Volume 17(2), 141- 147, 2013
JOURNAL of Horticulture, Forestry and Biotechnology
www.journal-hfb.usab-tm.ro

Behavior of some varieties with black grapes for red wine in the first three years after planting on improved sandy soils from Southern Oltenia

Rățoi I.[1]*, Croitoru Mihaela [1], Vladu Emanuela Cristina [2]

[1]Research–Development Centre for Agricultural Plants on Sands – Dăbuleni, Street Victoriei, 130, Code 207220, Dăbuleni, County Dolj, Romania, Tel. 040 251 334 402; [2] Faculty of Agriculture and Horticulture, Craiova

*Corresponding author. Email: iulianratoi@yahoo.com; ccdcpndabuleni@yahoo.com

Abstract In the first year of planting vines vigour has been very good for most varieties. Of the nine varieties studied only one recorded a value of total length of annual increases below 200 cm/vine, namely Pinot noir (167 cm/vine) and 2 varieties under 300 cm/vine, respectively, Cristina (277 cm/vine) and Amurg (279 cm/vine). The most vigorous was Cabernet Sauvignon Cl 33 Vl., which recorded a value of 441 cm/vine.
In the two year of planting, the biggest vigour has been recorded at the Amurg variety, which registered a value of total length of annual increases of 1150 cm spread over 5 shoots, followed by Arcaș and Novac varieties with vegetative growth of 1040 cm and respectively 1020 cm spread over 4 and 3 shoots. The smallest vigour was recorded at the Mamaia variety (610 cm on 3 shoots).
In the 3rd year of planting, the total length of annual increases, registered values over 1000 cm/vine, with one exception, the Pinot noir, which recorded a value of 794 cm/vine. At this variety and number of eyes trained on the vine was the smallest, 70. The most vigorous has been the Mamaia variety (1412 cm/vine and 110 eyes/vine). At the opposite pole, but more vigorous than Pinot noir, were Arcaș variety (1044 cm/vine and 91 eyes/vine) and Amurg variety (1078 cm/vine and 92 eyes/vine).
Although the viable buds were located at the base of vine and these varieties have produced grapes in the 3rd year of the planting. Some varieties have demonstrated their potential to fruiting on the short elements. Were emphasized the Codană variety (5680 Kg/ha grapes) and Novac variety (5680 Kg/ha grapes). The lowest production of grapes achived at the Pinot noir and Busuioacă de Bohotin the varieties (757 Kg/ha grapes) and Cristina and Arcaș varieties (1136 Kg/ha grapes).
The Mamaia variety was the first to come to the harvest maturity on 29.08.2012. It was followed by the Amurg variety, on 02.09.2012. The most varieties arrived at the moment of harvest on 4 and 5 September 2012.

Key words

behaviour, sandy soils, vine, red wine

Sandy soils are include into the category of weak fertile and weak productive soils but vines are grown with good economic results (1).

In the vineyards from the sandy soil areas to obtain wines generally dry, weak acid and weak alcohol (2), because the pedological, phytoclimatical and technological factors has a major effect on the quality of the grapes (4; 6; 8; 10). Minimum temperatures below -18 ^{0}C has a negative influence of buds and annual wood viability (11).

Although the young wines in these areas are pleasant to taste, as time, these, lose the qualities because to low acidity, are preserved with weight and not develop the bouquet (12). Improvement of the assortment of vine varieties was and is always up to the attention of growers (9; 5; 3; 7). The crop of new varieties, autochthonous and foreign origin, is expected to increase, mainly, the acidity of wine and alcohol content, to print a high-quality wines.

Material and Method

The varieties studied, in this experience, founded in 2010 year, were as follows: *Codană, Mamaia, Novac, Cabernet Sauvignon 33 Vl., Cristina, Arcaş, Amurg, Pinot noir, Busuioacă de Bohotin.*

They made the following observations and experimental determinations:

- entrance to the vegetation of the vines after planting;
- percentage of viable vines at planting;
- the number of eyes trained on the vine during the year;
- the total length of the annual increases;
- the number of shoots with a thickness exceeding 6 mm at the second internode;
- the yield production and their quality in three year;
- the main vegetative stage.

Before of planting was fertilized with 60 t/ha manure and 400 kg/ha 15 15 15 Complex.

In the initial period of the growing season, in May month, were administered 100 kg/ha 15 15 15 Complex.

Results obtained

After a autumn and 27 days since January, quiet in terms of minimum temperatures, there was a period of about 15 days, respectively on 28 January and until 10 February, when the vine was well below the limit of resistance for buds and annual or multiannual wood (Table 1).

