

## **Comparative Study of the Affinity between the Pepinierka Vine Rootstock and the Chardonnay Variety**

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### **Abstract**

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The affinity between the Pepinierka vine rootstock, Bulgarian selection [(Berlandieri x Riparia Kober 5 BB) x Rupestris Marten III-102D)] and the Chardonnay variety was studied. The Chardonnay variety is used for producing high quality white wines. The vine rootstocks Berlandieri x Riparia SO<sub>4</sub>, Shasla x Berlandieri 41B and Ferkal were used for comparison. The study was carried out during the period 1992-1996 under the soil and climatic conditions of Pleven region.

The values of the studied trait average for the period were higher in grafting the Chardonnay variety on the Pepinierka rootstock. Comparatively high and constant yield of first-class vine planting material was achieved in grafting on the rootstocks SO<sub>4</sub> and Ferkal. The results obtained in grafting on the 41B rootstock, used as control, were unsatisfactory.

*Key words*: affinity, vine rootstocks, grafting, stratification, callous formation, rooting, nursery, first-class vines

### **Introduction**

The studies on the behavior, yield and growth of the grafted variety under different soil and climatic conditions find out that the rootstock is of high importance (Corino, 1990) for achieving the desired production. According to Janini (1984), the choice of rootstock should be made separately for each case depending on the productive objectives.

Jaquinet (1989) found out that the rootstock played a very important role on the growth, quantity and quality of yield and its stability. This influence is different for each variety. The interaction of the grafted components is complex and various.

The behavior of the plants in grafting is a subject of numerous studies and is related to the interaction between the rootstock and the scion. They determine the physiological function of both genotypes,

but it is difficult to say which one is more important (Lilov, 1997; Becher, 1984; Boulay, 1982; Doloire, 1982; Fardossi, 1992; Jone, 1990; Pouget, 1982; Sehacfet, 1986; Popov, 1997).

The objective of the present research was a comparative investigation of the affinity between the Chardonnay variety and the Pepinierka vine rootstock, Bulgarian selection, [(Berlandieri x Riparia Kober 5 BB) x Rupestris Marten III – 102D)] under the soil and climatic conditions of Pleven region.

## Material and Methods

The Pepinierka vine rootstock is Bulgarian selection, selected for the soil and climatic conditions of Bulgaria and acknowledged by the State Variety Commission in 1976 (Dimitrov, 1997). The vine rootstocks Berlandieri x Riparia SO<sub>4</sub>, Shasla x Berlandieri 41 B and Ferkal/Berlandieri x Kolombar x Cabernet Sauvignon x Berlandieri were used for comparison (Pouget, 1983). The Chardonnay variety, a vine variety for production of high-quality white wines, was grafted on the rootstocks mentioned above. The stratification of the grafted cuttings was accomplished by the classic technology in substrate of sawdust under constant control of the stratification conditions. The grafted cuttings were rooted by the classic technology (mounding) in planting distance of 120/7 cm in the nursery, property of the Institute of Viticulture and Enology, Pleven. The soil type was leached black earth, formed on weak powerful, average eroded loam. According to the mechanical composition these soils are heavy sandy-clay. Each variant was repeated four times comprising 90 vines.

The following traits were studied:

- Regeneration processes after stratification of the grafted variants – recording of callus formation in the place of grafting and heel rootstock cutting;
- Vegetation of vines in the nursery - dynamics of sprouting in an interval of 10 days, growth dynamics of shoots in an interval of 10 days, maturity dynamics of shoots by morphological traits in an interval of 10 days and biometric characteristic of the first-class vines;
- Yield of first-class vines according to BSS.

## Results and Discussion

The results of the study are presented by traits as follows:

### I. Influence of the rootstock on callus formation at the time of stratification and rooting of the grafted cuttings.

The degree of callus formation of the grafted components at early stages of the plant's development (Nagornii, 1969) is one of the basic traits in studying the affinity. Not only are a complex of environmental conditions, but also internal genetically conditioned biological features for the different varieties of rootstocks and scions necessary for callus formation (Alleweldt, 1968).

