

# QUALITY OF GRAPES OF FETEASCA NEAGRA WINE VARIETY DEPENDING OF GROW REGION FROM THE REPUBLIC OF MOLDOVA

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## Abstract

In Moldova wine production is very important for the economic development, because is traditional for local people. The Moldovan Government have a one of the main purpose in their development strategy - to develop and promotion local traditions in the word, inclusive moldavian wines produced from local varieties. In the period from 2017 to 2021, we studied the influence of ecological conditions and grow technology on the quality of grapes of Feteasca Neagra wine variety (local moldavian variety) cultivated in different regions of the Republic of Moldova – South part (Alexandru Ioan Cuza, Cahul district / Bugeac, Comrat district / Leova, Leova District); South-east part (Purcari, Stefan Voda district); Central part (Speia, Anenii Noi district / Nisporeni, Nisporeni district / Mircesti, Ungheni district). Feteasca Neagra synonymous: *Coadă Rîndunicii*, *Coadă Rîndunicii*, *Mädchentraube Schwarz*, *Schwarze Mädchentraube*, *Pasareasca neagra*, *Fekete Leányka*. Feteasca Neagra is a local Moldavian and Romanian wine grape variety of the middle ripening period. The period from the beginning of bud break to the full maturity of berries in the conditions of the south part of Moldova is 125-140 days with a sum of active temperatures of 2700°-2800°C. The leaves are medium, cuneate-round, five-lobed, medium or deeply dissected with the edges of the lobes bent down, glabrous below with sparse bristles along the veins. The petiolate notch is open, vaulted or lyre-shaped with a pointed bottom. The flower is bisexual. Clusters are medium, cylindrical or cylindrical, medium dense. The berries are medium, rounded, purple-black. The skin is strong. The pulp is juicy. Shoot maturation is good. Productivity is 7.0-9.5 t/ha. Feteasca Neagra is moderately affected by mildew, and weakly by other diseases and pests. The grapes are used to prepare a well-colored table wine. In our research results we concluded that the quality and quantity of grapes and wine depend directly by the ecological grow conditions. In the south part we obtained early grapes by higher sugar and titratable acidity content in comparison with grapes obtained in the central or north part of Moldova. The distance between south and north experimental vineyards are about 200 km, but the conditions are very different.

**Keywords:** Feteasca neagra, Grapes, Local varieties, Republic of Moldova, Viticulture, Wine, Quality

## Introduction

The increase of competition on the world forces wine-growing entities to comply with quality standards in the management of vineyards. Although modern oenological techniques have an essential role in the winemaking process, the prerogative to obtain an excellent wine rest with the composition of the grapes (Romboli et al, 2017).

N. Perstnirov et al. (Perstnirov et al., 2000), M. Rapcea (Rapcea, 2002) mentions that the vine is a plant that reacts to changes in environmental factors (temperature, light, water, soil, etc.) and technological processes. That is why it is necessary to constantly study the degree of adaptation of the vine to these changes in order to correctly solve both the problems of cultivation technology and the improvement of varieties.

The grape variety, as a quality factor, with its specificity, has an essential role in the production of high quality wines (Jovanović-Cvetković et al., 2020).

Terroir is an extremely important concept in viticulture, influencing both the organoleptic characteristics of grapes and wine. The term combines topographic, climatic, pedological conditions and cultivation technologies (Karaođlan et al., 2015).

The concept of terroir has evolved in European viticulture over several centuries. It provides a link between the sensory characteristics of the wine, consumer expectations and the environmental conditions in which the grapes are grown. The globalization of international wine trade has led to increased production in New World countries, with an emphasis on varietal and branded wines. The validation and relevance of the concept of terroir to the modern wine industry, which faces challenges associated with maintaining international competitiveness,

environmental sustainability, climate change and consumer expectations, is discussed. (Clingeffer, 2014; Van Leeuwen and Seguin, 2006).

The ecological conditions of the Republic of Moldova can ensure the obtaining of raw material grapes that allow the production of national wine products of high and sustainable quality, ensuring their competitiveness on all wine markets.

The National Office of Vine and Wine makes an enormous effort to promote Moldovan wine on the world market. But this can only be achieved with the use of local varieties specific to the Moldavian climatic conditions - Fetească neagră, Fetească regală, Fetească albă, Răra neagră etc.