This period began on February 28, when, after a very favourable period for vine culture, with minimum temperatures positive or located in the 0 ^{0}C point, was registered a minimum temperature of –24.3^{0}C from 31 January, with an daily average temperature of –19.3 ^{0}C. The next day, on 1 February, the minimum temperature has reached the minimum negative history for this month, -27 ^{0}C, with an daily average of -19.3 ^{0}C. The temperature of -27 ^{0}C has been repeated on 9 February. In the summer (June-August) the monthly average temperature was greater with 1.7 – 3.4 ^{0}C comparative with multiannual monthly average. Thus, were appeared the drought and sunstroke phenomenons, which influenced negative the vineyards.

Table 1

The main climatical elements registered agricultural year 2011-2012, at weather Station meteo of Research-Development Centre for Agricultural on Sands Dăbuleni, Dolj

Climatical elements/Month	X 2011	XI 2011	XII 2011	I 2012	II 2012	III 2012	IV 2012	V 2012	VI 2012	VII 2012	VIII 2012	IX 2012	Average or sum
Average temperature (^{0}C)	10.1	1.7	0.7	0.7	**-6.6**	7.1	13.9	17.2	23.3	**26.4**	24.3	19.9	11.6
Maximum temperature (^{0}C)	22.8	-8.7	19.2	1.,9	10.4	24.9	29.4	31.8	37.8	**41.4**	**42.6**	32	-
Minimum temperature (^{0}C)	-4.5	15.8	-7.8	**-24.3**	**-27**	-7.9	-3.7	7.9	9.8	12.4	6.5	4.4	-
Rainfall (mm)	32.6	0.2	13.6	64.6	**0**	**0.4**	66.6	93.8	32.4	8.2	21.8	**8**	342.2
Relative umidity of air (%)	77.4	86	88.1	84	84.7	62.3	62.1	76.8	65	**47.7**	52.8	58.5	70.5
Multiannual average temperature (1956-2011) (^{0}C)	11.3	5.4	0.4	-1.4	0.8	5.6	11.7	16.7	21.6	23	22.3	17.7	11.3

Black grape varieties for red wine had a good reaction to the striking root which means that display affinity for sandy soils (Table 2). Five from the nine varieties have not registered any loss, all vines have been normal developed (Codană, Cabernet Sauvignon Cl 33 Vl, Mamaia, Novak and Arcaş). Other varieties have perished: a single vine at Cristina variety, 2 vines at Amurg variety, 3 vines at Busuioacă de Bohotin variety and 4 vines at Pinot noir variety. Percentage, losses have oscillated between 2.5 and 10 percent.

In the first year of planting vines vigour has been very good at most of the varieties (Table 3). From nine varieties studied, one recorded a value of total length of annual increases below 200 cm/vine, only, namely Pinot noir (167 cm/vine) and 2 varieties under 300 cm/vine, respectively Cristina variety (277 cm/vine) and the Amurg variety (279 cm/vine). The most vigorous was Cabernet Sauvignon Cl 33 Vl. variety, which registered an annual increase of 441 cm/vine. The number of nodes formed on a vine during

vegetation period was roughly proportional to the total length of annual increases, because the greatest number of nodes formed at Cabernet Sauvignon Cl 33 Vl. variety (126) and the lowest number of nodes formed at Busuioacă de Bohotin variety (52).

Table 2

Percentage of vines normal developed at finish of vegetative period at red wines varieties

Variety	Number of planting vines	Number of vines sickly or feebly	Vines normal developed	
			number	%
Codană	40	-	40	100
Mamaia	40	-	40	100
Novac	40	-	40	100
Cabernet Sauvignon Cl. 33 Vl.	40	-	40	100
Cristina	40	1	39	97.5
Arcaș	40	-	40	100
Amurg	40	2	38	95
Pinor noir	40	4	36	90
Busuioacă de Bohotin	40	3	37	92.5

Table 3

Vine vigour in the first year after planting at varieties for red wine grapes in first year

Variety	Total length of annual increases (cm/vine)	Number of nodes formed
Codană	311	91
Mamaia	381	90
Novac	388	101
Cabernet Sauvignon Cl. 33 Vl.	441	126
Cristina	277	67
Arcaș	359	119
Amurg	279	79
Pinor noir	167	55
Busuioacă de Bohotin	356	52

Table 4

The buds viability to entrance into vegetative and vigour of vines at differents vines varieties with black grapes foe red wine in the second year of planting

Variety	Viability of buds at entrance into vegetative %	Total annual increases (cm/vine)	Number of shoots with diameter over 6 mm at second node
Codană	100	720	4
Mamaia	100	610	3
Novac	100	1020	3
Cabernet Sauvignon Cl. 33 Vl.	100	970	5
Cristina	100	760	4
Arcaș	100	1040	4
Amurg	100	1150	5
Pinot noir	100	920	3
Busuioacă de Bohotin	100	820	3

In the second year of planting the varieties with grape for red wines were very vigorous, all recording vegetative grouth with higher values of 610 cm/vine (Table 4).