The data of the regeneration process in the place of grafting and heel rootstock cutting (callus formation) recorded after stratification of the grafted variants was higher in grafting on the Pepinierka rootstock 90.8% (Table 1). Comparatively high percentage of circle callus in the place of grafting was recorded in grafting the Chardonnay variety on the vine rootstocks 41 B and Ferkal, 87.4 % and 83.6 % respectively and lower in grafting on the SO<sub>4</sub> rootstock – 77.8%.

High percentage of circle callus in

**Table 1**  
**Callus formation after stratification of the grafted cuttings for the period 1992-1996**

Variant	In the place of grafting, %	At the heel, %	Root germs of 100 scions after stratification
Chardonnay/Pepinierka	90.8	93.6	245.5
Chardonnay/SO <sub>4</sub>	77.8	82.4	1.6
Chardonnay 41 B	87.4	93.0	3.4
Chardonnay/Ferkal	83.6	88.2	441.4

grafting on the Pepinierka rootstock was recorded at the heel rootstock cuttings – 93.6 %. The percentage of circle callus in grafting on the 41 B rootstock was almost the same – 90%. The values of this trait were a little lower in grafting on the Ferkal rootstock – 88.2 % and lowest for the SO<sub>4</sub> rootstock - 82.4 %.

In grafting on the SO<sub>4</sub> rootstock, the regeneration processes at the time of stratification obviously occur more slowly. This delay of the callus formation in the place of grafting and heel rootstock cuttings confirms our previous investigations and is most probably related to the specific genetic character of the SO<sub>4</sub> rootstock (Trifonova, 2002).

The root germs after stratification were most for the variant with the Ferkal rootstock – 441.6 of 100 rootstock cuttings.

This confirms the data of previous investigations and is probably related to the biological specific character of the rootstock.

In relation to the root system of the first-class vines after uprooting from the nursery, the data average for the period was higher for the variant with the Pepinierka rootstock (Table 2). The vines had strong root system with numerous heel roots with proper thickness, which is very important for their rooting after planting in constant place.

## II. Degree of rootstock influence on the vegetation of the grafted combinations in the nursery.

The sprouting of the scions after putting the grafted rootstock cuttings in the nursery shows the degree of accretion and formation of the vascular tissues between the two elements. In this study, the

**Table 2**  
**Root formation ability of the rootstocks in grafting of the Chardonnay variety average for the period 1992-1996**

Variant	Number of heel roots with thickness over 2 mm	Thickness of heel roots, mm
Chardonnay/Pepinierka	6.9	4.3
Chardonnay/SO <sub>4</sub>	5.9	3.1
Chardonnay/41 B	3.8	3.3
Chardonnay/Ferkal	5.4	4.1

**Table 3**  
**Dynamics of sprouting of the grafted variants in the nursery average for the period**

Variant	Sprouted shoots					
	Date	28.05.	08.06.	18.06.	28.06.	08.07.
Chardonnay/Pepinierka		31.5	45.5	50.6	61.4	66.5
Chardonnay/SO <sub>4</sub>		27.9	37.6	42.5	48.2	54.1
Chardonnay/41 B		27.7	36.6	39.1	44.5	43.1
Chardonnay/Ferkal		29.7	37.9	42.8	47.7	52.1

sprouting was recorded five times in an interval of 10 days after planting in the nursery (Table 3).

In the variant grafted on the Pepinierka rootstock, 66.5% of the scions sprouted shoots, on the SO<sub>4</sub> rootstock – 54.1%, on the Ferkal rootstock – 52.1% and on the 41 B rootstock – 42.1%. In spite of the good callus formation and good initial budding in the variant on the 41 B rootstock, there were cases of drying of already sprouted shoots. The reason for this is necrosis of callus tissues in the place of accretion and the heel for part of the grafted rootstocks.

