THE ANTIOXIDANT PROPERTIES DYNAMIC OF AGED RED WINES

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Abstract: This article presents the results of experiments that established the influence of the storage method of Cabernet Sauvignon and Merlot red wines on the phenolic complex and chromatic indices. The wines were kept in the bottle, moldavian and french oak shavings and oak barrel for a period of 275 days.
Key words: reduction capacity, chromatic indices, phenolic complex, red wine.

Introduction

Maturation is an important phase in the production of quality wines. Color stability and organoleptic quality indexes are improved by aging red wines. Color changes during aging of red wines is due anthocyanins which are incorporated into a more stable complex forming polymeric pigments in various reactions of condensation. Traditionally, wine is aging in oak barrels, but now the attention of researchers are on the alternative maturation with oak sources, such as chips, shavings and oak extracts.

Maturation wine in bottle is widely used in the process of maturation, as in oak casks, but more wine during aging [4].

Aging process refers only to wines from varieties of high quality red and white who had a good evolution during maturation.

Duration of aging red wines in bottles ranging from 8 to 20 years and even more in some varieties, especially in years with good harvests which were prepared and subject to strict technological processes. Duration of aging wines in bottles is optional for commercial purposes, for 6 to 12 months, depending on the type of wine and variety.

Materials and Methods

The intention of research were to kept Cabernet Sauvignon and Merlot red wines in: bottle, on the moldavian and french oak shavings [1,2] that each dose of 1 g/L, and in the barrel for a period of 270 days. The amount of administered shavings (1 g/L) was established in preventive investigations at the Department of Oenology, TUM.

Cabernet-Sauvignon and Merlot wines were produced in the Trifeşti wine center, Valul lui Traian geographical area, Burlacu wine realm (Vierul-Vin Winery), the harvest of 2011.

The research was performed in the science laboratory of Enology Department. For determine the basic physical-chemical and specific indices were used methods for analysis corresponding to current standards and recommended methods of OIVV. Dynamic analysis was carried out 7 days.

Results and Discussions

The wine samples studied were characterized by physical-chemical and organoleptic qualities shown in Table 1 and 2.

Table 1. Physical-chemical indices of Cabernet Sauvignon and Merlot wines

Wine	Alcohol, % vol.	Sugar, g/L	Titrable acidity, g/L	Volatile acidity, g/L	SO2 free/total, mg/L
Cabernet Sauvignon	13,8	0,9	6,0	0,36	50/90
Merlot	12,2	1,5	5,7	0,4	26/68

Table 2. Organoleptic qualities of researched wines

Wine	Clarity	Color	Flavor	Taste
Cabernet Sauvignon	Clear, no sediment and foreign inclusions	Intense ruby	Shades of green peppers, saffian, red fruit (plums, cherries, currants)	Full body.
Merlot	Clear, no sediment and foreign inclusions	Dark ruby	Shades of red fruits and berries (plums, raspberries)	Full, soft and harmonious.

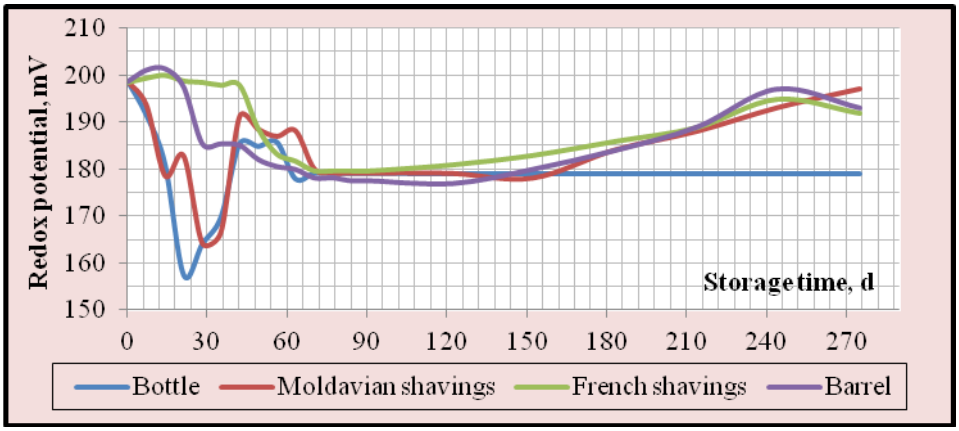
The analysis of Cabernet Sauvignon and Merlot red wines are characterized by physical-chemical indices falling within allowable values of normative documents. Cabernet Sauvignon and Merlot wines during implementation research were characterized by physical-chemical and microbiological stability, organoleptic changes were not improper. Specific and chromatic indices of investigated red wines are shown in table 3. Specific indices and chromatic values for Cabernet Sauvignon and Merlot wines are characteristic for wines obtained from the South of Moldova region, which is characterized by a sum of active temperatures (annual quota 3200 ÷ 3400 ˚C), which ensures full ripening of the grapes and emphasize the value of wine area.

