RESEARCH ON THE PRODUCTION OF RED AND AROMATED WINES IN THE BANU MĂRĂCINE WINEGROWING CENTER

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Abstract

In Romania, viticulture has an undeniable tradition, documented, recognized by various writings, both past and present, and certified by the distinctions obtained by our wines. From the point of view of viticultural classification, Banu Mărăcine is part of the Craiova Hills vineyard, along with two other centers (Brabova and Brădeşti), integrated into the Muntenia and Oltenia Hills region. The objectives considered in the study referred to the evaluation of the edaphic factor in the Banu Mărăcine Winegrowing Center, which is important for obtaining high-quality wines, and the Merlot variety was studied. One of the factors that leave its mark on the quality and quantity of wine production in a wine-growing area and to which special attention is paid is the soil. Interpreting the results of chemical analyses, it is highlighted that the reddish slightly luvic preluvosol is a soil with a medium to low supply of humus. To increase the productive capacity, deep loosening works and organic fertilization are recommended, first of all. Chemical fertilization should be focused on nitrogen fertilizers, the soil being poorly supplied with this element. The dynamics of the maturation of the Merlot variety during a wine year changes continuously, depending on the phenophases, and at the time of grape harvest, a sugar content (212.8 g/l) and acidity (5.0 g/l H_2SO_4) was recorded, which provides the raw material for obtaining DOC wines.

Key words: Merlot, slightly luvic reddish preluvosol, Banu Mărăcine Winegrowing Center

INTRODUCTION

The beginnings of viticulture are lost in the mists of time and it is a universally accepted fact that vines and wine are an inseparable part of our cultural heritage.

The study of vine culture leads to the conclusion that vines are the cultivated plant with the oldest history and the most studied. The preparation of wine, along with vine culture, are among the oldest human occupations.

Since ancient times, wine has been one of the important levers of civilization for the peoples who came into direct contact with it, by expanding the knowledge of vine culture.

The vine, a plant with great ecological values, is cultivated on all continents, in both hemispheres of the Earth, between the average annual isotherm of 9^0C in the northern hemisphere and that of the average of 10^0C in the southern hemisphere.

The Romanian wine-growing area has experienced fluctuations over time, changes that, from the phylloxera disaster to the present, are on an upward trend, at least in terms of quality. The rise is justified by the ecological favorability of the Romanian lands, by the economic efficiency of the crop and the superior utilization of lands unsuitable for other crops, as Olteanu I. and Mărăcineanu L.C. appreciate in a 2007 paper.

In Romania, viticulture has an undeniable tradition, documented, recognized by various writings, from yesterday and today, and certified by the distinctions obtained by our wines.

Viticulture and winemaking have a special economic importance and have developed over time due to the climatic zones favorable to vine cultivation, which include

very varied pedoclimatic regions, relief and rocks, which, together with the ecological requirements of the varieties and rootstocks, are decisive for obtaining superior grape and wine production in terms of quality and quantity, at the level of current requirements.

Romania has been a member of the International Wine Organization since 1927, and due to the fact that it has a large area of vine cultivation subject to the Common Market Organization in the wine sector (Oşlobeanu M. et al., 1991), based on studies conducted, they have divided the wine-growing areas in Romania into 8 wine-growing regions (which include 37 vineyards with a total of 123 wine-growing centers and 40 independent wine-growing centers).

MATERIALS AND METHODS

Summarizing the information contained in the specialized literature (Giugea N., 2001), we find that on the current territory of the Banu Mărăcine wine-growing center, the presence of vines and wine production has been attested since ancient times.

From the point of view of viticultural classification, Banu Mărăcine is part of the Craiovei Hills vineyard, along with two other centers (Brabova and Brădeşti), integrated into the Muntenia and Oltenia Hills region (figure 1.)

Figure 1

According to Order 645/2005 regarding the classification of Romanian wine regions in the wine areas of the European Union, the wine region of the Muntenia and Oltenia Hills, with the vineyards of Ştefăneşti-Argeş, Sâmbureşti, Drăgăşani and the Craiovei Hills, was integrated into the CIa wine area, with a natural alcoholic strength of at least 7.5% vol. The varieties that can be grown here are those included in Order 594/2004, which is presented in extract in Table 1. The predominant varieties currently in the portfolio of the Banu Mărăcine wine center are: Cabernet Sauvignon, Merlot, Fetească neagră, Sauvignon, Tămâioasă românească, Italian Riesling and Fetească regală, along with many others within the ampelographic collection here, the entire area occupied by vines totaling approx. 110 ha.

