RESEARCH ON THE GRAFTING AFFINITY OF VARIETY FOR TINCTORIAL RED WINES 'MĂGURA' ON ROOTSTOCKS WITH DROUGHT RESISTANCE

CERCETĂRI PRIVIND AFINITATEA DE ALTOIRE A SOIULUI PENTRU VINURI ROŞII TINCTORIALE 'MĂGURA' PE PORTALOI CU REZISTENTĂ LA SECETA

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Abstract. *The phenomen of global warming has considerably influenced the evolution of the thermal and water regime annually and during the growing season in the viticultural ecosystem of the Odobeşti vineyard, the atmospheric and pedological drought characterizing the last five years of viticulture. In this context, the use of drought-resistant rootstocks for grafting is one of the solutions to counteract this extreme phenomenon. The present paper presents preliminary results regarding the grafting affinity of the 'Măgura' grape variety for tinctorial red wines created at RDSVO Odobeşti, on three rootstocks with drought tolerance obtained in the Romanian viticultural research (Drăgăşani 70). M.', 'Crăciunel 71 Bl.', 'Ruggeri 140 Vl.'). The rootstock 'Berlandieri x Riparia Sel.Oppenheim 4 –4 Bl.', was taken into the study as a control. The obtained results show a very good grafting affinity of the 'Măgura' variety on the 'Ruggeri 140 Vl.' rootstock.*

Key words: variant, rootstock, grafting affinity, drought

Rezumat. *Fenomenul de încălzire globală a influenţat considerabil evoluţia regimului termic şi hidric anual şi din timpul perioadei de vegetaţie în ecosistemul viticol al podgoriei Odobeşti, seceta atmosferică şi pedologică caracterizând ultimii cinci ani viticoli. În acest context, folosirea pentru altoire a portaltoilor rezistenti la secetă este una dintre soluțiile de contracarare a acestui fenomen extrem. Lucrarea de față prezintă rezultate preliminare privind afinitatea de altoire a soiului pentru vinurile roşii tinctoriale 'Măgura' creat la SCDVV Odobeşti, pe trei soiuri de portaltoi cu toleranță la secetă obținute în cercetarea viticolă românească (Drăgăşani 70). M.', 'Crăciunel 71 Bl.', 'Ruggeri 140 Vl.'). Portaltoiul 'Berlandieri x Riparia Sel.Oppenheim 4 –4 Bl.', a fost luat în studiu ca martor. Rezultatele obţinute arată o afinitate de altoire foarte bună a soiului 'Măgura' pe portaltoiul 'Ruggeri 140 Vl.'.*

Cuvinte cheie: variantă, portaltoi, afinitate de altoire, secetă

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INTRODUCTION

Grafting affinity is an essential condition in the production of good quality viticultural planting material, while production affinity is the basic requirement for the establishment of new vine plantations with superior technological potential. Scientific research carried out over time has demonstrated once again that in the case of grapevine grafting there is a mutual influence of the grafted partners (Köse et al., 2014; Ungureanu et al., 2021). Thus, the rootstock exerts a strong influence on growth (Constantinescu et al., 1966), fertility, resistance to drought, at minimum temperatures, productivity (Țardea and Rotaru, 2003), as well as oenological potential. In the context of current climate changes that have led to the significant manifestation of the drought phenomenon in many wine-growing areas (Pușcalău et al., 2021), the use of rootstocks with drought resistance is increasingly necessary (Mărculescu et al., 2006). Establishing the most suitable rootstock varieties for grafting newly created vinifera varieties is one of the main objectives for the establishment of new vineyards, justifying current research on establishing the grafting affinity and production affinity of these varieties on different rootstock varieties.

MATERIAL AND METHOD

The research was carried out at RDSVO Odobești during 2023-2024, and the experimental device included four experimental variants, each with three repetitions. The cultivar for tinctorial red wines 'Măgura' was obtained at RDSVO Odobești from the crossing of the cultivars 'Băbească neagră' x ('Merlot' x 'Alicante Bouschet'), approved in 2014 (Fig. 1).

Fig. 1. 'Măgura' cultivar - young shoot, grape and adult leaf (original)

The Măgura vine cultivar was grafted onto three rootstock clones with drought resistance obtained in Romania: 'Berlandieri x Riparia - Sel. Drăgășani 70 M.' provided by RDSVO Drăgășani, 'Teleki 8 B - Sel. Crăciunel 71 Bl.' provided by RDSVO Blaj and 'Ruggeri 140 – Sel. 59 Vl.' provided by RDIVO Valea Călugărească (Fig. 2). The rootstock 'Berlandieri x Riparia Sel.Oppenheim 4 –clone 4 Bl', the most used for grafting in the Odobești wine growing area was used as a control.

