

STUDY CONCERNING THE QUALITY OF THE WINES PRODUCED FROM FETEASCA NEAGRA GRAPES IN VALEA CALUGAREASCA VITICULTURAL CENTER, ACCORDING TO THE CROP TECHNOLOGIES USED

ABSTRACT

The recent inclusion of our country in the European Union (UE) requires some structural modifications to be operated in the viticultural domain, too, in order to comply with the new conditions in which Romania is a member of a community where the most important viticultural countries are included, namely Spain, France and Italy.

Concerning the total vinegrowing area, Romania ranges among the first group of ten countries of the world, and the viticulture of any state cannot reach a high efficiency without ensuring a significant export of wines and/or table grapes, it is obvious that there is a strong competition for conquering different present markets, which will become stronger and stronger in the years to come. There is also a recurrent infiltration of the wines coming from other continents toward the European markets, their viticulture having become more and more prosperous lately (South Africa, USA, New Zealand, Chile, Argentina, Australia etc.), as well as the fact that in the EU larger and larger amounts of wines are produced when compared to the consumption needs.

It is obvious that in the agricultural branch there is no other sector in a more difficult or even similar situation to that in which the Romanian viticulture finds itself nowadays and which will become harsher in the future.

The viticultural plantations of our country presently include about $\frac{3}{4}$ white wine grapes and only $\frac{1}{4}$ red wine grapes. A situation completely reversed when compared to that existing in the viticulture of France, a country holding the first place in the world regarding the world export of wines (about 20%).

It is necessary that the new plantations that will be established in the near future include grapevine varieties from which high quality red wines with denomination of origin should be produced. If our country cultivated on large areas grapevines from the classic varieties belonging to this group, such as: Cabernet Sauvignon, Merlot, Pinot noir etc. originating in the western part of Europe where they cover large surfaces of vineyards, our successful chance would be unfortunately extremely reduced. That is why the only grape variety which is able to produce red wines of special quality and fineness is without any doubt the local variety **Fetească neagră** which has been grown on our lands for more than 2000 years. The grapes belonging to this variety produce wines not only of a rarely achieved quality but of an altogether special distinctiveness, highly appreciated both by the ordinary consumers and by the specialists in wine tasting.

Unfortunately, from all the 240000 ha of planted grapevines in our country, only a small area (of about 2000 ha) is covered by grapevines belonging to Fetească neagră variety. Although this variety

is highly appreciated by the specialists in enology, the vine-growers are still reluctant, trying to elucidate some specific biological features that make the vines too vigorous, this aspect being less appreciated by them, Fetească neagră not being therefore planted on large surfaces of vineyards.

On one hand, those specific features of the variety are not sufficiently known yet, and on the other hand, the adequate measures were not thoroughly considered and applied, beginning with the rootstock choice, the place and method of planting, and thereafter the maintenance works specific for both the young and the yielding vines.

That is why in the study carried out on this subject, Fetească neagră was chosen as a background of the experiments, trying to contribute at least to elucidate several agrophytotechnical links joining viticulture and enology, as a consequence of the fact that Valea Călugărească viticultural center is endowed with a natural vocation for producing red wines of high quality, a group to which this variety also belongs.

Valea Călugărească viticultural center is located in Prahova district, inside and in the neighbourhood of Valea Călugărească and Bucov, at 44°59' latitude and 26°13' longitude. The vinegrowing plantations are located on the slopes and peaks of the Sub-Carpathian hills and at the foot of the mountains, as well as on the Teleajen and Cricovul sărat river meadows and natural terraces.

The grapevines in the hilly region enjoy a predominantly southern exposure due to the fact that the more than 10 valleys of the region cross the land starting from the north and going toward the south, the exposure of the plots to the sun rays being favorable for growing grapevine.

As a consequence of the soil erosion process which has been developed since ancient times, the quaternary cover of the soil was removed here and there, so that older sediments appeared, clays and marls which developed under the action of the biological processes, engendering thus new soils. Concerning the soil structure, the middle and mainly the smooth texture are prevailing.

The mean of the air temperature calculated for a period of 10 years(1990-1999) registered 11.23°C, the values ranging in between 10.2°C (1996) and 12.5°C (1994). The annual variation of this temperature ranges in between - 0.1°C (January) and 22.8°C (July).

