

RESEARCH ON THE TECHNOLOGICAL CHARACTERISTICS OF SELECTED CLONAL ELITES FROM TWO POPULATIONS OF TABLE GRAPE VARIETIES UNDER THE CONDITIONS OF THE MURFATLAR VINEYARD

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Abstract

Between 2019 and 2024, a study was conducted in Research Development Station for Viticulture and Winemaking Murfatlar on clonal selections of two table grape varieties: 'Afuz Ali' and 'Coarna neagra'. Five clonal elites from each variety were comparatively analyzed, evaluating their technological qualities relative to the standard variant. During the research, the clonal elite 'Afuz Ali 72/3/16' consistently outperformed the control and the other four studied elites, recording high and quality yields with an average of 42 tons/ha, compared to 27 tons/ha for the control variety. Similarly, the clonal elite 'Coarna neagra 14/5/22' demonstrated a consistently higher level than the control and the other four elites, with high and quality yields, averaging 38 tons/ha compared to 26 tons/ha for the control variety. The clonal selections recommended for certification and propagation in the Dobrogea area and regions with similar climates are 'Afuz Ali 72/3/16' and 'Coarna neagra 14/5/22', which exhibit superior quality over the control in terms of bunch appearance, pulp consistency, aroma, and typicity.

Key words: clonal selection, productivity, quality, organoleptic evaluation.

INTRODUCTION

Table grape varieties are highly valued by consumers, being a valuable source of bioactive compounds that contribute to health through their antioxidant properties, anti-inflammatory action, and ability to support endothelial function (Manach et al., 2013).

To increase table grape production, it is necessary to focus on several aspects and measures, such as expanding and cultivating new areas, applying good agricultural practices, using irrigation, implementing effective protection programs, and more. In addition to these measures, grape quality and productivity can be enhanced by using varieties with high genetic potential and selecting suitable clones (Maicas et al., 2020).

Clonal selection is considered one of the most effective methods for the genetic improvement of grapevines, based on the selection of clones and cellular modifications of the varieties,

which are accompanied by an increase in vegetative mass (Salillari & Hoxha, 2001). Through clonal selection, both the production and commercial qualities of the varieties can be optimized.

Among the most important parameters in choosing a clone are: the shape and size of the grape and berry, the mechanical structure of the grape and berries, grape quality, and disease resistance (Rühl et al., 2004).

According to Winkler & Cook (1974), high-quality table grapes combine average berry size, uniformity, characteristic color, and a texture that reflects the specific taste of the variety. Today, in vineyards where table grapes are cultivated with irrigation systems, yields of over 25 tons/ha are easily obtained (Rotim & Gašpar, 2016), leading to an increase in yield between 20% and 47%, depending on annual conditions (Kryeziu, 2017; 2024).

MATERIALS AND METHODS

The research was conducted over six years (2019-2024) and involved studying clonal selections from populations of two table grape varieties: 'Afuz Ali' and 'Coarna neagra'.

The experimental plots are located on land with a slope of 2-3%. The soil type in this viticultural area is typical calcareous chernozem, and the soil has a loamy texture. The rows are oriented from east to west, the planting distance is 2.2 x 1.1 m, ensuring a density of 4132 vines per hectare. The rootstock used is Berlandieri x Riparia, Telecky Openheim SO4-4 selection. Drip irrigation systems were used only in 2024, as the system was established in 2023.

During this period five clonal elites from each variety were comparatively analyzed, evaluating their technological qualities in comparison to the standard variant (the initial varieties).

For the 'Afuz Ali' variety, the following five clonal elites were studied: 'Afuz Ali 15/8/4', 'Afuz Ali 46/9/12', 'Afuz Ali 72/3/16', 'Afuz Ali 28/5/3' and 'Afuz Ali 64/5/2'.

In the case of the 'Coarna neagra' variety, the following clonal elites were studied: 'Coarna neagra 9/7/4', 'Coarna neagra 14/5/22', 'Coarna neagra 17/5/3', 'Coarna neagra 32/1/6' and 'Coarna neagra 24/7/8'.

