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RESEARCH ARTICLE

Influence of microoxygenation, chips and oak barrels breeding in the phenolic composition and sensory quality of the press wine

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Abstract

The aim of this work was to study the influence of traditional aging in oak barrels, chips and micro-oxygenation treatment on color, phenoliccomposition and organoleptic parameter of Moroccan red press wine. These wines were treated by oxygen and chips for 0 to 3 months and aged in glass bottles for 3, 6 and 12 months. Ageing process leads to a chromatic structure modification and so the percentage of yellow, blue pigments increases and that red pigments decreases at the total color of wines. In the modalities tested decreased anthocyanins which are involved in the polymerization reactions is observed, structural modification of anthocyanins influence on the color evolution of the wines, the decrease in concentration of anthocyanins induces diminution of color intensity. Presence of wood on a incidence aromatic compounds brought the wine was studied. It was found that the wooded modality is preferred over unoaked modalities.

Introduction

High-quality red wines are traditionally stored for a long time in oak barrels to improve their sensorial attributes. Oak ageing leads to color stabilization, lower astringency, and the disappearance of excess vegetative notes. These latter transformations seem to be associated with small quantities of oxygen that penetrate the porosity of wood, the interstices between staves, and bunghole (LESICA, et al 2009). Micro-oxygenation treatment of red wine tends to simulate the low uptake of oxygen that occurs in oak barrels. It has been proposed as an alternative for accelerating the stabilization of color and phenolic compounds produced during wine ageing. This technique consists of the addition of very small amounts of pure oxygen to wine over time (Moutounet, et al, 2001). The application of microoxygenation influence quality of wine in the different stage of wine making process and the ageing of wine. Besides, oxygen has an influence on the phenolic composition and indirectly, also has an effect on some sensorial characteristic, such as colour, aroma and astringency, all of which determine wine quality (Atanasova et al., 2002; Ortega Heras et al., 2008). The treatment of micro-oxygenation and wood contact has frequently been used in recent years (McCord, 2003, Sartini et al, 2007). Chips have been tested to reduce costs and to improve the technological process of wine aging (Spillman, 1999). French wood extracts seemed to be richer in phenols and poorer in aromatic compounds than American ones (Singleton, 1974). In this perspective, it is interesting to apply this technology on the stability of press. Indeed, it contribute at about 13 to 17 % of press wine of the total production of the red wine (Vivas, 2007).It contains an undesirable phenolic, astringency vectors, greenness, turbidity levels and instability of color (Renouf et al., 2012). That way wine press grows separately; however, it is blending with free running wine at the end of winemaking stage (Renouf et al., 2012).The aim of this work was to compare the influence of traditional aging in oak barrels with chips and micro-oxygenation treatment during aging on color and phenolic composition of Moroccan red press wine.

1. Material and methods

1.1. Wine

The red press wine used at this study ~~issue~~ came from, the red grape pomace of three grape varieties Cabernet sauvignon, Merlot and Syrah, vintage 2013, pressed by wine press Bucher vaslin. The test was unrolling the winery of the Chateau Roslane in times of breeding. After the end of malolactic fermentation the wine were treated with protocol following figure 1. The second press wine tank of 375 hL share in four tanks of 25 hL witch including two 25 hL, one dedicated only to micro oxygenation modality (dose 1 ml/l/month) and the other dedicated to the modality micro oxygenation (dose 1 ml/l/month) coupled to the wood chips (chips US) dose 2 g/l. The other two tanks, the control tank is not treated and the other tank was treated only by wood chips (chips US) dose 2 g/L. Two barrels of 2,25 hL used two days as representing a traditional breeding. These wines were treated by oxygen and chips for 0 to 3 months and aged in glass bottles for 3, 6 and 12 months.

1.2. Treatments

A pneumatic type of wine press (Bucher Vaslin) is used for the elaboration of press wine. System of microoxygenation (Visio 6) and Wood chips USA complexity (Martin Viallatte).

2. Analysis

2.1. Routine analyses

Alcohol content, pH and titrable acidity were determined by OIV methods (OIV, 1990).

