Sensorial characteristic of single variety red wines from four local variants of Tempranillo

Caractéristiques sensorielles des vins issus de quatre diverses sélections locales de Tempranillo

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Summary

It is well-known that there is a relationship between the "terroir" and the characteristics of grapes and quality of wines. However, adequate grape variety and other cultural factors should be also taken into account. Among the grape varieties cultivated, large number of local variants names are detected, which usually do reference to the region or zone. Usually vineyards can show some divergences that are correlated with vine adaptation to the medium (soil, climate, topography, etc.). This study was focused on the evaluation of the sensory characteristics of single-variety red wines elaborated with grapes from four different local variants of Tempranillo grapes, one of the most important Spanish red grape varieties. Vineyards were sited on homogenous soil units (Gomez-Miguel and Sotes, 2003) classified as optimal or good. Grapes were harvested in similar ripening stages, and wines were obtained applying the same winemaking processes, which were carried out in the winery of The Oenological Station of Castilla y León.

Obtained wines showed general sensory profiles very similar but some significant differences were found among them. Some aroma components (vegetal and fruity) so as some mouth feel sensations (astringency and green and hard tannins) showed the most notable differences. The effect of microoxygenation treatment of the wines was clearly noted on chromatic, aromatic and mouth feel sensations. Microoxygenated wines were valuated with higher values of colour intensity, violet tones, fruity note, global astringency and hard tannins, and with lower values of dirty, sulphidric and reduction aromas than no microoxygenated ones. After one year of wood aging, differences among microoxygenated wines and control ones were reduced.

Key words: Sensory analysis, red wines, Tempranillo, synonymy, zoning

Introduction

Viticulturist and winemakers are continuously more interested in the careful selection of site vineyards (climatic zone, soil characteristics, topography, etc.). This fact is due to the well-known relationship between the "terroir" and the characteristics of grapes and quality wines. However, adequate grape variety and rootstock for each place should be also taken into account.

Nowadays the listed grape varieties cultivated in Europe are around 10.000. An important number of them are local variants of the key varietal types (Schuster, 2003). The local variant names usually do reference to the region or zone, and usually the oldest vineyards can show some divergences that are correlated with vine adaptation to the medium (soil, climate, topography, etc.).

Tempranillo is one of the most emblematic Spanish varieties for red winemaking. It is extensively cultivated all around Castilla León Autonomous region (North-West of Spain), but also in other regions of Spain. Furthermore, this variety is also cultivated in other countries all over the world. Different synonymies for this variety are extended for several regions. Three are the most habitual synonymies of Tempranillo used in viticulture regions of Castilla y León, Tinta de Toro (Zamora), Tinta del País or Tinto Fino (Burgos, Segovia, Soria and Valladolid) (Yuste et al., 1998). This study was focused on the evaluation of the sensorial characteristics of single variety red wines elaborated with grapes from these different local variants of Tempranillo grapes. Similarity and differences were analysed.

It is well-known that winemaking process can induce significant differences on the characteristics of the final wine. In the last decade, one of the oenological techniques applied to modulate colour, aroma and taste properties has been the microoxygenation (Roig and Yêrle, 2003). This technique allows the addition of continuous and controlled amounts of pure oxygen (or air) into wines over time (Parish et al., 2000). The rate of oxygenation and total oxygen added depend on volatile sulfides, anthocyanin and tannin concentration, and also on the ability of wine to consume this oxygen. Therefore, it cannot determine "a priori", and in general, although it is indirectly related to the relative concentration of polyphenols, it is determined by tasting. Then, microoxygenation treatment of the wines requires a continuous tracking of them (Moutunet et al., 2001).

This paper was also focused on the study of the effect of microoxygenation treatment on the sensory properties of the wines, trying to detect which are the properties more intensively affected, and which could be considered independent.

Materials and Methods

Four different local variants of Tempranillo grapes, Tinta de Toro, Tinta del País, Tempranillo, and Tinto Fino were harvested in vineyards sited in some of the most important Denominations of Origin of Castilla y León Autonomous Region, Toro, Ribera del Duero, Rueda and Cigales, respectively. Grapes were harvested from vineyards selected according to similarities of age, training systems, rootstocks, etc., and all of them were sited on homogenous soil units classified as optimal or good (Gomez-Miguel and Sotes, 2003).