The objective of the research is to identify which clones of the analyzed varieties offer the best performance based on the studied parameters. The results obtained should clarify the production characteristics of each clone under the specific cultivation conditions of Dobrogea, specifically within the Murfatlar viticultural center. These data will support the selection of the most suitable clones to complete the varietal conveyor of the area, while also contributing to the improvement of the studied grape varieties. The observations and measurements conducted focused on the production potential of the studied varieties and selections and the quality of the yield (average cluster weight, weight of 100 berries, and volume of 100 berries).

All these observations and measurements were determined considering the climatic conditions (temperature and precipitation) during the study years.

The chemical composition of the must was determined by measuring sugar content and acidity. For the organoleptic evaluation, a scale

from 5 to 10 points was applied. Following the assessments and tests by breeders and ISTIS inspectors, the samples of each variant were evaluated through taste, visual, and olfactory senses based on external appearance, consistency, taste, typicity, and variety originality.

RESULTS AND DISCUSSIONS

Analyzing the average monthly temperatures from 2019 to 2024 compared to the multi-year average (minimum of 20 years), according to Figure 1, it can be observed that the average monthly temperatures have increased above normal values, with very hot summers and mild winters.

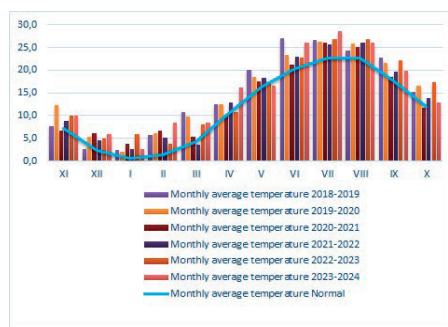


Figure 1. Analysis of the recorded temperatures during the studied period

Regarding the precipitation amounts recorded during the study period, compared to the multi-year average, according to Figure 2, they showed an uneven distribution. The years 2021, 2022, and 2023 were drought years, while in 2024, significant amounts of precipitation during the ripening and harvesting period had negative effects on the crops.

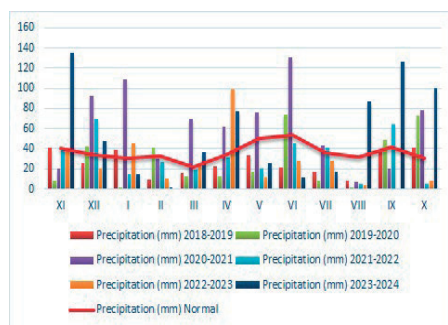


Figure 2. Analysis of the recorded precipitation during the studied period

Analyzing the data on average cluster weight, weight of 100 berries, and volume of 100 berries during the study period (2019-2024), as presented in Figure 3, it can be observed that for the 'Afuz Ali' variety, the elite that showed a distinctly significant difference compared to the control and the other studied elites is 'Afuz Ali 72/3/16'. This selection averaged 547 g per cluster compared to 440 g for the control, 535 g per 100 berries compared to 389 g for the control, and 562 in volume per 100 berries

compared to 353 in volume for the control. For the 'Coarna neagra' variety, the elite that registered a distinctly significant difference compared to the control and the other studied elites is 'Coarna neagra 14/5/22'. This clonal elite averaged 466 g per cluster compared to 335 g for the control, 380 g per 100 berries compared to 229 g for the control, and 416 in volume per 100 berries compared to 206 for the control, as shown in Figure 4.