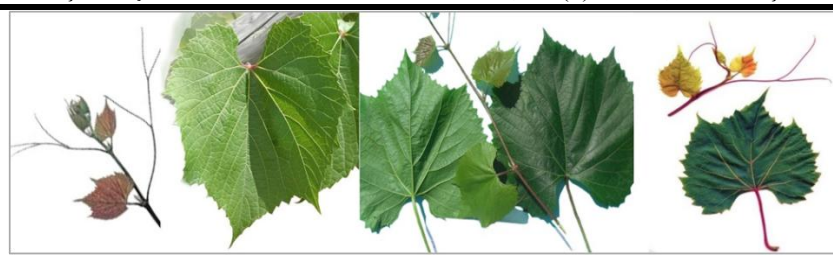

Fig. 2. Rootstock cultivars: a) 'Sel. Drăgășani 70 M'; b) 'Sel. Crăciunel 71 Bl.'; c) 'Ruggeri 140 – Sel. 59 Vl.'

The grafting was carried out mechanized in the "omega" system. The forcing of the grafted cuttings was done by the method with total stratification with sawdust and external heating. The planting of the cuttings in the vine nursery was done in linear soil beds made in the spring, on which a drip irrigation hose was placed. To determine the grafting affinity, after forcing and hardening the graft cuttings, the formation of circular callus at the grafting point, the growth of shoots from the grafts and the formation of roots at the base of the rootstock were observed in particular. After harvesting the vines from the nursery, the yield and quality of the seedlings were monitored for each variant of the experiment. The obtained data were statistically processed for analysis of variance using the statistical analysis program Data Analysis Single factor (Anova test).

RESULTS AND DISCUSSIONS

The analysis of the average values over the two years of experimentation obtained after forcing and hardening the grafted cuttings shows that the percentage of grafted cuttings with circular callus at the grafting point was higher in the case of grafting on the rootstocks ′Sel. Drăgășani 70 M.′ (94.2%) and ′Ruggeri 140 - Sel. 59 Vl.′ (91.0%), compared to the grafting variant on the rootstock Sel. Crăciunel 71 Bl. (83.7%) and the control rootstock - Sel.Opp. 4 – 4 Bl. (83.8%) (Table 1). Cuttings grafted onto the rootstock ′Sel. Crăciunel 71 Bl.′ presented a lower callus index (83.7%), a similar value to the control rootstock ′Berlandieri x Riparia Sel.Oppenheim 4 – 4 Bl.′ (83.8%). The highest values were obtained in the case of grafting onto the rootstock ′Sel. Drăgășani 70 M.′ (94.2%) and the rootstock ′Ruggeri 140 – Sel. 59 Vl.′ (91.0%).The average value obtained for the percentage of cuttings with shoots starting from the graft, after hardening before planting in the vineyard school, was higher when using the rootstock ′Ruggeri 140 – Sel. 59 Vl.′ (76.3%).

Table 1

Data obtained from forging and hardening grafted cuttings (%)

Variant / parameter		Cuttings with circular callus at grafting point	Cuttings with shoots from grafts	Cuttings with roots at the base
V1 - 'Măgura'/ Sel. Drăgășani 70 M.	2023	94.06	70.55	60.29
	2024	94.29	80.00	88.57
	average	**94.17**	**75.27**	**74.43**

V2 - 'Măgura'/ Sel. Crăciunel 71 Bl.	2023	81.45	64.72	41.41
	2024	85.93	84.44	15.56
	average	**83.69**	**74.58**	**28.49**
V3 - 'Măgura'/ Sel. Ruggeri 140 - 59 Vl	2023	91.16	70.71	64.71
	2024	90.91	81.82	90.91
	average	**91.03**	**76.26**	**77.81**
V4 - 'Măgura'/Sel.Opp. 4 – 4 Bl. (control)	2023	83.84	65.66	39.39
	2024	83.70	82.22	17.78
	average	**83.77**	**73.94**	**28.58**

Higher average values compared to the control rootstock were also obtained for the rootstocks ′Sel. Drăgășani 70 M.′ (75.3%) and ′Sel. Crăciunel 71 Bl.′ (74.6%). Regarding the formation of roots at the base of the grafted cuttings, the data obtained demonstrate that the type of rootstock influences both the duration of the rooting period and the number of rooted cuttings. (Fig. 3).

Fig. 3. Aspects of the planting material production process (grafted vines after forcing and hardening, vine school, harvesting and grading of grafted vines)

The percentage of grafted cuttings with roots at the base was much higher than the control in the case of the variants in which the rootstocks ′Ruggeri 140 – Sel 59 Vl.′ (77.8%) and ′Sel. Drăgășani 70 M.′ (74.4%) were used. Lower average values were obtained in the case of grafting on the rootstock ′Sel. Crăciunel 71 Bl.' (28.5%) and on the control rootstock 28.6%).

Statistical interpretation by analysis of variance (Anova test) of the experimental data obtained after forcing and hardening the graft cuttings shows very significant differences for the variants v1- ′Sel Drăgășani 70 M.′ and v3 - ′Ruggeri 140 – Sel. 59 Vl.′, compared to the control v4 - ′Sel. Oppenheim 4 – 4′ in terms of cuttings with circular callus at the grafting point, and cuttings with roots at the base of the rootstock, the value of the parameter P (5.42917E-06, respectively 0.001557922) being much lower than $p<0.05$ (Table 2).

