEJANACA VINOVE LOZE U USLOVIMA OGLEDNOG DOBRA "RADMILOVAC"

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Rezime

U periodu 1982-1991. godine na lokalitetu Radmilovac, Oglednom dobru Poljoprivrednog fakulteta u Zemunu, praćeno je 14 genotipova vinove loze. Ogledom su obuhvaćena svojstva: prinos grožđa po jedinici površine, masa grožđa, masa bobice i kvalitet šire izražen u sadržaju šećera i ukupnih kiselina. Genotipovi su međusobno upoređeni na osnovu karakteristika grožđa primenom diskriminacione analize, osnova poređenja bio je prinos i kvalitet. Razlike između genotipova najviše su došle do izražaja u visini prinosa. Sadržaj šećera u širi i krupniji grozdovi su sledeća dva svojstva koja bitno utiču na postojeće razlike, prvi u negativnom a drugi u pozitivnom odnosu na prinos.

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