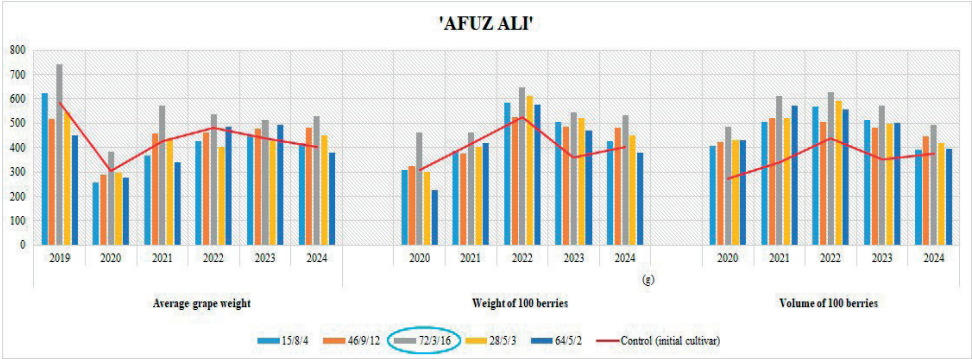


Figure 3. The quality of the yield for the 'Afuz Ali' variety

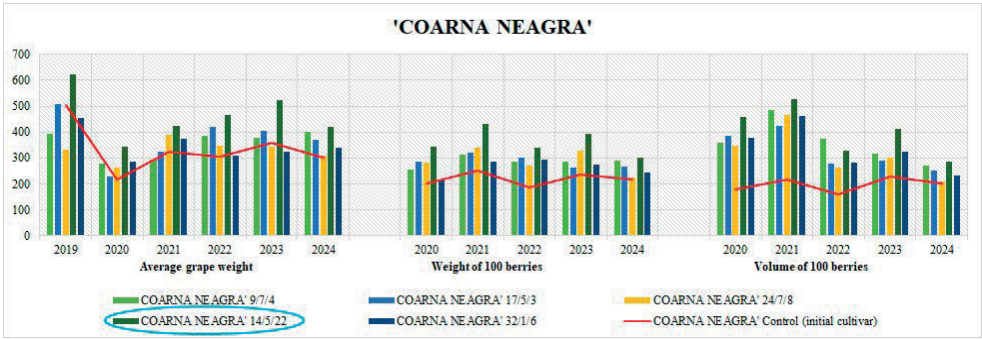


Figure 4. The quality of the yield for the 'Coarna neagra' variety

According to Figure 5, regarding average yields (tons/ha), for the 'Afuz Ali' variety, the elite 72/3/16 recorded a distinctly significant difference compared to the control, with an average yield of 42 tons/ha, compared to 27 tons/ha recorded by the control. According to Figure 6, regarding average yields (tons/ha), for the 'Coarna neagra' variety, the elite 14/5/22 recorded a distinctly significant difference compared to the control, with an average yield of 38 tons/ha, compared to 31 tons/ha recorded by the control.

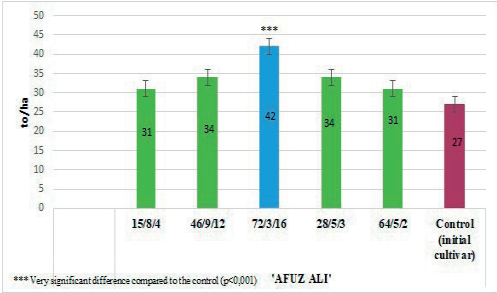


Figure 5. Average yields (tons/ha) recorded during the study period compared to the 'Afuz Ali' control variety

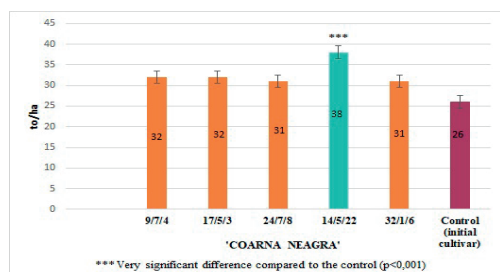


Figure 6. Average yields (tons/ha) recorded during the study period compared to the 'Coarna neagra' control variety

The chemical composition of the grapes varies depending on the variety, degree of maturity, climatic and ecological conditions, agricultural

practices used, plant health, and other factors. Analyzing the data from Table 1, for the 'Afuz Ali' variety, the clonal elite 'Afuz Ali 72/3/16' recorded the largest difference compared to the control, with +11.79 g/L of sugars and a standard deviation of 16.69; in terms of acidity, this elite recorded the smallest difference of -0.38 g/l H₂SO₄ with a standard deviation of 1.56. For the 'Coarna neagra' variety, the clonal elite 'Coarna neagra 14/5/22' recorded the largest difference compared to the control, with +46.51 g/L of sugars and a standard deviation of 13.49; in terms of acidity, this elite recorded a difference of -0.48 g/l H₂SO₄, with a standard deviation of 1.21 (Table 1).