The greatest effect was recorded at the Amurg variety with vegetative growth of 1150 cm/vine spread across

5 shoots, followed by Arcaș and Novac varieties with vegetative growth of 1040 cm/vine and respectively 1020 cm/vine spread across 4 and 3 shoots. The reduced vigour was recorded at the Mamaia variety (610 cm 3 shoots).

In the third year after planting, because the minimal negative temperature of -27 ^{0}C, registered at two dates, in February 2012, perished all buds located above the snow layer, whose thickness was 35-40 cm. In these conditions resisted the buds located at the base of vine, at eyes level 1-3 (Table 5). The percentage of viable buds, in these conditions, was greater than 94 but neither has descended below 85. From this point of view were the varieties Codană and Amurg varieties, with 94% viable buds. The fewer buds go to vegetation occurred at the Mamaia variety, 85%.

These varieties, with the one exception, the Pinot noir variety, are vigorous. In the 3rd year of planting, the total annual increases, registered higher values, over 1000 cm/vines, with one exception, the Pinot noir, which recorded a value of 794 cm/vine. The number of eyes formed on the vine was the smallest, 70. The most vigouros has been the Mamaia variety (1412 cm/vine and 110 eyes/vine), Novac variety (1370 cm/vines and 121 eyes/vine) and Cristina variety (1350 cm/vine and 108 eyes/vine). At the opposite pole, but more vigourous than Pinot noir, were Arcaș variety (1044 cm/vine and 91 eyes/vine) and Amurg (1078 cm/vine and 92 eyes/vine). The differences between varieties in relation to the number of shoots with a diameter greater than 6 mm from the base of the vine, were small, from 6 to 4.

Table 5

The buds viability to entrance into vegetative and vigour of vines at differents vines varieties with black grapes foe red wine in the third year of planting

Variety	Viability of buds at entrance into vegetative %	Total annual increases (cm/vine)	Number of nodes trained /vine	Number of shoots with diameter over 6 mm at second node/vine
Codană	94	1394	118	6
Mamaia	85	1412	110	5
Novac	92	1370	121	6
Cabernet Sauvignon Cl. 33 Vl.	90	1260	115	5
Cristina	86	1350	108	5
Arcaş	86	1044	91	5
Amurg	94	1078	92	5
Pinot noir	88	794	70	4
Busuioacă de Bohotin	86	1258	91	4

Although there were buds at the base of vine, only, these varieties have produced grapes in the 3rd year of the planting. Some varieties have demonstrated their potential to fruitng on short elements, evidence that grape production has exceeded 5000 Kg/ha, at Codană variety (5680 Kg/ha) and Novac variety (8331 Kg/ha). At the opposite pole there were located the Pinot noir and Busuioacă de Bohotin varieties (757 Kg/ha) and Cristina and Arcaș varieties (1136 Kg/ha), (Table 6).

To low production contributed to a small degree and lower weight of the grains of grapes, influenced by weather conditions. Weight of 100 grains was between 49 g to Cabernet Sauvignon Cl 33 Vl. variety and 150 g at Busuioacă de Bohotin variety. Four of these varieties have recorded values of average weight of 100 grains less than 100 g, and the rest between 113 and 150 g. At these varieties with black grapes the acidity has something higher values, between 3,3 g/l H_2SO_4 at the Mamaia variety and 5,2 mg/l H2 H_2SO_4 at the Cabernet Sauvignon Cl 33 Vl. Good values were recorded at the Cristina variety (5 g/l of H_2SO_4) and Amurg variety (4.9 g/l H_2SO_4), and Băbească Neagră and Busuioacă de Bohotin varieties (4,2 g/l H_2SO_4).

