RESEARCH ON THE BEHAVIOR OF SOME VINE CULTIVARES WITH RED GRAPES IN THE SANDY SOIL AREA OF SOUTH OLTENIA

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Abstract

The researches carried out followed the behavior of some cultivares of vines with red grapes in the ampelographic collection, over a period of three years (2020-2022). During the three years of study, the grape cultivares for red wines budded between April 13-20, the 'Mamaia' cultivar budded the earliest, and the 'Pandur' cultivar at the latest. Shoot fertility recorded different values depending on the cultivar and climatic conditions. From the point of view of the average production of grapes, in the analyzed period, the cultivares 'Novac' stood out 20479 kg/ha, being registered from a statistical point of view as very significantly positive, 'Codană' 18089 kg/ha and 'Haiduc' 17662 kg/ha, from a statistical point of view, they registered distinctly significant positive meanings.

The values of the content in total sugars, at harvest maturity, fluctuated from one cultivar to another but also from one year to another. From this point of view, the 'Codană' cultivar was in first place, with an average amount of total sugars of 207 g/l. The 'Arcaș' cultivar achieved an average total sugar content, with the lowest value (180 g/l). In the period 2020-2022, the grape cultivares analyzed behaved differently depending on the climatic conditions of the crop year.

Key words**: **vine, phenological stages, fruit, productivity, evaluation climatic conditions.

INTRODUCTION

The grapevine (*Vitis vinifera*) is an important species, highly preferred both for table grapes and for the production of high quality wine. It is native to the Mediterranean region, Central Europe and Southwest Asia. *Vitis vinifera* contributes to over 90% of the world's grape production. Grapevine is grown in all temperate regions, especially in areas with warm and sunny climates with mild winters and dry periods during fruit ripening (Navpreet Singh et al., 2018).

Since ancient times, the grapevine has been used as a fixing plant for shifting sands and as a plant that economically exploits this category of poor soils. The ecopedological conditions on the unimproved sands were and are quite stepmother. Precipitation is low, summer temperatures are high, and hygroscopicity is quite low. The wind blows strongly on summer days, evapotranspiration reaching maximum values.

The old assortment grown on the sands was very limited, consisting of cultivares resistant to the eco-pedological conditions on the sands in our country. Over time, winegrowers chose the most resistant cultivares to the eco-pedological conditions on the sands (Baniță P., 1983).

The old assortment from the dry sands of the south of Oltenia consisted of the cultivares 'Negru vârtos', 'Negru moale' and 'Băbească neagră' for red wines (Dvornic, V. et al., 1964, Oprean M., 1964, Constantinescu Gh. And al., 1972). The calendar of each phenological phase

differs based on each grapevine variety and is generally linked with local thermic conditions (Parker et al., 2011). Indeed, phenological models based on temperature accumulations higher than the reference temperature have been widely reported in studies (Rădulescu et al., 2010; Parker et al., 2011). Complex models have also been developed by using different threshold values (Parker et al., 2011). A number of studies have shown that high temperatures are associated with the early phenological development of plants (Cola et al., 2017; Rădulescu et al., 2010, Fraga et al., 2013). Based on the phenological phase, the highest consum-ption of water is recorded during the maximum sprout and grapevine growth stages, while the lowest consumption recorded occurs between the beginning of weeping and flowering (Olteanu 2000; Rădulescu et al., 2010). The pedoclimatic conditions of the Oltenia sands (high temperature, low relative humidity) cause a sharp decrease in acidity and even a consumption of carbohydrates from the grape berries; therefore, the wines obtained can be flat and with a low alcohol content. For these reasons, it is recommended to cultivate cultivares that have a reduced catabolism, such as the cultivares for red wines (Olteanu Ion, 2000).

Typically, grape maturity and harvest time are determined by analyzing the concentration of sugars, titratable acidity and pH of the grape must (Ribéreau Gayon et al., 2006). Determining the phenolic maturity is of great interest for deciding the optimal moment for harvesting. Knowing the phenolic maturity of grapes can be very useful for their classification at the time of vinification, in accordance with the level of quality and even for choosing the optimal vinification method, based on the extractability of phenolic compounds (Artem V., 2019).