Table 1.Extract from Order 594/2004 on the zoning of grapevine varieties in Romania

Wine center	Production directions	Variety	
		Advisable	Approved
Banu Mărăcine	Red wines	Cabernet Sauvignon	Burgund mare
		Merlot	Novac
		Pinot noir	Negru de Drăgăşani
		Fetească neagră	-
	White wines	Sauvignon	Riesling italian
		Chardonnay	Crâmpoşie selecţionată
		-	Fetească regală
	Aromatic wines	-	Tămâioasă românească
	Table grapes	Victoria	Muscat de Hamburg
		Muscat d´Adda	Afuz - Ali

From the point of view of geographical position, Banu Mărăcine occupies flat or sloping lands with different inclinations, located at 44o19' north latitude, and at an average altitude of 105 m (Teodorescu Şt. et al., 1987).

Numerous studies have been carried out on these coordinates and various approaches that characterize this area. Therefore, numerous Romanian researchers have contributed to the development of this sector, through valuable studies.

The objectives considered in the study referred to the evaluation of the edaphic factor in the Banu Mărăcine Wine Center with importance for obtaining high-quality wines and the Merlot variety was studied.

The Merlot variety can also be found under the names of Merlot noir, Merau, etc. It originates from France and is part of the

renowned assortment of red Bordeaux wines.

The vegetation period is medium to long (180-200 days) and has vigorous growth, it is not resistant to drought and frost -18...-160C. The preferred soils are moist, fertile soils. It has high to medium resistance to gray rot and oidium, but it is sensitive to scab. Recommended rootstocks for grafting are: SO_4, 420A, Kober 5BB.

This variety has a normal hermaphrodite flower, with fertile pollen. The color of the adult leaf is dark green, embossed on the upper side, and on the lower side it is scaly, the edges of the blade being brought towards the upper side. The blade is pentalobate with the triangular and slightly twisted terminal lobe. The petiole sinus is lyre-shaped, the lower sinuses are open in a "U" shape or tend to close, and the upper lateral sinuses are closed, ovate. The shape of the grapes is cylindrical-conical, with the first 2 branches more developed. The grapes are compact, small or medium in size, the skin color is bluish-black, of medium thickness, they have a juicy core and the must is colorless.

The ripening period is the 5th period, full ripening starting with the first decade of September. It accumulates between 190-200 g/l of sugars in the must and the total acidity is between 4.2-5.8 g/l H_2SO_4 at full maturity, but it is also suitable for overripening, the sugar content reaching 200-242 g/l, and the total acidity does not fall below 4.0 g/l H2SO4.

The Merlot variety ensures medium yields between 7.0-14 t/ha.

RESULTS AND DISCUSSIONS

Reddish preluvosols from the plantation of the Banu Mărăcine Educational Station. One of the factors that leave its mark on the quality and quantity of wine production in a wine-growing area and to which special attention is paid is the soil.

The Banu Mărăcine wine center is located in the southern part of the Getic Plateau, being located at 44019' north latitude and 23048' east longitude. Falling within the A3 oenoclimatic zone, this area being mainly producing red and aromatic wines of superior quality, the way the soils are formed is characteristic of the central area of Oltenia, the relief being very varied, with its composition ranging from flat valleys, high plains, low hills with moderate slopes from 6 to 32% and the central plateau Plaiul Vulcăneşti.

The slopes generally have an eastern and southeastern exposure.

The vegetation is natural, very common being the Quercineae (oak) forests which predominantly include *Quercus pubescens* (downy oak), *Quercus robur* (pedunculate oak), *Quercus frainetto* (germ oak), *Quercus cerris* (sky oak), mixed with elm, hornbeam, lime or resinous trees, in places. The next layer belongs to shrub species, such as *Rosa canina* (Rosehip), *Crataegus monogyna* (Hawthorn), Prunus spinosa (Dovetail) etc.