Evolution of redox potential during storage Cabernet Sauvignon and Merlot red wines aged in bottles, moldavian and french shaving and oak barrel is shown in Figure 1 (a and b). The initial value of redox potential in Cabernet Sauvignon wine was 198 mV. After the first week of storage, it increases with 5.28% compared to the control sample, for all modes wine storage. Since the second week of storage redox potential values gradually decrease until the end research environment maintained at 23.58% in the bottle, 7.78 and 16.54 % for samples maintained with french and moldovian shavings, and about 9.99% for wine kept in oak barrel, figure 1 (a).

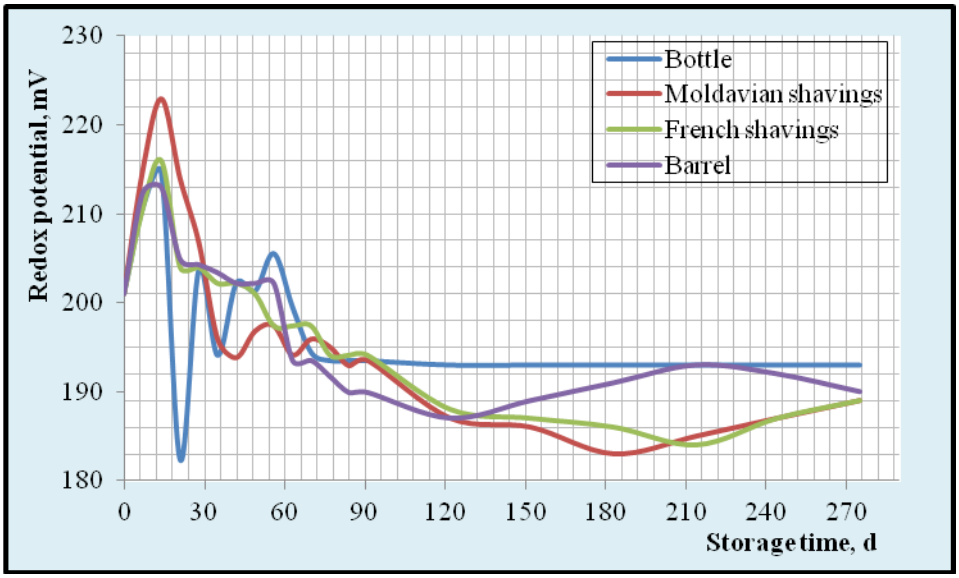
Table 3. Specific and chromatic indices of Cabernet Sauvignon şi Merlot wines

Wine	Total phenols, catechine mg/L	Total anthocyanins, mg/L	Monomeric/ polimeric anthocyanins, mg/L	IPT	Hue, u. a.	Tint, u. a.	Total antioxidant capacity, mM Trolox	E_H, mV
Cabernet Sauvignon	3951	494	146/348	58,8	2,57	0,49	14,91	198
Merlot	2534	391	89/302	42,6	1,37	0,52	13,62	201

A similar situation is recorded at Merlot wine samples. Initial Eh value record an increase to about 6.74 % for wine maintained in bottle, with 1.42 % and respectively 7.80 % for samples maintained on moldovian and frenches shaving and wine kept in oak barrel is characterized by higher values by about 5.32 %, Figure 1 (b). Later, during the 77 days there is an almost continuous decrease of Eh-value with approximately 11% for all samples of wines. Since, redox potential expresses the oxidation or reduction level of wine, the initial increase in the Eh value with 5.28 % for Cabernet Sauvignon wine and 5.32 % for Merlot wine may be subject to achievement intense oxidation processes due to oxygen mass solvate in wine made by following last aerations before pouring in the bottle / barrel and oxygen that enters by pores of oak staves, as well as the interaction of oxygen with reducing compounds in wine (phenolic substances). Well-onset reduction can be conditioned by the presence of SO_2 concentration of 100 mg/L administered in order to preserve wine. Subsequent stability of redox potential during storage is determined by the environment in which the wine tight and small changes that occur as doses of oxygen ingress due to opening containers.



a)



b)

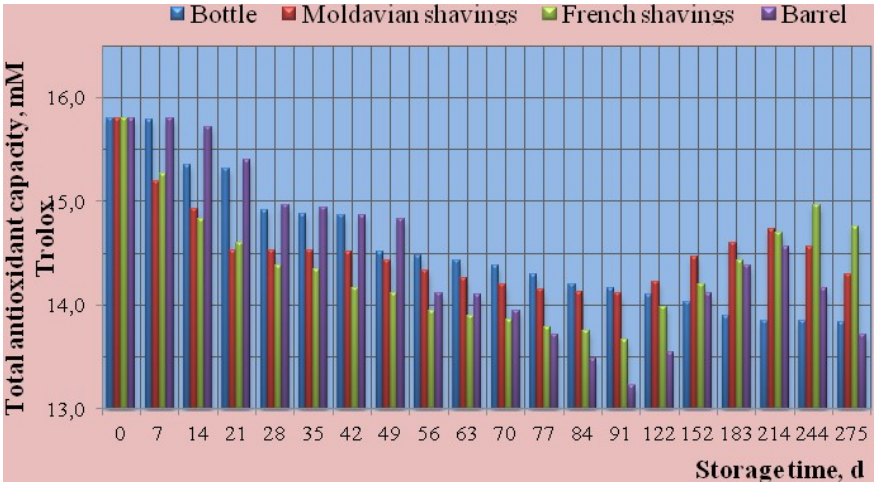
Fig. 1 The changing of redox potential values in Cabernet Sauvignon (a) and Merlot (b) wines
Note: d – days.