2.2. Color

Color intensity (CI) and tint (T) according to the official method OIV (6) are: $I = A_{420nm} + A_{520nm} + A_{620nm}$; $T = A_{420}/A_{520}$. Intensity of yellow (A_{420}/%), red (A_{520}/%) and blue (A_{620}/%); colors as well as the spectrum form (ΔA/%) according to Glories (7) are: $A_{420}/\% = (A_{420}/CI) * 100$ $A_{520nm}/\% = (A_{520}/CI) * 100$; $A_{620nm}/\% = (A_{620}/I) * 100$. Colour intensity was determined by measuring absorbance at 420nm, 520nm and 620nm in a 1 cm cell (recueil international) using a UV–visible spectrophotometer ANACHEM 220 spectrophotometer Hue was quantified as the ratio of absorbance at 420nm and 520nm (Glories, 1984).

2.3. Phenolic compounds

A280nm, which estimates total phenol content, was determined following the method described by (Ribereau *et al*., 1998). Total anthocyanin was determined by Spectrophotometry of wine diluted with ethanol and hydrochloric acid, making a reading of an aliquot with water (A0520nm). Another type treated with NaHSO3 (A520nm), the formula is as follows: $[Ant] = (A0_{520nm} - A_{520nm}) * 875$ (Ribereau and others 1965)**. Total tannins:** Were determined bay Spectrophotometry of wine diluted with water and hydrochloric acid and heated (A_{550}). Wine diluted in the same way but not heated ($A0_{550nm}$) the formula is as follows: $[Tan] = (A_{550nm} - A0_{550nm}) * 19:33$ (Zamora Marin, 2003).

2.4. Sensorial evaluation

The sensory evaluations of different samples of press wine were performed by a panel of five professional judges; the sensory evaluation was organized tree months after treatment. The tests were conducted at ambient temperature in individual boxes. Each sample was presented in a balanced random order in coded wine glasses. Judges were asked to rate the intensity of the perceived astringency on a 0-7 scale. At a later stage, panelists rated bitterness. Judges rinsed glasses twice with de-ionized water between samples.

1.1.1. Statistical analysis

The statistical calculations: ANOVA test with tuky evaluation of sensoriel parameters. non-parametric procedures by the paired-samples T-test (before and after 12 months of storage) with the Wilcoxon signed ranks test using SPSS 17.5 statistics softwar. The Significance of the results was established at $P < 0.05$.

3. Results and discussion

3.1. Analysis of phenolic compounds

All data on the analysis of phenolic compounds tests are regrouped in the figure 2, index 280, estimation of total phenolics. There is no significant difference between the values of index 280 obtained for the control and testing, and between trials between them. A small variation is observed for all test during the 12 months, a decrease in the total phenolic index is observed for the control over other tests after one year of storage.Anthocyanins are responsible for the coloration of red grapes. they are localized in the vacuoles of the cells of the skin (Amrani Joutei,

1993) and sometimes also pulp for teinturiers varieties. they are extracted during the operation of the fermentation and pressing, The press wines are more colorful than the runinig wine because of the pressur operation the more there is pressure, the more colorful, and rich on anthocyanin the wine will be (Renouf et al., 2012). The anthocyanins molecules are not chemically very stable, relatively small fraction of anthocyanins disappears by degradation, oxidation, precipitation, or formation of other colorless compounds, such as castavinols which can act as a reserve of anthocyanins (Jackson, 2008; Monagas, 2009), and disappear after a few years.
The anthocyanin content decreased similarly for all modalities which reflects a degradation of these compounds, this later can be linked to oxygen (vivar-quintana *et al*., 2002). The same results observed during the first five month of Breeding of press wines which are treated with different types of gelatin (Benaziz *et al*., 2015).

