ILLUSTRATION OF THE INFLUENCE OF ORGANIC FERTILIZERS ON WINE QUALITY IN THE VINEYARD STEFANESTI - ARGES (*VITIS VINIFERA* VAR. CABERNET SAUVIGNON AND ZWEIGELT)

ILUSTRAREA INFLUENȚEI FERTILIZĂRII ORGANICE ÎN PODGORIA ȘTEFĂNEȘTI – ARGEȘ ASUPRA CALITĂȚII VINULUI (*VITIS VINIFERA* VAR. CABERNET SAUVIGNON ŞI ZWEIGELT)

BEJAN CARMEN, VIŞOIU EMILIA
National Institute of Research and Development for Biotechnologies in Horticulture Stefanesti-Arges

Abstract. *The overall objective of this work is to illustrate the influence of organic matter(in the form of stable humus) from fertilized soil over the quality of wines produced in the vineyard Stefanesti-Arges. For each soil type there have been planned: V1 - a witness not fertilized; V2 - soil fertilized with grape marc; V3 - soil fertilized with green manure; V4 - soil fertilized with manure. The study covers 3 years of experimentation in Vitis vinifera vines var Cabernet Sauvignon and Zweigelt. The musts and wines were also analyzed after 6 months of clarification. The characteristics of musts (content in sugars, total acidity, anthocyanins and phenolic compounds), and then finite wines show that the red wines from fertilized plots are generally improved by qualitatively significant changes in the density of must, a decrease in the total acidity and increase of phenolic compounds in grape skins. Of the two reds studied, the most qualitatively changed compounds are polyphenols, especially anthocyanins. The wines from fertilized plots with green manure are better structured, more harmonious, with a higher phenolic potential.*

Rezumat. *Obiectivul general al acestei lucrări este acela de a ilustra influența materiei organice (sub formă de humus stabil) din parcelele fertilizate într-o plantație din podgoria Ştefăneşti – Argeş, asupra calității vinurilor obținute. Pentru fiecare parcelă experimentală au fost prevăzute mai multe variante: V_1 – martor nefertilizat; V_2 – sol fertilizat cu tescovină; V_3 – sol fertilizat cu îngrăşăminte verzi; V_4 – sol fertilizat cu gunoi de grajd. Studiul a avut loc pe 2 soiuri Vitis vinifera var. Cabernet Sauvignon şi Zweigelt, durata de experimentare fiind de 3 ani. A fost analizat mustul şi vinul obținut la 6 luni de la pritoc. Caracteristicile musturilor (conținutul în glucide, aciditatea totală, antocianii şi compuşii fenolici) şi apoi a vinurilor finite arată faptul că, vinurile roşii provenite din parcelele fertilizate organic sunt, în general, ameliorate calitativ prin modificarea semnificativă a densității mustului, reducerea acidității totale şi creşterea conținutului în compuşi fenolici din struguri. Pe cele două vinuri studiate compuşii cei mai modificați cantitativ sunt polifenolii şi, în special, antocianii totali. Vinurile obținute din parcelele fertilizate cu îngrăşăminte verzi sunt mai structurate, mai armonioase şi cu un potențial fenolic mai ridicat.*

The association between wine quality and environmental factors have called experienced research and attention and led to intense discussions and debates over many decades. However, in this debate, few disagree that soil properties and management play a role in the production of wine. In many regions, soil plays a very important role. *Seguin (1986)* attributed the quality of wine produced in the prime growing areas of Bordeaux wine and Médoc to soil factors. On the other hand, some have denied that the soil plays a role on the taste of wine. For example, *Charters (2000)* says that the soil has little effect on the taste of wine.

Wine growers have often associated quality of the grape and wine quality with the type of soil where the grapes are produced *(3, 4, 5, 1,)*. The effects of the type of soil over the quality of wine have been attributed to differences in mineral, thermal and physical soil properties. The most recent publications suggest that the effect of soil type on the quality of grapes is associated with the interaction between the force vine and soil retention properties of water *(6, 8)*.