Evolution of total antioxidant capacity (TAC) during storage of Cabernet Sauvignon and Merlot red wines kept in bottles, moldavian and french shavings and barrel is reflected in Figure 1 (a and b). Initial value of total antioxidant capacity, or as it is called antioxidant power of wine is the 14, 91 mM Trolox [7] for Cabernet Sauvignon wine. Subsequently, for wine maintained in barrel, for the first week, although insignificant, but an increase in antioxidant capacity by 0,19 % due to possible extraction of phenolic compounds from oak wood, but then diminishes over time by about 8,12 %.

A decrease in total antioxidant capacity of Cabernet Sauvignon wine is registered to keep the wine in bottle by 9, 6 %, on moldovian and french shavings 8,08 % and respectively 6,32 %. Merlot wine also recorded throughout the research one decrease in antioxidant capacity on average 8, 70 % for wine sample remained in the bottle, 7,62 % and 6,98 % on moldovian and french shavings. It is worth mentioning that if wine sample maintained in barrel are an increase of 10,06 % in the first week, 3,91 % and 0,08 % in the second and third week and later to drop by an average by 19,07 % over the 70 days.

The reducing of antioxidant power during investigations, 180 days, is due to physical-chemical reactions (polymerization, condensation, oxidation) in which phenolic substances from both the raw material and the oak. An evident decrease of total antioxidant capacity is observed when Cabernet Sauvignon and Merlot wines are maintaining in barrel, figure 2, due to the porous structure of oak wood which facilitates penetration of oxygen [1, 2, 5, and 6].

Cabernet Sauvignon wine compared to Merlot wine has a higher antioxidant capacity by about 1, 5 times, this would be a consequence of higher phenolic substances technology stocks for Cabernet Sauvignon.



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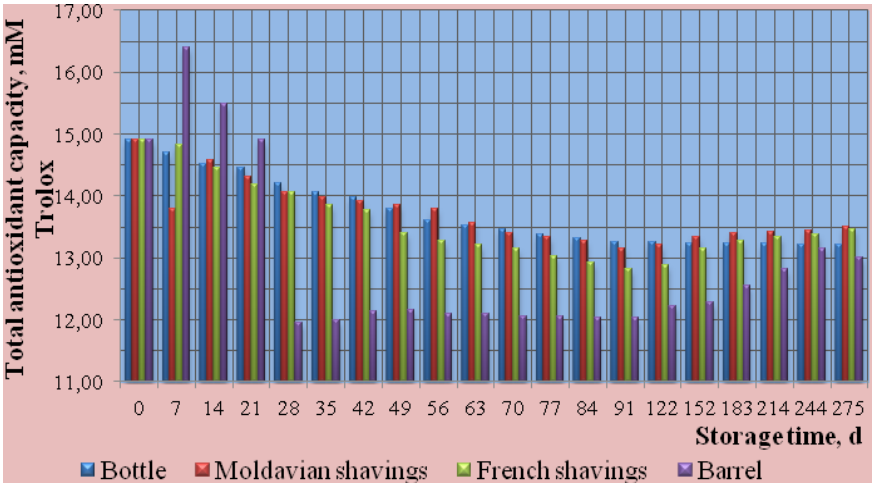

b)

Fig. 2. Evolution of total antioxidant capacity during storage of Cabernet Sauvignon (a) şi Merlot (b) wines

Note: d – days.

Conclusions

On based research about how to preserve Cabernet Sauvignon and Merlot red wines kept in bottle, on the moldovian and french shavings, and oak barrel, we can conclude the following:

- The dynamic of redox potential values during wine storage reflect obvious fluctuations while the period of 40 days for the wines stored in barrels and kept on shavings. Subsequent stability of redox potential value is determined by the formation of a reductive environment, especially for samples stored in the bottle.

- The antioxidant activity of phenolic substances gives wines a subsequent reduction potential that contributes to their stability over time. Most value of total capacity is 1167.4 mM Trolox in Cabernet Sauvignon wines, samples maintained in the bottle and moldovian shavings.

The time of storage influence the stability of specific indices in red wines, registering obvious changes for a period since 30 to 40 days.

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