The herbaceous vegetation is less represented and develops mainly in the spring, until the trees leaf out, after which it disappears largely due to shading, this category includes: *Galium odoratum* (sweet woodruff), *Dentaria bulbifera* (coralroot bittercress), *Chelidonium majus* (celandine) etc. (Şorop Gr. et al., 1992).

In addition to the oenoclimatic conditions, the parental material (soil) has a particularly important role in the composition of the grapes, which has the following composition: slightly luvic reddish preluvosol; medium eroded reddish preluvosol; eroded and stagnogleized reddish preluvosol; coluvo-alluvial reddish preluvosol.

The reddish, slightly luvaceous preluvosol is characteristic of flat lands and in slightly negative areas of the resort, accumulating and retaining water for a longer period of time. Against this background, more pronounced alteration, basification and alluvial processes take place. Due to these processes, colloidal silica is released, depositing on the surface of the structural aggregates in the first horizon, giving it a gray color, and at the AB and Bt horizons, accumulations of illuvial clay occur.

The analyzed profile is located south of the center of the vineyard farm on a flat land

and presents the following morphological description:

Ap 0 cm Ap horizon: 0-19 cm; grayish brown (10 YR 4.5/2) in dry state; loamy-clayey-sandy texture; poorly formed granular structure; porous; loose to medium compact; frequent fibrous roots, rare cervotocines and coprolites; wet; clear passage.

Ao 19 cm Ao horizon: 19-38 cm; dark grayish brown (IOYR4/2) in dry state; loamy-clayey-sandy texture; large granular structure; finely porous; very compact; rare fibrous roots, cervotocins and coprolites; wet; frequent quartz grains of 1-2 mm diameter; gradual transition.

AB 38 cm AB horizon: 38-55 cm; dark brown (7.5YR3.5/2) in wet state and brown (7.5YR4/2) in dry state; loamy-clayey-sandy texture; medium and large polyhedral-angular structure; finely porous; very compact; very rare roots, cervotocins and coprolites; return to wet, quartz grains of 1-2 mm diameter; gradual transition.

Bt1 55 cm Bt1 horizon: 55-118 cm; dark reddish-brown (5YR3/3) in wet state and light brown (IOYR4/3) in dry state; clay-sandy texture; lumpy prismatic structure; finely porous; very compact; evident clay films on the surface of structural aggregates; re-ebbish to wet; gradual transition.

Bt2 118 cm Bt2 horizon: below 118 cm; dark reddish brown (5YR4/4) in wet state and yellowish brown (5YR4/4) in dry state; clayey-sandy texture; boulder structure; finely porous; compact; frequent grains of siliceous quartz; re-ebb; does not effervescent.

Main physical properties of the slightly luvite reddish preluvosol. By interpreting the granulometric analysis data, it is concluded that the slightly luvite reddish preluvosol is composed of a high percentage of coarse sand, which decreases slightly from 21.9% to 14.7% on the profile. In the composition of this type of soil we also find fine sand which has an approximately constant percentage from the first horizon Ap (30.7%) to the horizon Bt1 (25.6%), and the dust fraction is 21.7% in the first horizon at the surface (Ap) and decreases in depth to 18.5% in the horizon Bt2, while the fine clay fraction records a clear eluviation on the soil profile, depositing in the horizon Bt1, where it reaches a percentage of 39.9%, due to this, clay films appear on the surface of the structural aggregates.

The Ap horizon, which is the surface horizon, is loosened due to processing with agricultural tools, and the profile is very compacted. The first three horizons have a loamy-sandy texture, and the last two horizons are clayey-sandy.

The apparent density (DA) increases from 1.38 g/cm^3 in the Ap horizon to 1.57 g/cm^3 in the Bt1 horizon, as does the apparent density. The density increases from 2.63 g/cm^3 in the surface horizon and reaches 2.69 g/cm^3 in the Bt1 and Bt2 horizons.

Due to these two properties, the soil has a total porosity (Pt) of 47% in the Ap horizon, after which it begins to decrease to 40% in the Bt1 horizon. Of the total porosity, a low percentage is held by aeration porosity, which is found in the first horizon (Ap) in a proportion of 18% and in the second horizon Ao in a proportion of 8%. It is absent in the remaining horizons. (table 2, figure 2).