Table 1. Sugar content and acidity of the studied elites compared to the control cultivars

Cultivar	Clonal elites	Sugar g/L						Average	Differences (±)	Standard deviation	Acidity g/L H ₂ SO ₄						Average	Differences (±)	Standard deviation
		2019	2020	2021	2022	2023	2024				2019	2020	2021	2022	2023	2024			
'AFUZ ALI'	15/8/4	142.0	160.4	190.1	156.7	150.3	142	156.92	-5.66	17.90	5.1	5.0	4.2	2.23	3.2	2.3	3.67	-0.53	1.29
	46/9/12	144.6	148.5	187.3	160.3	148.1	163	158.63	-3.95	15.84	5.0	5.2	3.7	2.28	3.0	2.6	3.63	-0.57	1.24
	72/3/16	158.3	164.0	205.1	170.4	168.4	180	174.37	+11.79	16.69	6.2	5.3	3.5	2.43	2.6	2.9	3.82	-0.38	1.56
	28/5/3	143.3	152.4	192.0	164.1	145.2	153	158.33	-4.25	18.05	6.0	4.8	4.0	2.34	3.1	2.4	3.77	-0.43	1.45
	64/5/2	150.3	151.2	191.5	168.2	147.5	129	156.28	-6.3	21.29	4.2	4.7	4.1	2.40	2.2	2.0	3.27	-0.93	1.19
	Control (initial cultivar)	150.4	155.8	194.8	161.9	176.6	136	162.58	0	20.67	6.4	5.8	3.9	3.75	3.0	2.2	4.20	0	1.62
	Control (initial cultivar)	150.4	155.8	194.8	161.9	176.6	136	162.58	0	20.67	6.4	5.8	3.9	3.75	3.0	2.2	4.20	0	1.62
'COARNA NEAGRĂ'	9/7/4	163.0	158.4	191.7	158.4	154.4	175	166.82	+30.05	14.12	4.6	5.1	5.4	2.31	2.5	3.2	3.85	-0.27	1.35
	17/5/3	160.1	160.1	198.4	150.6	148.3	162	163.25	+26.48	18.11	6.8	4.6	3.8	2.16	2.9	3.0	3.88	-0.24	1.66
	24/7/8	150.2	164.2	194.5	160.7	150.1	136	159.28	+22.51	19.88	7.2	6.2	3.9	2.30	2.2	2.5	4.05	-0.07	2.17
	14/5/22	187.2	186.4	203.2	162.2	176.7	184	183.28	+46.51	13.49	5.4	4.8	2.7	2.33	3.2	3.4	3.64	-0.48	1.21
	32/1/6	149.5	160.9	194.2	156.8	140.2	149	158.43	+21.66	18.92	6.5	5.3	3.7	2.25	2.2	2.8	3.79	-0.33	1.76
	Control (initial cultivar)	140.4	139.8	152.4	121.6	135.4	131	136.77	0	10.31	6.0	5.5	4.0	3.80	3.0	2.4	4.12	0	1.40

According to Table 2, in the case of the 'Afuz Ali' variety, the clonal elite 'Afuz Ali' 72/3/16 had an average gluco-acidimetric index value of 52, exceeding the control value, which indicates that the grapes were sweet, with low acidity, making them suitable for direct consumption.

In the case of the 'Coarna neagra' variety, the clonal elite 'Coarna neagra 14/5/22' had an average gluco-acidimetric index value of 55, also exceeding the control value, signifying that the grapes were sweet, with low acidity, and suitable for direct consumption.