With a history of over 2000 years, the Feteasca neagra variety has its origins in the Prut River valley in the southwestern part of Moldova.

The Feteasca Neagră variety is grown, in particular, in the wine-growing regions of the Muntenia and Oltenia Hills, the Moldavia, Banat, Crișana and Maramureș Hills, the Dobrogea Hills, the Danube Terraces and the Transylvanian Plateau. Feteasca Neagra is also one of the most cultivated varieties in the Republic of Moldova.

The area of the Feteasca Neagră variety, in the Republic of Moldova according to the Wine Registry (as of 30.12.2019) was - 242.0 ha, including 76.0 ha for obtaining IGP wine products.

The purpose of this study is the comparative agrobiological analysis of the Feteasca neagra variety cultivated in various wine-growing regions of the Republic of Moldova.

## Material and Methods

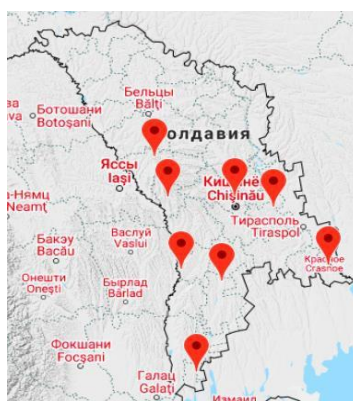
The researches were carried out on the basis of the ONVV Project "Quality Grapes" - "Dissemination of good practices through field schools for winegrowers".

The study was based on the native grape variety for wine – Fetească neagra, cultivated in four plantations in different wine regions – Bugeac, Leova, Alexandru Ioan Cuza (Valul lui Traian Region), Purcari (Ștefan Vodă Region), Mircești, Speia, Nisporeni (Codru Region).

In the Table 1. below, the characteristics of the wine plantations of the experimental sectors are reflected.

**Table 1.** The characteristic of the vineyard plantations in the experimental sectors (*Feteasca neagra* variety)

Experimental sector location	Canopy management	Year of planting	Planting distances, m	Altitude, m	Exposition	Inclination, degrees
1) Cahul, Alexandru Ioan Cuza Vodă / Vinăria Bostavan SRL ( <i>LD Cuza</i> )	Casenave bilateral	2015	2.5 x 1.25	85	SV, V	1 - 3
2) Comrat, Bugeac / ÎM Chateau Vartely SRL ( <i>LD Bugeac</i> )	Bilateral simple Guyot	2008	2.75 x 1.4	152	SV, S	1 - 3
3) Leova, Școala Profesională din Leova ( <i>LD Leova</i> )	Unilateral Arched Guyot	2009	2.25 x 0.9	160	S, SE	1 - 3
4) Ștefan Vodă, Purcari / Vinăria Purcari SRL ( <i>LD Purcari</i> )	Bilateral Royat	2010	2.75 x 1.3	121	S, SE	5 - 7
5) Anenii Noi, Speia / Castel Mimi SRL ( <i>LD Speia</i> )	Bilateral simple Guyot	2015	2.2 x 1.0	85	NE, E	3 - 5
6) Nisporeni, Vărzărești, Școala Profesională ( <i>LD Nisporeni</i> )	Unilateral Arched Guyot	2006	2.25 x 0.9	120	SV, V	3 - 5
7) Ungheni, Mircești / Crama Mircești SRL ( <i>LD Mircești</i> )	Unilateral simple Guyot	2014	2.20 x 1.3	304	E, SE	5 - 7



## Result

In the study, the variants without adjustment of the load with green shoots (variant 1 - Control) and with the adjustment of the load of the hubs with shoots, variant 2, were analyzed.

To achieve the proposed goal and objectives, a series of observations, records and analyzes were carried out according to the methods and standards in force, accepted in viticulture, especially the OIV guide.