Tabelul 2.The main physical-mechanical properties of red preluvosol low luvic

Horizon	Depht (cm)	Coarse sand 2-0,2 (mm)	Fine sand 0.2-0,02 (mm)	Dust 0,02-0,002(mm)	Clay < 0,002 (mm)	Textural class	DA (g/cm3)	D (g/cm3)	Pt (%)	Pa (%)
Ap	0-19	21,9	30,7	21,7	26,2	LAN	1,38	2,63	47	18
Ao	19-38	19,7	30,6	20,5	29,7	LAN	1,53	2,63	43	8
AB	38-55	16,6	29,9	20,7	33,8	LAN	1,55	2,65	41	-
Bt1	55-118	14,7	25,6	19,8	39,9	AN	1,57	2,69	40	-
Bt2	Sub 118	15,8	27,2	18,5	37,5	AN	1,56	2,69	42	-

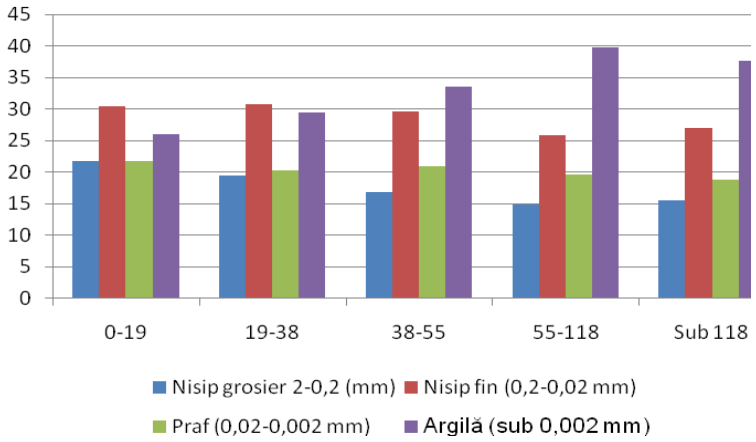

Figure 2 Mechanical and physical properties of red preluvosol low luvic

If we analyze the hydro-physical indices (table 3, figure 3), we find that their value is average, being in direct correlation with the granulometric composition and the content of organic material of the soil.

The hygroscopicity coefficient (CH) has lower values in the first horizon Ap, namely 5.82%, due to the lower percentage of clay and increases to the horizon Bt1 up to 10.13%, where the percentage of clay is higher.

The wilting coefficient is lower in the horizon Ap (8.79%) after which it increases to 15.18% in the horizon Bt1.

The moisture equivalent (EU) also increases from 24.19% in the surface horizon to 30.69% in the horizon Bt1.

The usable water capacity (UC) for the weakly luvite reddish preluvosol is medium and remains at constant values throughout the profile, oscillating between 15.02% and 16.26%.

Table 3. The main hydro-physical properties of red preluvosol low luvic

Horizon	Depht (cm)	CH (%)	CO (%)	EU (%)	CU (%)
Ap	0-19	5,82	8,79	24,19	15,44
Ao	19-38	7,17	10,74	25,74	15,02
AB	38-55	8,58	12,82	29,15	16,26
Bt1	55-118	10,13	15,18	30,69	15,47
Bt2	Sub 118	8,34	12,48	28,47	16,05