Table 6

Grapes production and their quality at different varieties of vines with grapes for red wine in third year after planting

Variety	Grape production Kg/ha	Weight of 100 grape grains g	Total sugar g/l	Titrable total acidity g/l H_2SO_4
Codană	5680	117	185.4	5.1
Mamaia	2651	121	187.5	3.3
Novac	8331	127	216.2	5
Cabernet Sauvignon Cl. 33 Vl.	1515	49	198.1	5.2
Cristina	1136	75	172.6	5
Arcaş	1136	78	204.5	5
Amurg	3408	55	189.6	4.9
Pinot noir	757	113	185.4	3.6
Busuioacă de Bohotin	757	150	221.5	4.2

The content of total sugars has been elevated values, over 185.4 mg/l, at most varieties, except was Cristina variety, with a quantity of the total sugar acumulated in grains of grapes was 172.6 mg/l. Was noted the Novac variety that has registered the highest production record and total sugars content of 216.2 g/l. The highest content of total sugars, 221.5 g/l, recorded the Busuioacă de Bohotin variety. The majority of black grape varieties ensures obtaining wine over 10.5% vol. alcohol, but there are varieties that ensure obtaining wines of 11.5 vol% alcohol, *Busuioacă de Bohotin, Novac şi Arcaş*. From grapes of the Cristina variety may be obtained wines under 10 vol.% alcohol.

From group black grape varieties for red wine are varieties that have pursued growth phases according to the recorded data in Table 7.

Table 7

Phenological observation at different varieties of vines with grapes for red wine in third year after planting

Variety	Start of vegetation		Blooming		Increasing of grape grains -Start-	Ripe stage -Start-	Maturity of grapes
	Start	End	Start	End			
Codană	11.04.12	16.04.12	20.05.12	04.06.12	27.05.12	20.07.12	05.09.12
Mamaia	07.04.12	12.04.12	18.05.12	02.06.12	24.05.12	16.07.12	29.08.12
Novac	07.04.12	10.04.12	20.05.12	03.06.12	26.05.12	21.07.12	05.09.12
Cabernet Sauvignon Cl. 33 Vl.	16.04.12	21.04.12	21.05.12	03.06.12	27.05.12	23.07.12	05.09.12
Cristina	12.04.12	18.04.12	21.05.12	05.06.12	27.05.12	23.07.12	04.09.12
Arcaş	14.04.12	19.04.12	21.05.12	04.06.12	28.05.12	22.07.12	04.09.12
Amurg	13.04.12	17.04.12	19.05.12	03.06.12	24.05.12	23.07.12	02.09.12
Pinot noir	14.04.12	19.04.12	21.05.12	04.06.12	26.05.12	16.07.12	05.09.12
Busuioacă de Bohotin	13.04.12	18.04.12	21.05.12	04.06.12	27.05.12	18.07.12	04.09.12

The start of vegetation has been carried out in the period from 7 to 21 April 2012. At the varieties Novac and Mamaia the start of vegetation was early, on date of 7.04. 2012 and completed on 10 and 12 April. The variety which of start of vegetation was too late was Cabernet Sauvignon Cl 33 Vl. variety, which the start of vegetation began on 16.04.2012 and completed this stage on 21.04.2012. This stage has been carried out

during the period of 5-7 days depending on the variety.

The blooming stage began at an early period of 18.05.2012 at the Mamaia variety and completed not later than on the date of 04.06.2012 half of the varieties studied. Blooming period lasted between 15 and 16 days. Since 24.06.2012 started to increase grain of grape.

The Mamaia variety entered into ripe stage an early, on 16.07.2012 and the varieties Cabernet Sauvignon Cl 33 Vl. and Amurg, too late, on 23.07.2012, at 1-2 days after the majority of varieties from this group. The Mamaia variety was the first to come to the harvest maturity, on 29.08.2012. It was followed by the Amurg variety, on 02.09.2012. Most varieties have arrived at the moment of harvest on 4 and 5 September 2012.

Conclusions

1. In the first year of planting vines vigour has been very good in most varieties. From the nine varieties studied only one recorded a value of total length of annual increases below 200 cm/vine, namely Pinot noir (167 cm/vine) and 2 varieties under 300 cm/vine, respectively Cristina variety (277 cm/vines) and Amurg variety (279 cm/vine). The most vigorous was Cabernet Sauvignon Cl 33 Vl., which recorded a value of 441 cm/vine.

2. In the second year of planting, the biggest vigour has been recorded Amurg variety (1150 cm/vine, spread on 5 shoots), followed by Arcaș and Novac varieties with vegetative growth of 1040 cm/vine and respectively 1020 cm/vine spread on 4 and 3 shoots. The reduced vigour was recorded at the Mamaia variety (610 cm on 3 shoots).