MATERIAL AND METHODS

The study have been done on two wine varieties with the aim of obtaining high quality red wines – Cabernet Sauvignon şi Zweigelt – located in a plantation owned by I.N.C.D.B.H. Ştefăneşti – Argeş. The samples of grapes have been drawn from the plots organized in four experimental variants :

V_1 – non-fertilized witness;
V_2 – fertilization with grape marc superficially incorporated in the soil;
V_3 – fertilization with green manure;
V_4 – fertilization with farm manure.

Grapes from the varieties Cabernet Sauvignon si Zweigelt have been subjected to microvinification, harvested at their technological maturity and then processed according to the red grapes classical vinification technology, by maceration on husks. At the end of the alcoholic fermentation, the malolactic fermentation has been achieved and then the main decanting. The physical and chemical analyses have been performed on fresh must an on the wine, 6 months from decanting.

RESULTS AND DISCUSSIONS

Although the content in glucides is mainly influenced by the variety and the climatic conditions of the maturation period of the grapes, one can notice that within both studied varieties (*figure 1*), the applied system of fertilization constitutes an influential factor over the glucide accumulation in grapes; thus, at technological maturity, the concentration of sugars reached a maximum value in the plots fertilized with green manure (190 g/l at Cabernet Sauvignon variety şi 181 g/l at Zweigelt).

The phenolic maturity of the grapes does not replace the so called technological maturity which emphasizes the richness in glucides and organic acids and which contributes at settling the optimal moment of yielding. The phenolic maturity is interesting as it furnishes useful data to the wine makers on the moment when the content of anthocyans reaches the maximum value. On the whole, if climatic conditions are favourable, phenolic maturity superposes the technological one. The control of the phenolic maturity of grapes is based on two observations:

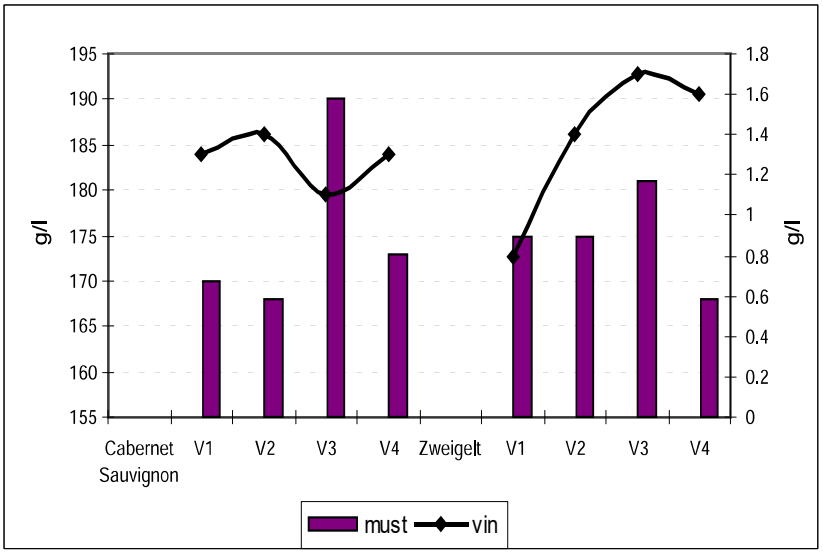

Fig. 1. Concentrtion in glucides of the must and wine at 6 months from decanting

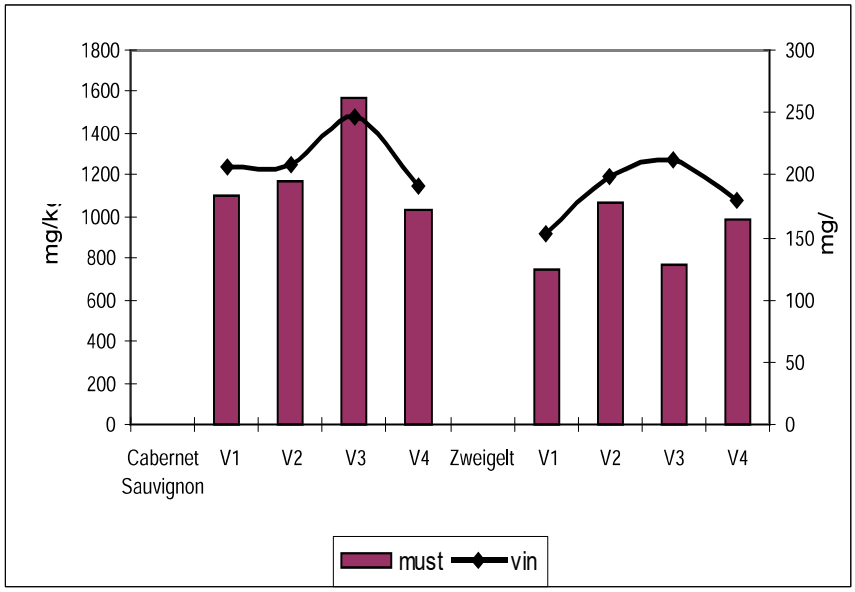

Fig. 2. The content in anthocyans of the must and wine 6 months from decanting

Analyzing the data obtained at the moment of yielding (*figure 2*), one can notice that, in the case of Cabernet Sauvignon variety, the phenolic maturity coincides with the technological maturity of the grapes; on the other hand,the applied system of fertilization influences both glucide accumulation and

anthocyanic biosynthesis positively , the grapes harvested from the plots fertilized with green manure having maximum values of concentration, in must as well as in the wine analyzed at 6 months from vinification.

As regards extractibility or grapes capacity of releasing the anthocyans – it resulted that, in the case of the studied varietieties, the anthocyans from the grape skins were easily extractible and apt to pass into wine in the course of vinification, the concentration in anthocyans of the wines analyzed 6 months from decanting is comparable to that of the must (*figure 2*).

The obtained wines have been analyzed at 90 days after malolactic fermentation ended, taking into acccount the phenolic criteria. The analysis of the wines underlined the same differences among experimental variants, the largest concentration in anthocyans and total polyphenols being recorded within the variant V_3 (*figures 3 and 4*).

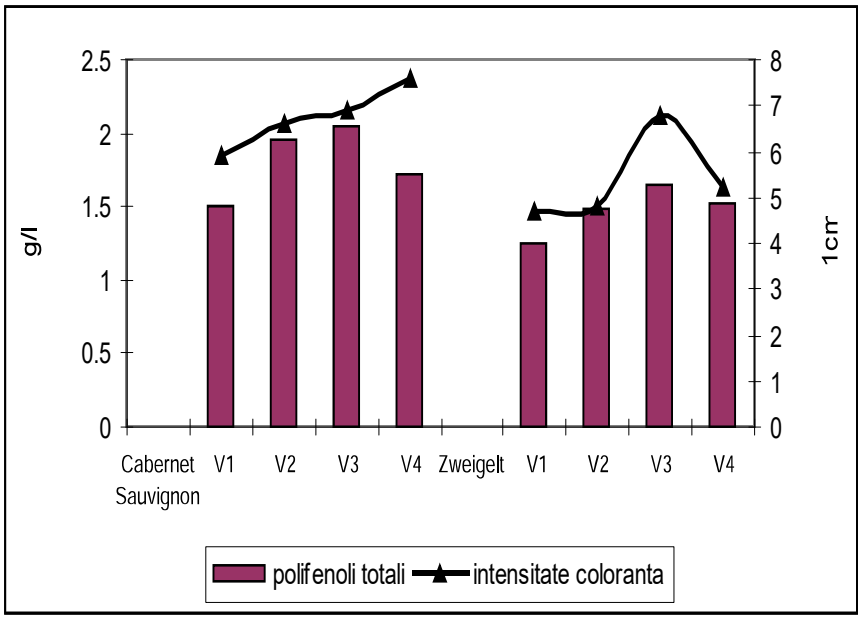

Fig. 3. The wine content in total polyphenols (9 months from decanting)