Following the analysis of the pedological conditions of the demonstration lots, we find that:

- at LD Bugeac, in the 0-157 cm profile of the typical chernozem soil, the humus content is reduced from 4.05% to 0.83%. Carbonates are highlighted at a depth greater than 104 cm, and the pH increases from 7.30 to 8.15. The content of harmful Na salts is observed in the 0-63 cm layer and constitutes 0.45 me/100 g soil;

- at LD Purcari, in the 0-165 cm profile of carbonated chernozem soil, the humus content is reduced from 1.39% to 0.52%. Carbonates are prominent at the surface and increase from 3.5% to 11.5%, and pH increases from 7.92 to 8.30 with depth. The content of harmful Na salts is reduced in the 0-79 cm layer from 0.44 to 0.23 me/100 g soil;

- at LD Mircești, in the 0-150 cm profile of the typical chernozem soil, the humus content is reduced from 2.32% to 0.63%. Carbonates are not evident in the 0-150 cm layer, and the pH increases from 6.95 to 8.05. In the 0-96 cm layer, the content of harmful Na salts is within the limits of 0.11-0.23 me/100 g soil;

- at LD Leova, in the 0-155 cm profile of the usual chernozem soil, the humus content is reduced from 2.10% to 0.46%. The carbonate content is highlighted in the 0-155 cm layer in the range of 1.30-10.60%, and the pH increases from 8.10 to 8.70. The content of harmful Na salts is observed in the 0-106 cm layer within the limits of 0.16-0.34 me/100 g soil;

- at LD Cuza in the 0-150 cm profile of carbonated chernozem soil, the humus content is reduced from 1.72% to 0.52%. The content of carbonates in the 0-150 cm layer is within the limits of 2.1-9.3%, the pH value increases from 8.25 to 8.72. Harmful Na salts are observed in the 0-119 cm layer within the limits of 0.16-0.34 me/100 g soil;

- at LD Speia, in the 0-180 cm profile of leached chernozem soil, the humus content is reduced from 2.74% to 0.29%, carbonates are highlighted in the 132-180 cm layer within the limits of 1.30-4, 5%, pH increases from 7.05 to 8.30, the content of harmful Na salts is observed in the 0-132 cm layer and constitutes 0.167 me/100 g soil;

- at LD Nisporeni in the 0-140 cm profile of carbonated chernozem soil, the humus content is reduced from 1.50% to 0.37%, carbonates are highlighted in the 0-140 cm layer within the limits of 4.7-6.0 %, the pH increases from 8.10 to 8.55, and the content of harmful Na salts is observed in the 0-124 cm layer and constitutes 0.16 me/100 g soil.

As a result of the agrobiological records and analyses, the following data reflected in Table 2 were obtained.

**Table 2.** Fertility of the shoots depending on the origin

Variantele	Cones			Spurs			Perennial wood			Shoots		
	CFR	CFA	% fertile shoots	CFR	CFA	% fertile shoots	CFR	CFA	% fertile shoots	CFR	CFA	% fertile shoots
<b>Cuza LD: Feteasca neagră</b>												
V. 1 (C)	0.6	1.1	55.0	1.4	1.5	94.9	0.4	1.0	35.7	1.1	1.4	80.5
V. 2	0.0	0.0	0.0	0.9	1.1	78.0	0.3	1.0	25.0	0.8	1.1	69.2
<b>Bugeac LD: Feteasca neagră</b>												
V. 1 (C)	1.5	1.9	80.4	1.2	1.8	66.7	0.2	2.0	8.3	1.3	1.9	67.6
V. 2	1.6	1.7	94.1	1.3	1.8	71.4	0.8	2.3	36.4	1.5	1.7	84.9
<b>Leova LD: Feteasca neagră</b>												
V. 1 (C)	1.4	1.7	82.7	1.5	1.8	84.6	0.1	1.0	14.3	1.1	1.7	66.3
V. 2	1.3	1.5	85.3	1.0	1.3	75.0	0.3	1.0	33.3	1.2	1.5	81.9
<b>Purcari LD: Feteasca neagră</b>												
V. 1 (C)	1.4	1.7	85.2	0.9	1.2	78.3	0.1	1.3	11.1	1.0	1.5	64.4
V. 2	1.5	1.6	92.5	0.7	1.1	64.7	0.1	1.3	8.1	0.9	1.4	63.0
<b>Speia LD: Feteasca neagră</b>												
V. 1 (C)	1.8	1.8	98.8	1.3	1.3	100.0	0.9	1.4	66.7	1.6	1.7	94.7