Color analysis
Whatever the measured parameter (color intensity, tint) figure 4 and 5 and A420nm%, A520nm% and A 620nm% table 1, during first 3 months there is an increase in the color intensity in modalities MOX, MOX + CH and Ba relative to the witness and this increase continues after bottling until the month sex and reaches maximum values MOX 18.75 , MOX + CH 19.29 and 16.94 Ba after this month or there is a color intensity decrease for all modalities. .This decreases probably due to phenomenon of disappearance by degradation, oxidation, and precipitation. The tint is also correlated with the duration of the test increases with time for all modalities in the end its evolution to orange increases, oxidation and polymerizations of the phenomenon that cause the formation of brown pigments. During 12 months, for all modalities the percent of yellow pigments increased significantly and that of red pigments decreased significantly, but both types of pigments are more balanced in aged wines. Blue pigments participate at red wines color in a smaller percent (15.29, 18.69% for press wine). Red pigments are predominant both in young and aged wines with 52.12-42.67 percent. Yellow pigments contribute with less than 39% at red wine color. It was observed that during red wines ageing the values of absorbance at λ=520nm decreased and those at λ=420nm and 620nm increased. This phenomenon is caused by transformation of monomer anthocyanes in polymer anthocyanes. The highest value of color intensity were for young red wines (Roman *et al*., 2013). The results obtained showed that the oxygen is not the only influences the color of the wine and therefore that other combination abrit of oxygen can occur (glorie et al., 1990).

Sensoriel analysis
The results of the sensory analysis are presented in Figure 5, wines were characterized on the nose and mouth taste to various parameters, according to the test tuky, there is a significant difference in flavor intensity between the modality treated only with chips and other modalities which the wood intensity remains very marked. As for breeding in traditional barrels, the addition of chips significantly changes the organoleptic characteristics of wines. However, it differs from the barrel aging by the absence of oxidation arranged, the addition of chips leads to changes by supplying aromatic compounds transferred to wine from wood like furfural, 5 methylfurfural, wiskilactone, vaniline, syringol... The different extractables wood (aromatic and phenolic) diffuse into the wine in the 3-month period (Ducournau et al., 2000). The supply of oxygen to wines coupled with the addition of wood enriched the wooded aromas wines and wines obtained are richer in aromatic intensity, but at this work still low for the barrel because it has lost its potential during the previous uses. For astringency intensity we noted that the microoxygenation increase significantly astringency intensity, the results obtained during the tasting, show preferences jury for woodland conditions and the vessel treated with oxygen is placed in last position of preference. The most preferred modality by the jury is the only modality treated with chips.

Conclusion
The effect of the judged supply of oxygen mastered coupled to the interaction of wood with wine leads the analytical and organoleptic changes on the latter. The physicochemical effects on wine continues after the exit of the wood chips and the stop of the microoxygenation. In testing decreased anthocyanins causing the decrease in the intensity of the color and progression to orange-red color. The addition of wood chips provides aromatic compounds in wine presence of wood affect the aromatic compounds brought to press wine. Several volatile compound and pass from wood to press wine and will enrich the aroma characteristic wooded. This impact is reflected in the tastings in the framework of this study. a majority of tasters see these changes as positive and the wooded modalities are preferred the unwooded modalities.

Table 1. Chromatic parameters of red wines determined through Glories method

	Yellow pigments (%)		Red pigments (%)		Blue pigments (%)	
	P<0.05*		P<0.05*		P<0.05*	
	0 months	12 months	0 months	12 months	0 months	12 months
C	32,64	38,81	51,92	42,22	15,43	18,98
CH	32,47	38,23	52,27	41,80	15,26	19,96
MOX	32,38	38,70	51,95	41,78	15,67	19,51
MOX+CH	32,39	39,24	52,55	43,41	15,06	17,35
Ba	33,00	38,55	51,94	44,14	15,07	17,31
Main	32.57	38.70	52.12	42.67	15.29	18.69