The viticultural center often enjoys warm and dry autumns, ensuring therefore favorable conditions for the grape ripening.

The multi-annual mean of the rainfalls registered 667 mm, oscillating in between 440.9 mm (1992) and 912.4 mm (1999). During the period of active vegetation of the grapevine, about 460.6 mm rainfalls were registered, representing 68.9% from the total annual rainfalls.

The general characteristics of soil and climate in Valea Călugărească viticultural center demonstrate that its whole area presents a favorable natural vocation for growing grape varieties from which high quality red wines may be produced.

In order to accomplish the specific studies inside the proposed subject, two experiments of randomized type were set up in two plantations where Fetească neagră grapevines were growing. One of them is located on Valea Mantei and may be found in the plot 2005 which was established

in 1987, Fetească neagră vines having been grafted on the following rootstocks: Riparia Gloire (RG), Selection Oppenheim-4, Clone 4 (SO 4-4), Berl.x Rip. Crăciunel -2 (C 2), Berl. X Rip. Crăciunel 26 (C 26), Berl.x Rip. 125 AA (125 AA), Berl.x Rip. Crăciunel-71 (C 71), Berl.x Rip. Kober 5 BB (5 BB), Berl. X Rip. Drăgășani 57 (D 57), and Berl.x Rup. 140 Ruggeri (140 Ru).

The second experiment was set up in the plot 5053 located in the neighbourhood of the Viticultural High School in the same locality. The plantation was established in 1995 by planting Fetească neagră vines grafted on the rootstock Kober 5 BB. The land is somehow flat and the soil is made of a superior halogenic clayey deposit.

In order to select the best variant of Fetească neagră/rootstock combination, a study was carried out within 1988-2003 period, and the information accumulated was processed by a variance analysis and graphic representations. The criteria concerning the distinctions between the different combinations took into consideration both the technical aspects based on the enological potential of the variants and on their economical aspects.

Concerning the economical aspect it was noticed that in case of several combinations in which the rootstocks RG, 5 BB, C 26 și 140 Ru were used, the grapes obtained could be included in the quality category “DOCC-CT”, so that the value of the output/ha was of 4160 lei. But in case of other combinations, when rootstocks belonging to the varieties C 2, SO 4-4, 125 AA, D 57 and C 72, the quality category of the grapes was “DOCC-CMD”, and the value of the output/ha was of only 3840 lei.

By the graphic representation of the ratio “quality/economic value” in case of the combinations, there were established 3 groups: 1st group (the most valuable) was represented by the combination Fetească neagră/140 Ru; the 2nd group included the combinations of Fetească neagră with rootstock cuttings belonging to 5 BB, RG și C 71. The combination with the rootstock SO 4-4 may be added to them, a high value being reached in this case, with an average content in sugars. The 3rd group included the combinations with the rootstocks C 2, C 26, 125 AA și D 57 which gave no satisfaction.

The influence of several differentiated agrophytotechnical measures on the grape quantity and quality was taken into studied in order to get a more efficient culture of Fetească neagră variety. The study took into consideration the potential crop/ha, namely the number of buds retained when pruning the vine, with 3 graduations: 8-10 and 12 buds/cane, as well as the potential crop/ha represented by the graduations 12-15 and 18 buds/m². The experiment included two factors of “3 x 3” type with 9 variants, starting from “a1 to b1” and up to “a3, b3”. The organization of the experiment was accomplished in subdivided plots, each of them including 50 vine trunks.

It was noticed that when the length of the yielding elements maintained at the dry pruning increased from 8 buds/cane to 10 buds/cane, the content in sugars accumulated in grapes diminished by 3.59 g/l, and in case of 12 buds/cane the diminution registered 8.35 g/l. Proportionally with the increase of the number of buds retained at pruning from 12/m² to 15/m², the content of anthocyanins in grapes diminished by 9.4%, and in case of 18 buds/m², the diminution registered 15.5%. There is a

negative relationship between the length of the yielding canes on one hand and the grape content in sugars and anthocyanins on the other hand.