Variantele	Cones			Spurs			Perennial wood			Shoots		
	CFR	CFA	% fertile shoots	CFR	CFA	% fertile shoots	CFR	CFA	% fertile shoots	CFR	CFA	% fertile shoots
V. 2	1.6	1.7	98.7	1.4	1.6	87.5	1.0	1.2	83.3	1.5	1.6	94.2
<b>Nisporeni LD: Feteasca neagră</b>												
V. 1 (C)	1.3	1.5	93.0	1.1	1.3	85.7	0.8	1.0	75.0	1.2	1.4	88.9
V. 2	1.4	1.6	87.5	1.2	1.4	90.5	0.3	1.0	28.6	1.2	1.5	81.7
<b>Mircești LD: Feteasca neagră</b>												
V. 1 (C)	1.4	1.4	96.3	2.7	2.7	100.0	0.6	1.0	62.5	1.4	1.5	92.8
V. 2	1.4	1.7	84.1	1.0	1.3	75.0	0.6	1.0	60.0	1.4	1.7	82.1

CFR – relative fertility coefficient - CFA - absolute fertility coefficient

Among the variants analyzed, depending on the origin of the shoots (rope, cone, perennial wood), the shape of the stumps (Guyot, Cazenave, Royat) and the region of cultivation, etc. CFR obtained values between 0.0-1.8 for shoots from winter eyes on strings, 0.9-2.7 for shoots from winter eyes on cones and 0.1-1.0 for shoots originating from dormant buds on perennial wood. CFA obtained values between 0.0-1.9 for shoots from winter eyes on strings, 1.1-2.7 for shoots from winter eyes on cones and 1.0-2.3 for shoots originating from dormant buds on perennial wood.

Fertile shoots constitute values between 0.0-98.8% for shoots originating from winter eyes on strings, 64.7-100.0% for shoots originating from winter eyes on cones and 8.1-75, 0% for shoots originating from dormant buds on perennial wood.

Generalizing the above, taking into account the origin of the shoots, CFR was comprised of values between 0.8-1.5, CFA was comprised of values between 1.1-1.9 and fertile shoots - 63.0- 94.7%.

**Table 3.** Calculation of the surface of the external plant wall

Variantele	H, m	B, m	Missing plants, %	Distance between rows, m	Distance between plants, m	SECV, m <sup>2</sup> /ha
<b>Cuza LD: Feteasca neagră</b>						
V. 1 (C)	1.1	0.4	10	2.50	1.25	9792.0
V. 2	1.3	0.3	10	2.50	1.25	10672.0
<b>Bugeac LD: Feteasca neagră</b>						
V. 1 (C)	1.3	0.3	30	2.75	1.40	8285.7
V. 2	1.2	0.3	20	2.75	1.40	8415.6
<b>Leova LD: Feteasca neagră</b>						
V. 1 (C)	1.6	0.4	30	2.25	0.90	10666.7
V. 2	1.3	0.4	30	2.25	0.90	8888.9
<b>Purcari LD: Feteasca neagră</b>						
V. 1 (C)	1.3	0.5	10	2.75	1.30	10405.6
V. 2	1.3	0.5	10	2.75	1.30	10405.6
<b>Speia LD: Feteasca neagră</b>						
V. 1 (C)	1.5	0.4	30	2.20	1.00	11590.9
V. 2	1.5	0.5	20	2.20	1.00	12727.3
<b>Nisporeni LD: Feteasca neagră</b>						
V. 1 (C)	1.2	0.6	10	2.25	0.90	11851.9
V. 2	1.2	0.6	10	2.25	0.90	11851.9
<b>Mircești LD: Feteasca neagră</b>						
V. 1 (C)	1.6	0.5	10	2.20	1.30	15524.5
V. 2	1.5	0.4	20	2.20	1.30	13076.9

The height of the vegetal wall was comprised of values between 1.0-1.6 m, the width – 0.3-0.6 m, and the gap ratio – 0.1-0.3. These indices directly influenced the external surface of the vegetal carpet (SECV), which obtained values between 8285.7-15524.5 m<sup>2</sup>/ha.

## Conclusion

As a result of the analysis of the pedological conditions, we can mention that the soil is an important factor in the development of the vine and corresponds to this culture in all the demonstration lots. All soils represented at LD are sufficiently provided with nutrients for vine culture.

The increased fertility level of the shoots originating from the dormant buds on the perennial wood allows obtaining relative harvests in the case of the restoration of stumps affected by various unfavorable factors.

The surface of the external vegetal carpet directly influences the photosynthetic intensity and productivity, as a result of obtaining a high quality grape harvest.

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