***:Signficant at p<0.05**

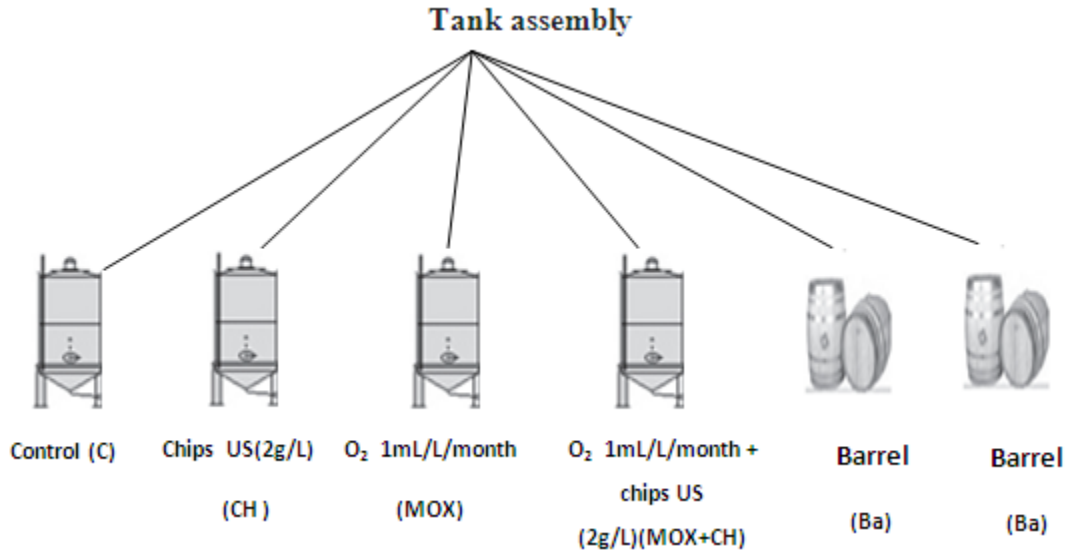


Figure 1: Modalities of press wine Treatment

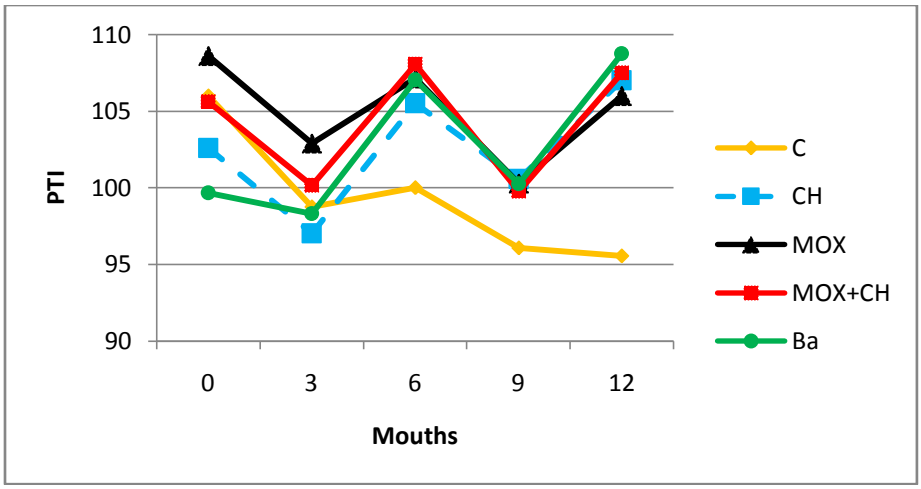


Figure 2: The evolution of the press wines trials phenolic total index for 12 months