The fertilization of Fetească neagră plantations, mainly when Polyfed 12.18.27 was applied, significantly influenced the beginning of grape maturation and delayed the full ripening of the grapes. It is considered that the fertilization of Fetească neagră plantations should be seldom applied, only when there is some deficit of nutrients or when the plantations are old or not well nourished.

For establishing the best harvesting moment, 100 kg of grapes were harvested, but not all of them at the same time but at different moments of their maturation: 5-10 and 15 days after their full ripening. Each experimental variant underwent the winemaking process and thereafter the main parameters of the wines were determined: sugar, acidity, total extract, non-reducing extract, color intensity, total polyphenols, anthocyanins, tannins, color hue and sensory appreciation (on a scale from 0 to 20).

The best harvesting time of the grapes was conditioned first by the agro-meteorological parameters of the years during which the observations and determinations were made. Therefore, the year 1999 enjoyed normal technical conditions, but also an excess of rainfalls, the multiannual mean being exceeded by 52%, the weather being rainy even in August. The year 2000 was warm and dry being appreciated as a very favorable viticultural year, and 2001 was warm but with a small amount of rainfalls, being considered however as a normal viticultural year.

In the years considered as “very favorable (e.g. 2000), the full maturation of the grapes was accomplished during the first period of ten days in September, and the weight of a grape berry was rather diminished (about 1 g). In the years “normal” viticultural years, but with an excess of rainfalls (e.g. 1999), the grape maturation was late (during the 3rd period of ten days in September), and the weight of a grape berry increased (about 2 g). In the years registering thermic and hydric excess (e.g. 2001), the grapes ripened during the second period of ten days in September, the grape berry having an middle weight (about 1.2 g).

A quick accumulation of anthocyanins in the grape skins occurred during the early stages of grape maturation, and in the favorable years their accumulation went on further in the same rhythm till reaching the full ripening. In the years with cold rainy autumn days, the anthocyanin accumulation either slowed down or even temporarily stopped.

The accumulation of the total polyphenols in the grape berries registered a similar rhythm to that of the content in anthocyanins in the same tissue. On the contrary, the polyphenols in seeds registered descending curves of accumulation, starting from the stage of maturation beginning and continuing till full maturation.

In order to render the winemaking technology better, the following variable factors were taken into study: the treatment applied before fermentation; the maceration-fermentation technique; the extent of the maceration-fermentation process. The following parameters defining the enological potential specific for the red wines were determined in case of each experimental variant: color structure;

phenolic composition; ability of capturing the free radicals. It was studied the influence of the maceration-fermentation process on the quality of the wines, the processes being comparatively conducted in the following types of tanks: open static tanks; closed static tanks; closed dynamic tanks.

The maceration-fermentation process developing in open containers: wooden vats (400-800 l); in closed static containers: vertical stainless steel tank (500 l); and in closed rotary tanks: horizontal metallic tanks (300 l) conducted to differentiated results.

It was concluded that in the closed tanks the anthocyanins are better protected against oxidation, whereas in the open tanks the extracted anthocyanins are to a larger extent transformed into other products.

In the closed tanks, the extraction processes in case of the polyphenols last a longer period of time than in case of the open ones, and their color diminution during the time passing register a diminished intensity.

The prolonged maceration applied after the end of the alcoholic fermentation, for the first time used under the conditions of our country in case of Fetească neagră, allowed the obtention of wines of an altogether special quality, provided that the phytosanitary state of the grapes is good.

By using some enzymatic preparations in the maceration-fermentation process in the “Roto” type system, a compositional and organoleptic improvement of the wines occurred, but the preparations used had differentiated effects. Therefore, **the 1st enzyme** (*Vinozym*) contributed to the accomplishment of higher concentrations in anthocyanins, intensifying the color of the wines; **the 2nd enzyme** (*Rapidase color*) improved the content in total polyphenols; and **the 3rd enzyme** (*Trenolin rouge*) increased the extraction of tannins.

The utilization of some selected yeasts had as a main consequence the improvement of the organoleptic features of the wines and the intensification of their color by increasing the content in anthocyanins.

When the “enzyme-yeast two-ply” was used in the process of maceration-fermentation closed in the “Roto” system, the physico-chemical and organoleptic features of the young wines significantly improved, having a good evolution in the following years. Some enzymes and selected yeasts are recommended to be used in the maceration-fermentation process.