Grapes were collected in similar ripening stages, and all the wines were made in the same winery, the Experimental Winery of the Oenological Station of Castilla y León (Rueda). The same winemaking processes were applied in order to eliminate all factors of variability associated to the making-process.

After manual harvesting, grapes were transported until the winery in plastic boxes of 20 Kg. After eliminating damaged clusters, these were destemmed with minimum physical damage, and the mass lightly sulphited (0.04g/L). The fermentation was carried out at a controlled temperature (25-28ºC). The wines were racked off a new tanks when the maximum of the total polyphenol index (TPI, measurement of wine absorbance at 280 nm) were raised, which coincided, in the majority of the cases, with nearly complete consumption of the reducing sugars (<3g/L). At the end of the alcoholic fermentation and before malolactic fermentation started, 2000 liters of each wine was separated, locked in four different stainless steel tanks, and then these wine were microoxygenated. A microoxygenation equipment provided by AZ3 (Oenodev, France) was used. The total among of oxygen added in each wine and vintage was adapted to each one in order to obtain an optimum structuring effect (Parish et al, 2000), which was determined by tasting. The temperature was controlled, and maintained around 15ºC while microoxygenation treatment was applied.

The rest of each wine, more or less 1500 L, was maintained in closed stainless steel tanks, one for each single-variety wines, where the malolactic fermentation was carried out spontaneously. These wines were considered the control or test ones (T).

After the microoxygenation treatment, the microoxygenated wines (MO) carried out the malolactic fermentation (MLF) spontaneously, as the T wines. At the end of MLF wines were racked off to new tanks where they remain until they were put in American oak barrels, in which they were aged for one year. Wines were analyzed before aging (time 0) and periodically during wood aging, 4, 6, 8 and 12 months in barrel. However this work is focused mainly in the results of the initial and final wines (time 0 and 12 months of wood aging).

Quantitative Descriptive Analysis of wines was carried out according to international norm ISO 6564:1985, which describes the methodology to establish the flavour profile. The final profile was extended to visual characteristics so as to some other mouthfeel sensations (González-Sanjosé et al., 2008). A tasting panel, comprising 8 expertise tasters, specialist in wines, was convened. Judges were specially trained (including definitions, detection, identification and evaluation) about astringency sensations. The training was carried out with the appreciable collaboration of researchers of Institut de Dégustation of Tours (France) which provide standard wines with the different astringency sensations.

The analysis of the variance (ANOVA) and the Least Significant Difference test (LSD) were used to detect differences and to establish which data could be considered statistically different. A significance level of $\alpha = 0.05$ was used. All statistical analyses were carried out using the statistics package Statgraphics Plus 4.0 (1999, Manugistics Inc.).

This study was carried out using grapes from two consecutive vintages.

Results and discussion

To obtain appropriate and reliable information regarding to the sensory properties of wines was very important to obtain an adequate profile, which allowed detecting and communicating the differences among wines. Furthermore, the standardization of the terminology and the use of common scales was other important fact to achieve. For that reason, a lot of time was employed to unify tasters' criteria about terms and their meanings, and to unify the use of the structured scales of seven points.

The profile used included descriptors from visual, odorant and taste sensations. Visual properties were, colour intensity (CI), and three colour tones: violet (Vio), garnet (Gr), and orange-brown (Br). Used odour notes were, olfactory intensity (OI) and 9 odour notes: fruity (fru), woody (Wd), herbaceous (Hb), vegetal (Vg), sulphidric (SH), ethanal (Et), dirty (Dir), oxidation (Oxi) and reduction (Rdc). Taste and mouth sensations properties evaluated were, fatty (Fat), acidity (Ac), global astringency (Ast), green or unripe tannins (GT), hard tannins (HT), smooth tannins (ST), dry tannins (DT), and equilibrium (Equ). A final global valuation, global value (GV), was also included.