Table 2. The gluco-acidimetric index

Cultivar	Clonal elites	The gluco-acidimetric index						Average	Differences (±)
		2019	2020	2021	2022	2023	2024		
'AFUZ ALI'	15/8/4	28	32	45	70	47	62	47	+3
	46/9/12	29	29	51	70	49	63	48	+4
	72/3/16	26	31	59	70	65	62	52	+8
	28/5/3	24	32	48	70	47	64	47	+3
	64/5/2	36	32	47	70	67	65	53	+9
	Control (initial cultivar)	24	27	50	43	59	62	44	0
	Control (initial cultivar)	24	27	50	43	59	62	44	0
'COARNA NEAGRĂ'	9/7/4	35	31	36	69	62	55	48	+12
	17/5/3	24	35	52	70	51	54	48	+12
	24/7/8	21	26	50	70	68	54	48	+12
	14/5/22	35	39	75	70	55	54	55	+19
	32/1/6	23	30	52	70	64	53	49	+13
	Control (initial cultivar)	23	25	38	32	45	55	36	0

Organic acids bring benefits regarding the taste of grapes and play an important role in enhancing their flavor characteristics.

The balance between sweetness and acidity is a key factor in determining the quality of consumer acceptance (Topalovic et al., 2010). As a result of the evaluations and testing conducted by the breeders at SCDVV Murfatlar and the ISTIS inspector, using a rating scale from 5 to 10, the samples of each variant were assessed through taste, visual, and olfactory senses, based on the exterior appearance, consistency, taste, and typicity, that is, the originality of the variety.

Thus, the selection with the best properties, recommended for approval and multiplication, is 'Afuz Ali 72/3/16', which has superior quality compared to the control, in terms of exterior appearance, consistency, aroma, and typicity (Table 3 and Figure 7).

Table 3. Organoleptic properties of the grapes from the 'Afuz Ali' variety

Characters	Afuz Ali control	15/8/4	46/9/12	72/3/16	28/5/3	64/5/2
Media (2019 – 2024)						
External look	6	5	5	7	6	6
Consistency	6	6	6	8	6	6
Flavour	6	6	6	7	6	6
Typicality	7	7	7	8	7	7
Clasification	poor quality	poor quality	poor quality	superior quality	poor quality	poor quality



Figure 7. The bunch size and berry dimensions in the case of the clonal elite 'Afuz Ali 72/3/16', compared to the control

The selection with the best properties, recommended for approval and multiplication, is 'Coarna neagra 14/5/22', which has excellent

quality compared to the control, in terms of exterior appearance, consistency, aroma, and typicity (Table 4 and Figure 8).

Table 4. Organoleptic properties of the grapes from the 'Coarna neagra' variety

Characters	Coarna neagra control	9/7/4	17/5/3	24/7/8	14/5/22	32/1/6
Media (2019-2024)						
External look	6	6	7	7	8	7
Consistency	7	7	7	6	8	7
Flavour	6	6	6	6	7	6
Typicality	7	8	7	7	8	7
Clasification	poor quality	poor quality	poor quality	poor quality	excellent	poor quality



Figure 8. The bunch size and berry dimensions in the case of the clonal elite 'Coarna neagra 14/5/22', compared to the control

CONCLUSIONS

Throughout the study, the clonal elite 'Afuz Ali 72/3/16' consistently maintained a superior level compared to the control and the other four elites studied. On average, it had 547 g per grape compared to 440 g for the control, 535 g for the weight of 100 berries, compared to 389 g for the control, and 562 for the volume of 100 berries compared to 353 for the control. The recorded yields were high and of good quality, averaging 42 t/ha compared to 27 t/ha for the control variety.

The clonal selection with the best properties, recommended for approval and multiplication in the Dobrogea region and other regions with a similar climate, is 'Afuz Ali 72/3/16', which has superior quality compared to the control in terms of exterior appearance, consistency, aroma, and typicity.

In the same period, for the 'Coarna neagra' variety, the clonal elite 'Coarna neagra 14/5/22' consistently maintained a superior level compared to the control and the other four elites studied. On average, it had 466 g per grape compared to 335 g for the control, 380 g for the weight of 100 berries, compared to 229 g for the control, and 416 for the volume of 100 berries compared to 206 for the control. The recorded yields were high and of good quality, averaging 38 t/ha compared to 26 t/ha for the control variety.

The clonal selection with the best properties, recommended for approval and multiplication in the Dobrogea region and other regions with a similar climate, is 'Coarna neagra 14/5/22', which has superior quality compared to the control in terms of exterior appearance, consistency, aroma, and typicity.

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