MATERIALS AND METHODS

The study was carried out on 9 local cultivares, namely 'Haiduc, 'Codană', 'Mamaia', 'Novac', 'Cristina', 'Pandur', 'Arcaş', 'Amurg', 'Băbească neagră'.

For the comparison of the results, the 'Băbească neagră' cultivar was chosen, an old, native cultivar, which gives good results on the sandy soils of the south of Oltenia.

The ampelographic collection was founded in 2010. The planting density was 3787 stumps/hectare, which resulted from planting distances of 2.2/1.2 m.

The study carried out consisted of observations and experimental determinations regarding the phenology of the buds, the fertility of the shoots, the production of grapes and its quality (weight of 100 berries, content of total sugars and total titratable acidity).

Observations and determinations were made regarding the phenological stages: beginning of bud burst (07 BBCH), beginning of ripening (81 BBCH) and berries ripe for harvest (89 BBCH), production and quality of grapes.

The phenological observations (beginning of bud burst (07 BBCH), beginning of ripening (81 BBCH) and berries ripe for harvest (89 BBCH)) consisted of the visual observation and notation every day of the beginning of each phenophase, for each cultivar.

Production determinations were conducted out by weighing grapes from 3 plants at 4 repetitions, for each cultivar. For quality determinations, samples are taken from the harvested plants and analyzed in the laboratory: the weight of 100 berrie is determined gravimetrically; the content in sugars is determined with the refractometer; the titratable acidity at

harvest is determined by the titrimetric method.

The results obtained were statistically analysed using the analysis of variance (ANOVA).

RESULTS AND DISCUSSIONS

In the period 2020-2022, relatively favorable conditions for grapevine culture were manifested.

The minimum temperature, between -9.4 and -10.6 in the period 2020-2022, was favorable for the wintering of vines in optimal conditions (Figure 1).

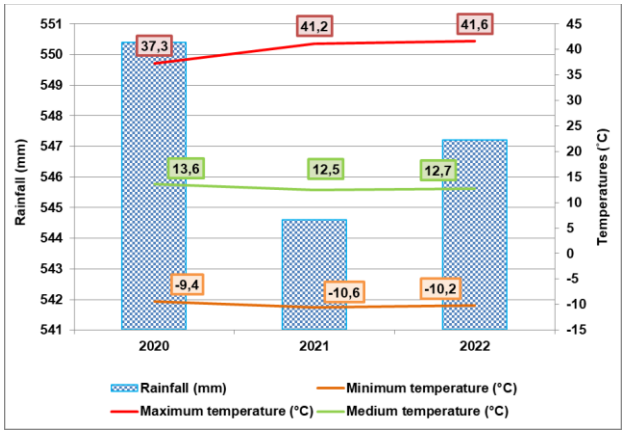

Figure 1. The main climate data from the period 2020-2022

The average temperature in the analyzed period was between 12.5-13.6 °C, the lowest average temperature was recorded in 2021, and the highest average temperature was recorded in 2020.

In the period 2020-2022, the maximum temperature was increasing from the year 2020 when 37.3 °C was recorded, and in 2022 the maximum of this period was recorded at 41.6 °C.

From the point of view of annual precipitation, the amount of precipitation in the period 2020-2022 was around 500 mm, in 2020 550.4 mm were recorded, and in 2021, 544.6 mm. During the vegetation period, the highest amount of precipitation was recorded in 2020 with 310.4 mm, and the lowest amount of precipitation was recorded in 2021, which was 173.6 mm.

In 2022, the rainfall recorded during the vegetation period, in a small amount (300.2 mm), but over a large number of days (62), caused the appearance of the main vine diseases, *Plamopara viticola* and *Uncinula necator* since phenophase of grain growth, requiring a large number of treatments.

In the analyzed period, the grape cultivares for red wines beginning of bud burst (07 BBCH) between April 13-20, the 'Mamaia' cultivar beginning of bud burst (07 BBCH the earliest, and the 'Pandur' cultivar at the latest (Table 1).

The beginning of ripening (81 BBCH) fallow phase took place during the month of July, starting on the 17 for the 'Codană' and 'Mamaia' cultivares and ending with the 'Novac' cultivar on the 25 of July.