The four types of tannins evaluated give information about the wine structure, and they are correlated with the evolution of wine during wood aging, so as they are intensively correlated with the effect of microoxygenation treatment. Green or unripe tannins are the tannins that produce negative sensation including an intense astringency sensation with intense acidity feel and strong green or herbaceous notes. Hard or harsh tannins are those which produce intense astringency sensations, still unpleasant, with intense roughness notes, but less aggressive than green tannins. Smooth or complex tannins are those tannins, which produce a positive sensation including pleasant smooth sensation that fills the mouth. Dry tannins are the tannins that produce a negative sensation including a excessive dryness with lack of lubrication of the mouth (Francis et al., 2002; and González-Sanjosé et al., 2008).

The sixteen studied wines showed similar sensorial profiles (figure 1) independently of the vintage, microoxygenation treatment or zone of precedence of the grapes. These results are not surprising from the fact that they were made from the "same" variety of grape. However, some significant differences were found among them, ones probably correlated with particularities of the grapes cultivated in each studied region, and other due to the microoxygenation treatment.

Some of the divergences showed by grapes from "local variant names" of the same grape variety, can be associated to the vine adaptation to the medium, soil, climate, topography, etc., which can modify mainly the secondary metabolites synthesis. Considering that the most important secondary metabolites of grapes are the phenolic compounds, which are involved in the most significant sensorial properties of red wines, it is easy to understand and justify the effect of the medium on the phenolic composition of the grapes and therefore in the sensorial characteristics of red wines which depend on their phenolic composition. So, significant differences were detected among wines related to the visual parameters colour intensity and violet tones, although the significance was vintage dependent, detecting large number of significant differences among wines of the first vintage. Similar results were detected among astringency notes of global astringency and green tannins, while the significant differences for hard tannins parameters were very similar in both years. These results seems to indicate that grapes from each zone, even after being processed under the same conditions, can produce wines with different sensory properties, which can be slight or intense depending on other factors as vintage.

Significant differences were also detected for some odorant notes such as olfactory intensity, fruity and vegetal notes, and once more a factor vintage was observed. From the point of view, that Tempranillo is not an aromatic grape variety it was expected that the possible influence of the medium on its volatile profile was more difficult to detect than the effect on its phenolic composition.