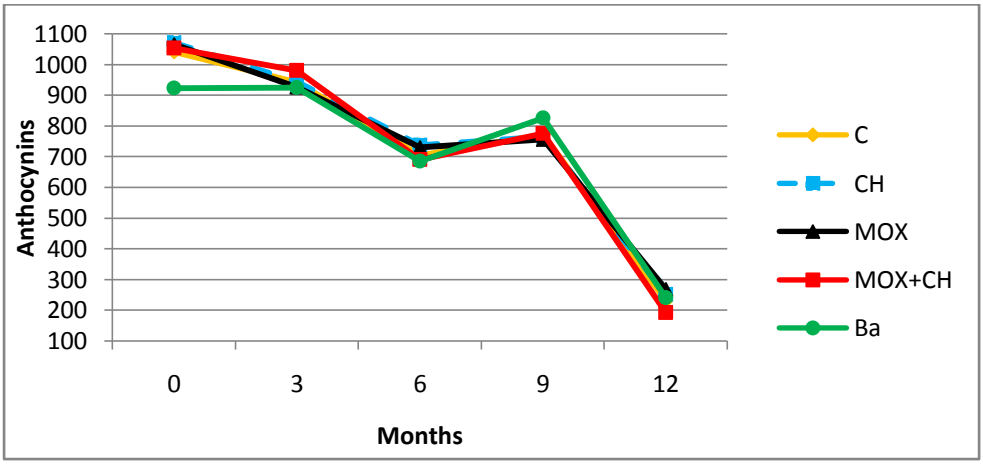


Figure 3: Evolution of the press wines trials total anthocyanins for 12 months

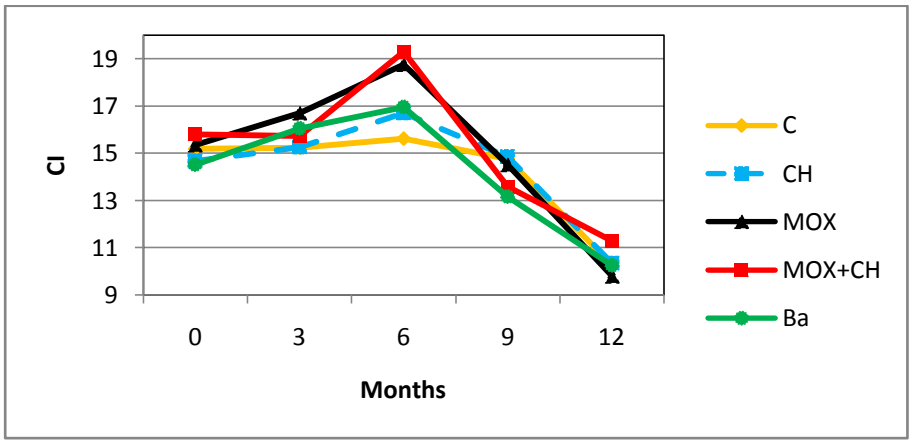


Figure 4: The evolution of the press wines trials color intensity for 12 months

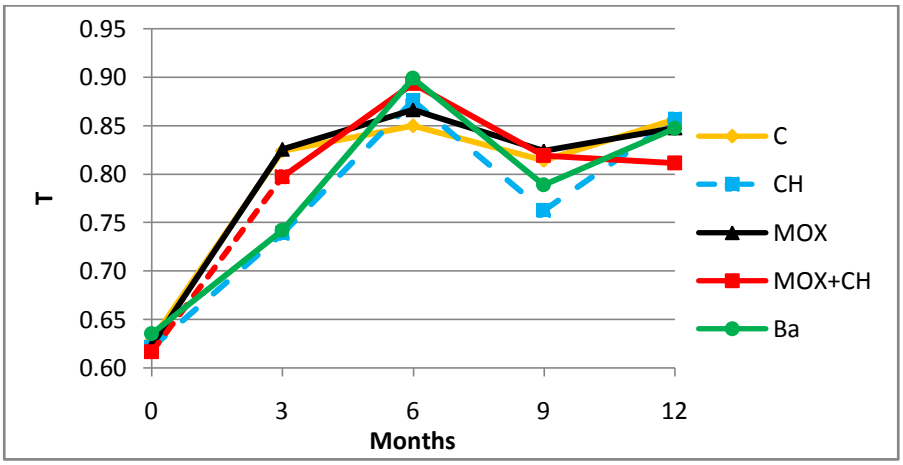
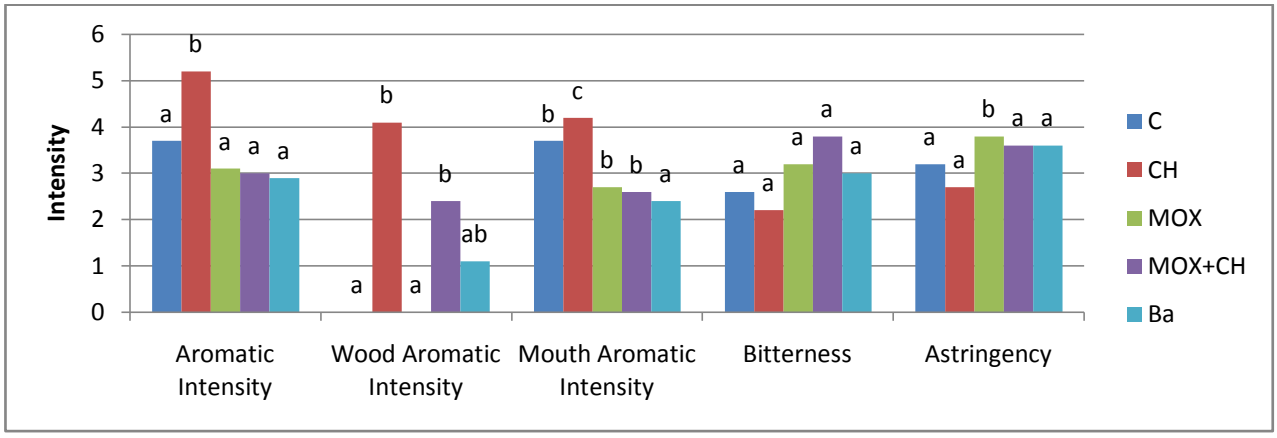