The grape harvest took place between September and October, the earliest cultivares could be harvested 'Băbeasca neagră' and 'Pandur'.

The specialized literature emphasizes that the ripening of grapes evolves differently, in relation to the earliness of the varieties, the vigor of growth, the size of the production and the favorability of the climatic conditions. For this reason, in order to determine the optimal time of harvesting, it is necessary to know the dynamics of the ripening process, marked by the evolution of the weight of the grapes, the accumulation of sugars and the decrease in the acidity of the unfermented wine (Irimia, 2012).

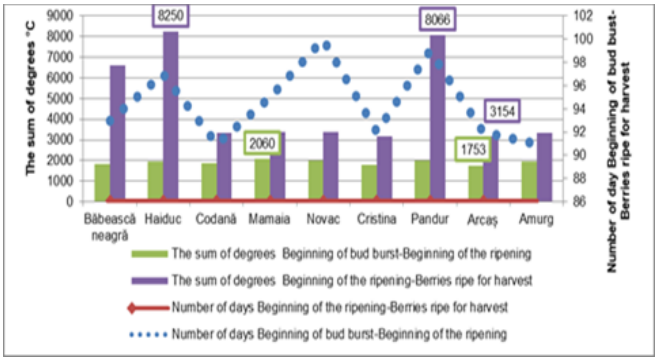

Figure 2. The course of the phenological stages of red wines in the period 2020-2022

The 'Mamaia' cultivar, which beginning of bud burst first, among the cultivares analyzed, required 95 days from bud bursting to beginning of ripening and 59 days from beginning of ripening to maturity of the grapes, and the sum of the degrees required from bud bursting to beginning of ripening recorded 2060 °C and from beginning of ripening to maturity of the grapes recorded 3397 °C (Figure 2).

Table 2. Shoot fertility in grapevine cultivares for red wines in the period 2020-2022

Cultivar	Fertility coefficient	
	relative	absolute
'Băbească neagră'	0.79-0.93	1.09-1.20
'Haiduc'	0.92-1.37	1.36-1.91
'Codană'	1.07-1.34	1.36-1.50
'Mamaia'	0.86-1.13	1.23-1.42
'Novac'	0.88-1.04	1.36-1.45
'Cristina'	0.95-1.53	1.29-1.73
'Pandur'	1.28-1.31	1.53-1.61
'Arcaș'	0.99-1.59	1.37-1.70
'Amurg'	0.86-1.45	1.11-1.75

The 'Novac' cultivar was the last to trigger the fenovase the beginning of ripening and it required 100 days from bud bursting to beginning of ripening and 59 days from bud bursting to beginning of ripening, and the sum of the degrees required from bud bursting to beginning of ripening recorded 2012 °C and from beginning of ripening to ripening lever recorded 3363 °C. The cultivares 'Haiduc' and 'Pandur' recorded the highest sum of temperature degrees, during from beginning of ripening to ripening period 8066 °C for the 'Pandur' cultivar and 8250 °C for the 'Haiduc' cultivar.

Shoot fertility recorded different values depending on the cultivar and climatic conditions.

The relative fertility coefficient recorded, depending on the year, both subunit and superunit values, with the exception of the 'Codană' cultivares (1.07-1.34 and 'Pandur' (1.28-1.31) in which the values were only superunit, and the maximum value of the absolute fertility coefficient was recorded in the 'Pandur' cultivar, between 1.53 and 1.61 (Table 2).

Table 3. Grape production of different cultivares with red wine grapes in 2020-2022

Cultivar	Production kg/ha	The difference from the 'Băbească neagră' cv.		Signification
'Băbească neagră'	13900	%	kg/ha	
'Haiduc'	17662	127	3762	**
'Codană'	18089	130	4189	**
'Mamaia'	8689	63	-5211	ooo
'Novac'	20479	147	6579	***
'Cristina'	12978	93	-922	-
'Pandur'	15661	113	1761	-
'Arcaș'	13012	94	-888	-
'Amurg'	16544	119	2644	-

DL 5%=2710
DL 1%=3733
DL 0.1%=5139

In the period 2020-2022, the average production of grapes for red wine cultivares was between 8689 kg/ha for the 'Mamaia' cultivar and 20479 kg/ha for the 'Novac' cultivar, with a production increase of 6579 kg/ha, very significant in terms of statistical view (Table 3). High productions were also recorded in the 'Haiduc' cultivares 17662 kg/ha, having a production increase of 3762 kg/ha, and a distinctly significant positive significance, the 'Codană' cultivar recorded a production of 18089 kg/ha with a production increase of 4189 kg/ha and distinctly significant meanings.