Table 2

Statistical interpretation of experimental data obtained after forcing and hardening of grafted vines through analysis of variance (Anova test)

Source of Variation	SS	df	MS	F	P-value	F crit
cuttings with circular callus at the grafting point						
Between Groups	251.0071	3	83.66904	66.25458	5.43E-06	4.066181
Within Groups	10.10273	8	1.262842			

Total	261.1099	11				
cuttings with roots at the base of the rootstock						
Between Groups	6810.624	3	2270.208	13.85639	0.001558	4.066181
Within Groups	1310.707	8	163.8383			
Total	8121.331	11				

The basic criterion that determines the establishment of grafting affinity is the yield and quality of the grafted vine. The data presented in Table 3 confirm that in the combined scion/rootstock interaction the best results were obtained in the case of variant V3 - Măgura/′Ruggeri 140 – Sel. 59 Vl.′ (65.9%) followed by variant V1- Măgura/′Sel. Drăgășani 70 M.′ (42.1%). The lowest value was obtained in the case of variant V2 - Măgura/Sel. Crăciunel 71 Bl. (18.6%), lower than the control variant V4 - Măgura/′Sel. Opp. 4 – 4 Bl.′ (26.7%).

Table 3

Yield of grafted vines after removal from the vine school and grading (%)

Variant / Year	V1 - 'Sel. Drăgășani 70 M.'	V2 - 'Sel. Crăciunel 71 Bl.'	V3 - 'Ruggeri 140 – 59 Vl.'	V4 - 'Sel. Opp. 4 – 4' (control)
2023	48.55	23.94	61.87	33.33
2024	35.56	13.33	70.00	20.00
Average	42.06	18.64	65.94	26.67

The statistical interpretation of the experimental data obtained from the classification of grafted vines by analysis of variance, shows very significant differences for variant v3 - Măgura/Ruggeri 140 - Sel. 59 Vl.′, and significant for variant V1 - Măgura/Sel. Drăgășani 70 M.′, the value of the parameter P (3.79672E-05) being much lower than P<0.05 (Table 4).

Table 4

Statistical interpretation of experimental data obtained after ranking grafted vines by analysis of variance (Anova test)

Source of Variation	SS	df	MS	F	P-value	F crit
cuttings with circular callus at the grafting point						
Between Groups	3899.63	3	1299.877	39.60789	3.8E-05	4.066181
Within Groups	262.5491	8	32.81863			
Total	4162.179	11				

CONCLUSIONS

1. Preliminary research on establishing the grafting affinity of the Măgura red wine variety in interaction with the three drought-resistant rootstocks demonstrated the existence of significant differences compared to the control.

2. The variants V3 - Măgura/′Ruggeri 140 – Sel. 59 Vl.′ and V1 - Măgura/′Ruggeri 140 – Sel. 59 Vl. demonstrated the best results regarding the percentage of grafted cuttings with circular callus at the grafting point (91.0%, respectively 94.2%) and the percentage of cuttings with roots at the base of the rootstock (77.8%, respectively 74.4%).

3. The variant V3 - Măgura/′Ruggeri 140 – Sel. 59 Vl. demonstrated the best grafting affinity, with an yield of grafted STAS vines by 65.9%, followed by variant V1 - Măgura/′Ruggeri 140 – Sel. 59 Vl. (42,1%).

4. Preliminary data for the two years of study show a good grafting affinity of the Măgura variety on the drought-resistant rootstock Ruggeri 140 – Sel. 59 Vl.

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REFERENCES

1. **Constantinescu Gh., Văleanu L., Poenarul I., 1966 -** *Portaltoii folosiţi în viticultura din RPR şi influenţa lor asupra prinderii la altoire, producţiei şi longevităţii plantaţiilor.* Buletinul ştiinţific al Academiei RPR, vol. VIII.
2. **Köse B., Karabulut B., Ceylan K., 2014** - *Effect of rootstock on grafted grapevine quality*. European Journal of Horticultural Science, v. 79 (4), p. 197-202.
3. **Mărculescu M., Baniță E., Vlădășel M., Ciolacu M., Șeiculescu M., 2006** – *Drăgășani M 70 – soi nou de portalltoi cu însușiri superioare de productivitate, afinitate la altoire cu rezistență ridicată la atacul de filoxera galicolă și mană*, Analele I.C.D.V.V. „Valea Călugărească", vol. XVIII, p.75–81.
4. **Puşcalău M., Bosoi I., Dîrloman C.A., 2021** - *Research on climate trends in the area of Odobeşti vineyard,* Scientific Papers. Series B, Horticulture. Vol. LXV, No. 1, p. 334-341.
5. **Țârdea C. and Rotaru L. 2003**. *Ampelografie*, vol. I – Ampelografia generală și vițele portaltoi, Ed. Ion Ionescu de la Brad, Iași.
6. **Ungureanu S., Mihov D., Vutcarău V. 2021** - *Afinitatea de altoire a unor soiuri autohtone viţă-de-vie Vitis vinifera, altoite pe diferite soiuri de portaltoi aflate în cultură în Republica Moldova*. Pomicultura, Viticultura și Vinificația, Nr. 1 (85), p. 25-29; CZU: 634.8, https://doi.org/10.53082/1857-3142.21.85.05