Figure 5: The evolution of the press wines trials tint for 12 months of storage.



***:Signficant at p<0.05**

Figure 6: Organoleptic analysis of wines after 3 months of microoxygenation and contact chips with press

References

Atanasova, V., Fulcrand, H., Cheynier V and Moutounet M. 2002. Effect of oxygenation on polyphenol changes in the course of wine-making. AnalyticaChimica Acta, 458 : 15-27.

Benaziz, M., Ebnaich,S., Ouissa,F., Douieb.H., Hajjaj, H.(2015). Behavior of Moroccanredpresswineafter the clarification process. international journal of advanced research. 5, 218-225.

Ducournau, P., Davaux, F. (2000). Que sait-on de l'utilisation de la micro-oxygenation et des copeaux ?. Extrait de « Maîtrise de l'élevage du vin » Journée Technique (compte-rendu).

Glories, Y. (1984). La couleur des vins rouges. Conn. Vigne Vin. 18: 253-271.

Glories,Y., Bondete de la bernadie C. (1990). Role joué par l'oxygene et la temperature sur l'evolution du contenu phénolique du vin rouge. Mecanisme mise en œuvre. In actualités œnologique 89, dunod, ed. :paris, France, 398-402.

Lesica, M. and Košmerl, T. (2009). Microoxygenation of red wines. Acta agriculturae Slovenica. 93 – 103.

Moutounet, M., Mazauric, J. P., Ducournau, P., and Lemaire, T. (2001). Microoxygénation des vins. Principe et applications technologiques. Industrie delle Bevande. 30: 253–258.

McCord, J. (2003). Application of toasted oak and micro-oxygenation to ageing of Cabernet Sauvignon wines. Australian and New Zealand Grape grower Winemaker. 474: 43–53.

Ortega-Heras, M., Rivero-Pérez, M. D., Pérez-Magariño, S., González-Huerta, C., and González-Sanjosé, M. L. (2008). Changes in the volatile composition of red wines during aging in oak barrels due to micro-oxygenation treatment applied before malolactic fermentation. European Food Research and Technology. 226: 1485–1493.

Renouf, V. and Murat, M.L. (2012). La valorisation des vins de presse par un collage precoce et approprié. Rev Fran Œnol. 142: 32-35.

Ribereau-Gayon, P., Glories, Y., Maujean, A. and Dubourdieu, D. (1998). Traité d'œnologie 2. Chimie du vin et stabilisation et traitement. Dunod.(ed).

Roman, L.A, PoianăM. A., Dogaru,D.V., Tracă, T.I. Studies regarding the impact of aging time on color of red wine merlot obtained in recas vineyard Journal of Agroalimentary Processes and Technologies. 19(3): 374-377.

Sartini, E., Arfelli, G., Fabiani, A., and Piva, A. (2007). Influence of chips, lees and microoxygenation during aging on the phenolic composition of a red Sangiovese wine. Food Chemistry. 104: 1599–1604.

Spillman, P.J. (1999). Wine quality biases inherent in comparisons of oak chip and barrel systems. The Australian and New Zealand Wine Industry Journal. 14: 25-33.

Singleton, V. L. (1974). Some aspects of the wooden container as a factor in wine maturation. Advances in Chemistry Series. 137: 254–277.

Vivas, N. (2007). Les composé phenoliques et l'élaboration des vins rouges. Féret. Bordeaux. (ed).

Zamora Marin, F. (2003). In A madrid vicente (Ed) élaboration y crianza del vino tinto: aspectoscientificos y practicos (pp.67) madrid: Mundi Prensa.