Quality analyzes consisted of determinations of 100 berries weight, total sugar content and total titratable acidity at harvest (Table 4).

From the point of view of the weight of 100 berries, the cultivares 'Novac' (263 g) and 'Pandur' (260 g) recorded the highest value, being statistically assured as significantly positive compared to the 'Băbească neagră' cultivar, and the lowest

value was recorded for the cultivar 'Arcaș' (180 g), statistically uninsured.

The values of the content of total sugars, at harvest maturity, fluctuated from one cultivar to another but also from one year to another. From this point of view, the 'Codană' cultivar was in first place, with an average amount of total sugars of 207 g/l. The 'Arcaș' cultivar achieved an average total sugar content, with the lowest value (180 g/l).

Regarding the total titratable acidity, expressed in g/l H_2SO_4, the cultivares accumulated very different amounts from one cultivar to another, with values from 3.47 for the 'Mamaia' cultivar to 4.39 as recorded by the 'Cristina' cultivar.

Table 1. Phenological observations on different vine cultivares with grapes for red wines in the period 2020-2022

Cultivar	Beginning of ripening	Beginning of ripening	Berries ripe for harvest
'Băbească neagră'	April 18-27	July 19 - August 01	September 13-24
'Haiduc'	April 18-27	July 23-26	September 19-Octomber 19
'Codană'	April 18-23	July 17-26	September 14-Octomber 19
'Mamaia'	April 13-23	July 17 - August 01	September 14-Octomber 22
'Novac'	April 16-17	July 25-27	September 19-Octomber 19
'Cristina'	April 18-27	July 18-28	September 14-Octomber 17
'Pandur'	April 20-27	July 27-29	September 13-Octomber 19
'Arcaș'	April 18-27	July 18-26	September 14-Octomber 19
'Amurg'	April 16-27	July 19-28	September 14 Octomber 17

Table 4. Grape quality of some red grape vine cultivares in 2020-2022

Cultivar	Weight of 100 berries (g)	The difference compared to the control (g)	Total sugar content (g/l)	The difference compared to the control (g)	Total titratable acidity (g/l H_2SO_4)	The difference compared to the control (g)
'Băbească neagră'	206	Mt	197	Mt	4.0	Mt
'Haiduc'	222	16	196	-1.0	3.9	-0.06
'Codană'	221	15.3	207	9.7	3.8	-0.25
'Mamaia'	221	15.0	197	-0.3	3.5	-0.53
'Novac'	263**	56.7	200	3.0	4.1	0.10
'Cristina'	232	26.0	203	5.7	4.4	0.39
'Pandur'	219	13.3	195	-2.0	3.5	-0.49
'Arcaș'	180	-26.0	180	-16.7	3.8	-0.24
'Amurg'	260**	54.3	188	-8.7	4.3	0.31
	DL 5%	39.1	DL 5%	15.9	DL 5%	0.96
	DL 1%	53.8	DL 1%	21.9	DL 1%	1.33
	DL 0.1%	74.1	DL 0.1%	30.1	DL 0.1%	1.82

CONCLUSIONS

In the period 2020-2022, the table grape cultivares analyzed behaved differently depending on the climatic conditions of the crop year.

In the analyzed period, the grape cultivares for red wines beginning of bud burst (07 BBCH) between April 13-20, the 'Mamaia' cultivar beginning of bud burst (07 BBCH the earliest, and the 'Pandur' cultivar at the latest

The grape harvest took place between September and October, the earliest cultivares could be harvested 'Băbească neagră' and 'Pandur'.

The cultivares 'Haiduc' and 'Pandur' recorded the highest sum of temperature degrees, during from beginning of ripening to ripening

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