The colour of the wines does not depend only on its concentration in anthocyans, but also on the content in chlorophyllian and carotene pigments and on the tannin-anthocyan combinations. The colouring intensity of the wines quantified by the sum of the optic density at 420,520 and 620 nm, makes evident the superiority of the wines obtained on the organically fertilized plots from the non-fertilized witness (Cabernet Sauvignon variety). The variety Zweigelt variant V_3 records superior values of total polyphenol concentration and of the colouring intensity of the wines at 6 and 9 months from decanting – *figure 4.*

Fig. 4. The colouring intensity of the wine

The physical and chemical features of the wines analyzed at 6 months from vinification are shown in table 1.

Table 1.

The physical and chemical features of the obtained wines

Variety / Variant	Glucides g/l	Alcohol %	Total acidity g/l tartric ac.	Volatile acidity g/l aceticum ac.	Nonreducing extract g/l	Glycerol g/l	Ashes %
Cabernet Sauvignon							
V1	1,3	9,4	5,3	0,27	23,2	9,2	1,640
V2	1,4	9,6	5,2	0,05	24,4	9,9	1,680
V3	1,1	10,8	5,2	0,05	27,0	10,6	1,690
V4	1,3	10,1	5,1	0,12	25,3	11,3	1,690
Zweigelt							
V1	0,8	9,8	4,4	0,20	21,6	11,5	1,630
V2	1,4	10,3	4,2	0,17	22,1	9,2	1,400
V3	1,7	10,4	4,7	0,26	22,5	7,6	1,500
V4	1,6	9,3	4,6	0,13	21,1	8,3	1,620

CONCLUSIONS

► The use of green manure as organic fertilizer has a positive influence over glucide accumulation and over the anthocyanic biosynthesis in grapes.

► The state of technological maturity of the grapes conditions the content in anthocyans of the resulted wine.

► In the vineyard Ştefăneşti-Argeş the wines obtained from the varieties Cabernet Sauvignon şi Zweigelt organically fertilized, have been appreciated as being superior from the point of view of the the phenolic charasteristics as compared to the non-fertilized witness.

► Organic fertilization of the viticultural plantations has a beneficial influence not only on the amelioration of the physical and chemical properties of the soil but also on the improvement in the quality of the grape yielding.

REFERENCES

1. **Carbonneau A.P. and Casteran P., 1987 -** *Interactions 'training system x soil x rootstock' with regard to vine ecophysiology, vigour and red wine quality in the Bordeaux area*. Acta Horticulturae 206¸ 119-140.
2. **Charters S., 2000 -** *The world of wine*. In: 'The global encyclopedia of wine' (Harper Collins Publishers, Australia) pp. 14-61.
3. **Gregory G.R., 1963 -** *Soil requirements for grape growing*. Agricultural Gazette of New South Wales 74, 434-438, 65-467
4. **Peynaud E. and Ribéreau-Gayon P., 1971 -** *The grape*. In: 'The biochemistry of fruits and their products' Ed. AC Hulme 2 (Academic Press, London) pp. 171-205.
5. **Rankine B.C., Fornachon J.C.M., Boehm E.W. and Cellier, K.M., 1971 --** *Influence of grape variety, climate and soil on grape composition and on the composition and quality of table wines*. Vitis 10, pp. 33-50.
6. **Saayman D. and Kleynhans P.H., 1978** - *The effect of soil type on wine quality*. Proceedings of the South African Society of Enology and Viticulture, 21st Annual meeting, Cape Town, pp.105-119.
7. **Seguin G., 1983** - *Influence des terroires viticoles*. Bulletin de l'O.I.V. **56,** 3-18
8. **Seguin G**., **1986** - *Terriors' and pedology of wine growing*. Experentia 42, 861-872.