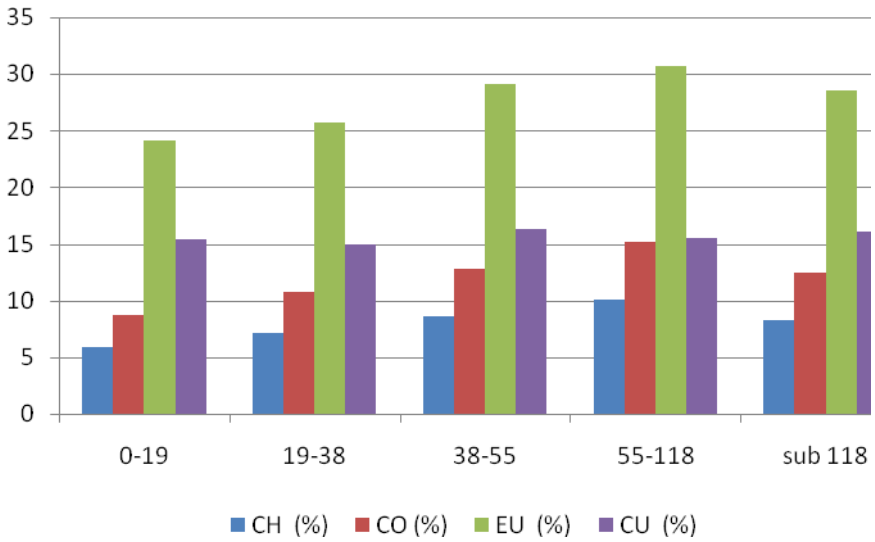

Figure 3 Hydro-physical properties of red preluvosol low luvic

Interpreting the results of the chemical analyses (table 4, figure 4) it is highlighted that the reddish slightly luvite preluvosol is a soil with a medium to low supply of humus.

In the Ap horizon we find a percentage of humus of 2.78%, which decreases along the profile reaching the Bt2 horizon at 0.44%, but it is worth noting that at a depth of approximately 50 cm, that is, up to the third AB horizon, the percentage of humus is over 1%.

Like humus, total nitrogen is found in greater quantity in the Ap horizon, having a value of 0.19%, then the percentage gradually decreasing up to the Bt2 horizon at a value of 0.061%. From this it is concluded that in terms of total nitrogen the soil is also medium supplied in the first horizon and very low supplied in the rest of the horizons.

The amounts of mobile phosphorus and potassium are also very high in the Ap horizon, being in amounts of 80.2 and 224 ppm respectively, and below 40 cm the amounts decrease suddenly, the soil becoming poorly supplied with phosphorus and potassium. The high amount of phosphorus and potassium in the first horizon is believed to be due to the large amount of fertilizers and minerals applied.

The acidity of the soil is weak throughout the thickness of the profile, the pH value increasing slightly from 6.03 to 6.73.

Hydrolytic acidity (Ah) has low values of less than 5 me/100 g soil, being correlated with the weakly acidic reaction.

The sum of exchangeable bases (SB) in the soil and the total cation exchange capacity (T) have medium to low values, and from the point of view of the degree of saturation in bases (V) the slightly luvic reddish preluvosol falls into the moderately mesobasic category.

Due to the morphological characteristics and physico-chemical properties that characterize the slightly luvic reddish preluvosol, we can say that this soil has medium to low natural fertility, which needs deep loosening works and organo-mineral fertilization in complexes, and as chemical fertilization, only nitrogen fertilizers are needed, the soil being poorly supplied with this element.

Phosphorus and potassium fertilizers must be applied rationally, the soil being very well supplied with these elements.

Table 4.The main chemical properties of red preluvosol low luvic

Horizon	Depht (cm)	Humus (%)	Nt (%)	P (ppm)	K (ppm)	pH (water)	Ah	SB	T	V (%)
							me/100 g soil			
Ap	0-19	2,78	0,19	80,2	224	6,03	4,73	14,8	19,44	73
Ao	19-38	1,45	0,11	16,4	87	6,22	3,64	15,6	19,45	84
AB	38-55	1,22	0,10	10,2	64	6,32	3,17	17,0	20,37	87
Bt1	55-118	0,87	0,08	4,7	83	6,41	3,12	17,9	20,92	87
Bt2	Sub 118	0,44	0,06	3,6	57	6,73	2,82	19,2	21,93	89