3. In the third year of planting, the total annual increases, registered higher values of 1000 cm/vine, with one exception, the Pinot noir variety, which recorded a value of 794 cm/vine. At this variety the number of eyes formed on the vine was the smallest, 70. The most vigouros has been the Mamaia variety (1412 cm/vine and 110 eyes/vine), Novac (1370 cm/vine and 121 eyes/vine) and Cristina (1350 cm/vine and 108 eyes/vine). At the opposite pole, but more vigorous than Pinot noir, were Arcaș variety (1044 cm/vine and 91 eyes/vine) and Amurg variety (1078 cm/vine and 92 eyes/vine).

4. Although there were just buds at the base of the vine these varieties have produced grapes in the 3rd year of the planting. Some varieties have demonstrated their potential to fruiting on short elements, evidence that grape production has exceeded 5000 Kg/ha, at Codană variety (5680 Kg/ha) and Novac variety (8331 Kg/ha). At the opposite pole there were located Pinot noir and Busuioacă de Bohotin varieties (757 Kg/ha) and Cristina and Arcaș varieties (1136 Kg/ha).

5. Mamaia variety was the first to come to the harvest maturity on 29.08.2012. It was followed by the Amurg variety, on 02.09.2012. Most varieties have arrived at the moment of harvest on 4 and 5 September 2012.

References

1.Baniță P., 1983 – Viticultura pe nisipuri. Editura CERES, Bucureș ti pag. 15-45.

2. Baniță P., Vlădoianu Em., 1984 - Caracterizarea tehnologică a unor soiuri pentru vinuri albe cultivate pe nisipurile ameliorate de la Dăbuleni. Anale SCDCPN Dăbuleni, vol. VII, pp. 315-332. Editura Scrisul românesc, Craiova.

3. Cichi Daniela Doloris, Costea D.C., 2008 – Soiuri de viță de vie cultivate și cultivabile în România. Editura Arves, Craiova, 300 p.

4. Cichi Daniela Doloris, Popa Camelia, Necula Cezarina, 2010 - Monitoring and evaluation of environmental factors incidence on biodiversity variability in wine-growing. Book of abstracts. International Society for Horticultural Sciense (ISHS)-First Symposium on Horticulture in Europe-Viena, pp. 97.

5. Dejeu L.C., and al., 2008 – Globalisation and Romanian Viticulture: Opportunities and restrictions. World Congress of Vine and Wine 6th general assembly of the O.I.V., 15-20 iunie, Verons, Italia.

6. Ionică L., 2010 – Studiul influenței conjugate a soiului, arealului de cultură şi a factorilor tehnologici de vinificație primară asupra compoziției şi calității vinurilor roşii. Analele Universității din Craiova, vol. XV (XLXI). Editura Universității Craiova.

7.Mîndrilă Gheorghiț a, 2010 – Studiul caracterelor morfologice și al însușirilor biotehnologice, la unele soiuri de viță de vie, prin sisteme bazate pe ampelografie. Teză de doctorat, Universitatea din Craiova, Craiova.

8. Munteanu Camelia, Cocoş M., Cojocaru Ganelia, 2010 – Study of the anthocyanin potential of Novac and Negru de Drăgășani grapes cultivated in various centres of Drăgășani vineyards. Analele Universității din Craiova, vol. XV (XLXI). Editura Universității Craiova.

9. Peter D. Oldak, 2007 – Wine and table grapevarieties for New England. Jewell Towne Vineyards. South Hampton, New Hampshire NE Vegetable and Berry Conferance.

10. Popescu Agatha, Enache Viorica, Simion Cristina, Donici Alina, Tăbăranu G., 2010 – Research concerning grape quality in the hilly area of eastern Romania under climate change during the period 2007-2009. Analele Universității din Craiova, vol. XV (XLXI). Editura Universității Craiova.

11. Stroe Marinela Vicuț a, Bucur Georgeta Mihaela, 2012 – Study regarding the influence of low winter temperatures between 2011-2012 on the viability of winter buds of some tablegrape varieties in the conditions of the didactic experimental field in Bucharest. Scientific papers of University of Agronomic Sciences and Veterinary Medicine of

Bucharest, Faculty of Horticulture, Series B. Horticulture, Volume LVI.
12. Vlădoianu Em., 1979 – Caracterizarea tehnologică a unor soiuri pentru vinuri albe cultivate pe nisipurile irigate de la Dăbuleni, Dolj. Anale SCDCPN Dăbuleni, vol. III. Editura Scrisul românesc, Craiova.