The shoot growth was recorded ten times per year in an interval of 10 days from 21 June to 11 September. The growth dynamics (Table 4) average for the period was more intensive in the vines grafted

on the rootstocks Pepinierka and Ferkal.

The biometric measurements of the uprooted vines were analogous to the results of the growth dynamics. The total length and weight of the shoots were higher in the vines grafted on the rootstocks Pepinierka and Ferkal (Table 5).

It was also recorded that the gain with longer length had lower percentage of the matured part. The gain from the 41B rootstock was lower but the percentage of its matured part was higher - 54.6%.

### III. Influence of the vine rootstock on the yield of standard vines.

The yield obtained from first-class vines average for the period was higher in the Pepinierka rootstock 53.72 % (Table 6).

Comparatively high, qualitative and constant yield was obtained in grafting the Chardonnay variety on the rootstocks

**Table 4**  
**Growth dynamics of shoots in the nursery average for the period 1992-1996**

Variant	Growth of shoots, cm								
	Date	21.06.	11.07.	21.07.	01.08.	11.08.	21.08.	01.09.	11.09.
Chardonnay Pepinierka		24.3	39.6	49.5	58.5	61.1	67.3	75.1	79.2
Chardonnay/SO <sub>4</sub>		19.5	27.3	38.4	46.2	57.6	62.5	66.5	70.1
Chardonnay/41 B		10.8	14.3	22.3	32.6	40.4	49.8	57.7	62.8
Chardonnay/Ferkal		21.1	25.5	33.6	44.7	52.1	64.2	68.5	72.4

**Table 5**  
**Biometric characteristic of the standard vines average for the period 1992-1996**

Variant	Matured shoot gain			
	%	Weight, grams	Number of shoots	Total length, cm
Chardonnay/Pepinierka	40.3	51.9	2.8	105.8
Chardonnay/SO <sub>4</sub>	43.9	36.4	2.1	81.7
Chardonnay/41 B	54.6	29.5	1.9	69.1
Chardonnay/Ferkal	38.8	46.1	2.4	94.5

**Table 6**  
**Yield of first-class vines (according to BSS) 1992-1996**

Variant	Yield of first-class vines in years, %							
	Years	1992	1993	1994	1995	1996	Average	S
Chardonnay/Pepinierka		56.65	58.82	46.67	60.08	46.36	53.72	+ 11.79
Chardonnay/SO <sub>4</sub>		45.28	50.56	38.78	43.64	35.45	42.74	+ 0.81
Chardonnay/41 B		24.49	41.09	24.17	27.62	20.02	27.48	- 14.46
Chardonnay/Ferkal		41.02	54.12	40.83	41.95	40.91	43.77	- 1.84

Ferkal and SO<sub>4</sub> - 43.77 % and 42.74 % respectively.

The lowest yield 27.48% was obtained from the vines grafted on the 41 B rootstock. In spite of the good callus formation in the place of grafting and heel rootstock cutting, tissue differentiation and accretion between the components were not realized. Most probably both genotypes were not simultaneously ready for accretion. The final result was low percentage of first-class vines which had comparatively low gain measured as total length and weight.

Obviously, the rootstock as an active part of the transplanted plant significantly influences the grafted variety.

## Conclusions

The following conclusions can be drawn based on the results obtained from the study for the period 1992-1996.

The first-class planting material from grafting the Chardonnay variety on the Pepinierka rootstock is 53.72 % of the grafted rootstocks which is considerably more than the planting material obtained from grafting the same variety on the rootstocks Ferkal and SO<sub>4</sub>. It is reasonable to note that there is good affinity between both genotypes.

Comparatively good, qualitative and constant yield of first-class vines has been obtained 43.77 % and 42.74 % in grafting

the Chardonnay variety on the vine rootstocks SO<sub>4</sub> and Fercal.

The results obtained in grafting the Chardonnay variety on the 41 B vine rootstock are significantly lower 27.48 %, because of which we think that the affinity between both varieties is unsatisfactory.

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