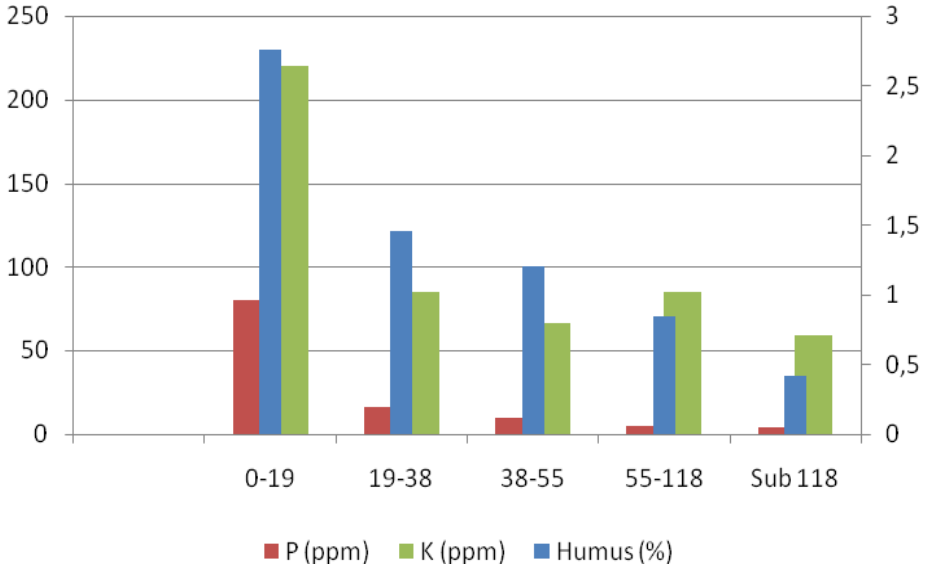

Figure 4 Chemical properties of red preluvosol low luvic

In the case of the soils from Banu Mărăcine, we can say that the reddish, slightly luvic preluvosol has a medium to low natural fertility. To increase the productive capacity, deep loosening works and organic fertilization are recommended, first of all. Chemical fertilization should be focused on nitrogen fertilizers, the soil being poorly supplied with this element. Phosphorus and potassium fertilizers should be applied rationally because the soil is very well supplied with these elements.

The dynamics of the ripening of the varieties during a wine-growing year is shown in table 5. It is easily observed that the elements considered in this case change continuously during these phenophases and that, at the time of grape harvest, a sugar content (212.8 g/l) and acidity (5.0 g/l H2SO4) was recorded, which provides the raw material for obtaining DOC wines.

Table 5.Maturation dynamic of Merlot variety in wine year

Parameter	Data									
	1 VIII	6 VIII	11 VIII	16 VIII	21 VIII	26 VIII	31 VIII	5 IX	8 IX	11 IX
V100 (ml)	63	79	74	84	89	100	95	116	126	129
G100 (g)	64,6	78,8	72,5	89,3	94,5	105,0	99,8	123,4	131,0	136,3
Carbohydrates (g/l)	50,6	52,9	62,1	75,9	102,4	112,9	117,9	160,8	204,7	212,8
Acidity (g/l H2SO4)	24,8	22,9	17,9	13,2	12,0	11,6	10,1	7,3	5,2	5,0
glucoacidimetric index	0,2	0,2	0,3	0,6	0,9	1,0	1,2	2,2	3,9	4,2

During ripening, the glucoacidimetric index follows an ascending line and reaches a value of 4.2 at harvest, a value that indicates a balanced ratio between the two components.

CONCLUSIONS

. The slightly luvic reddish preluvosol is characteristic of flat lands and in slightly negative areas of the Banu Mărăcine research station, accumulating and retaining water for a longer period of time.
Due to the more pronounced weathering, debasing and alluvial processes, colloidal silica is released, depositing on the surface of the structural aggregates in the first horizon, giving it a gray color, and at the level of the AB and Bt horizons, accumulations of illuvial clay occur.
The slightly luvic reddish preluvosol is made up of a high percentage of coarse sand, which decreases slightly from 21.9% to 14.7% on the profile.
If we analyze the hydro-physical indices, we find that their value is medium, being in direct correlation with the granulometric composition and the organic material content of the soil.
The slightly luvic reddish preluvosol is a soil with medium to low humus supply; and in terms of total nitrogen, the soil is medium supplied in the first horizon and very low supplied in the remaining horizons.
Due to the morphological characteristics and physical-chemical properties that characterize the slightly luvic reddish preluvosol, we can say that this soil has a medium to low natural fertility, which requires deep loosening works and organo-mineral fertilization in complexes, and as chemical fertilization, only nitrogen fertilizers are needed, the soil being poorly supplied with this element.
Phosphorus and potassium fertilizers must be applied rationally, the soil being very well supplied with these elements.
The dynamics of the ripening of varieties during a wine-growing year changes continuously during the phenophases and at the time of grape harvest, a sugar content (212.8 g/l) and acidity (5.0 g/l H_2SO_4) was recorded, which provides the raw material for obtaining DOC wines.
During ripening, the glucoacidimetric index follows an ascending line and reaches a value of 4.2 at harvest, a value that indicates a balanced ratio between the two components.

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