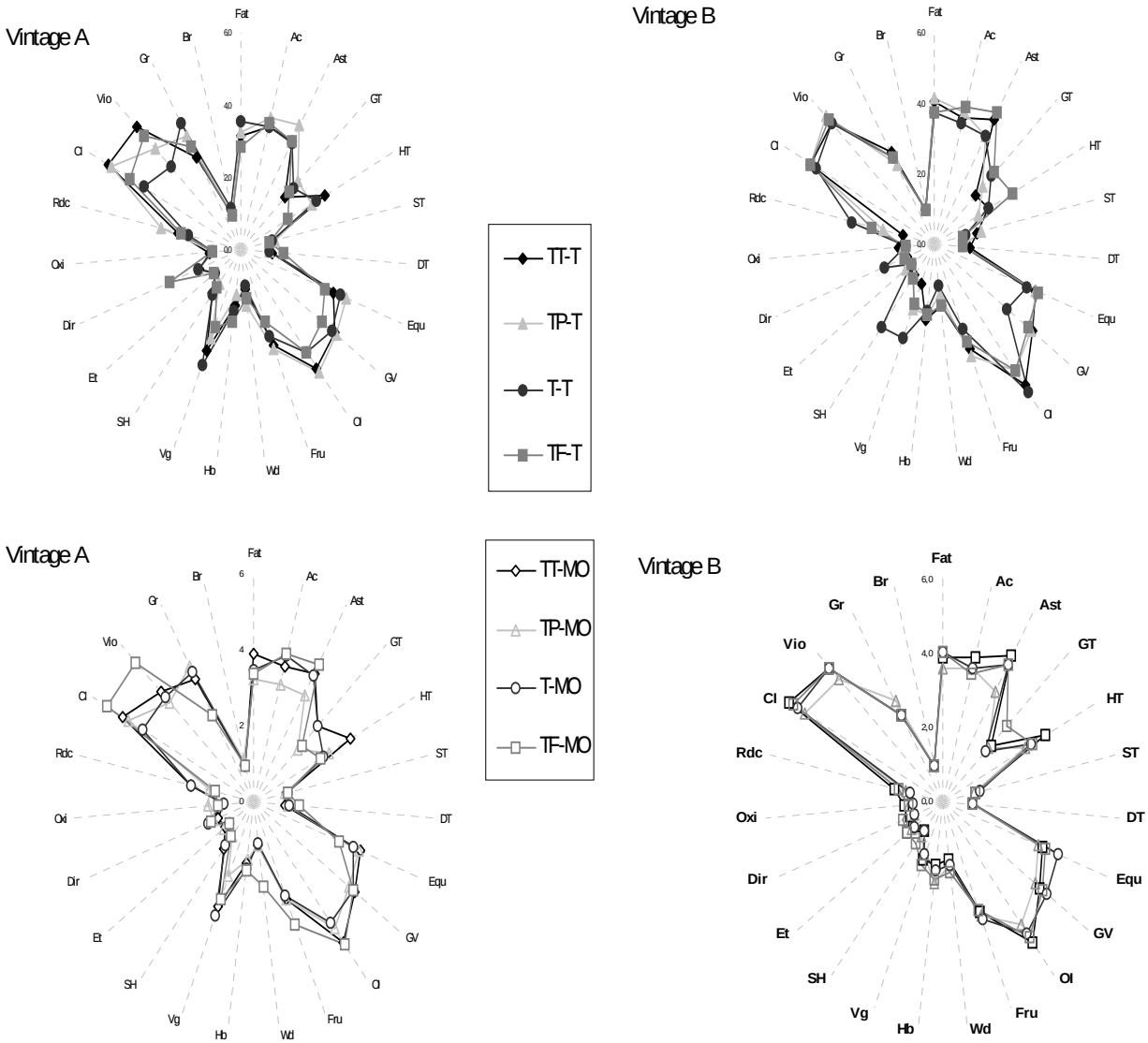

Figure 1 Graphical representation of the sensory profile of the sixteen studied wines at time 0. T, test or control wines. MO, wines with microoxygenation treatment. TT, Tinta de Toro. TP, Tinta del País. T, Tempranillo. TF; Tinto Fino. CI, colour intensity. Vio; violet. Gr, Garnet. Br, orange-brown. OI, olfactory intensity. Fru, fruity. Wd, woody. Hb, herbaceous. Vg, vegetal. SH, sulphidric. Et, ethanal. Dir, dirty. Ox, oxidation. Rdc, reduction. Fat, fatty. Ac, acidity. Ast, global astringency. GT, green or unripe tannins. HT, hard tannins. ST, smooth or complex tannins. DT, dry tannins. Equ, equilibrium. GV, global value (GV).

It is well-known that during winemaking process wines can develop "negative" aromatic notes, such as reduction, dirty, etc., which should be controlled in order to avoid their presence in the final wines. In fact, some of the technologies applied by oenologist during winemaking, pumping over, racking off, "batonnage", microoxygenation, among others, are used to avoid the synthesis of the compounds responsible of these characteristics so as to eliminate these compounds once formed. From the point of view that these techniques are associated with oxygen supplies (controlled or not) it was also necessary to control that wines were not oxidised, reason that justify the evaluation of parameters such as ethanal and oxidation.

A clear effect of microoxygenation treatment was detected in both vintages. In general, microoxygenated wines were evaluated with higher values of colour intensity and violet notes, so as of global astringency, and green and hard tannins. Furthermore, they were clearly evaluated with lower values of dirty, reduction and sulphidric notes, and in same cases with lower values of herbaceous and vegetal notes, so as higher values of fruity note and olfactory intensity. No significant differences were detected for oxidation or ethanal notes. Furthermore, in general microoxygenated wines showed

sensory profiles more homogenous than control or test ones, although this effect was also vintage dependent, being the microoxygenated wines of the second vintage more similar among them than microoxygenated wines of the first vintage. It was noted that some of the differences related to astringency parameters remained in any case. Probably, the effect of microoxygenation treatment on astringency properties explains the higher global values obtained for some MO-wines respect to their control.

Data from wines after one year of wood aged described similar profiles but with some differences respect to the initial ones (figure 2).

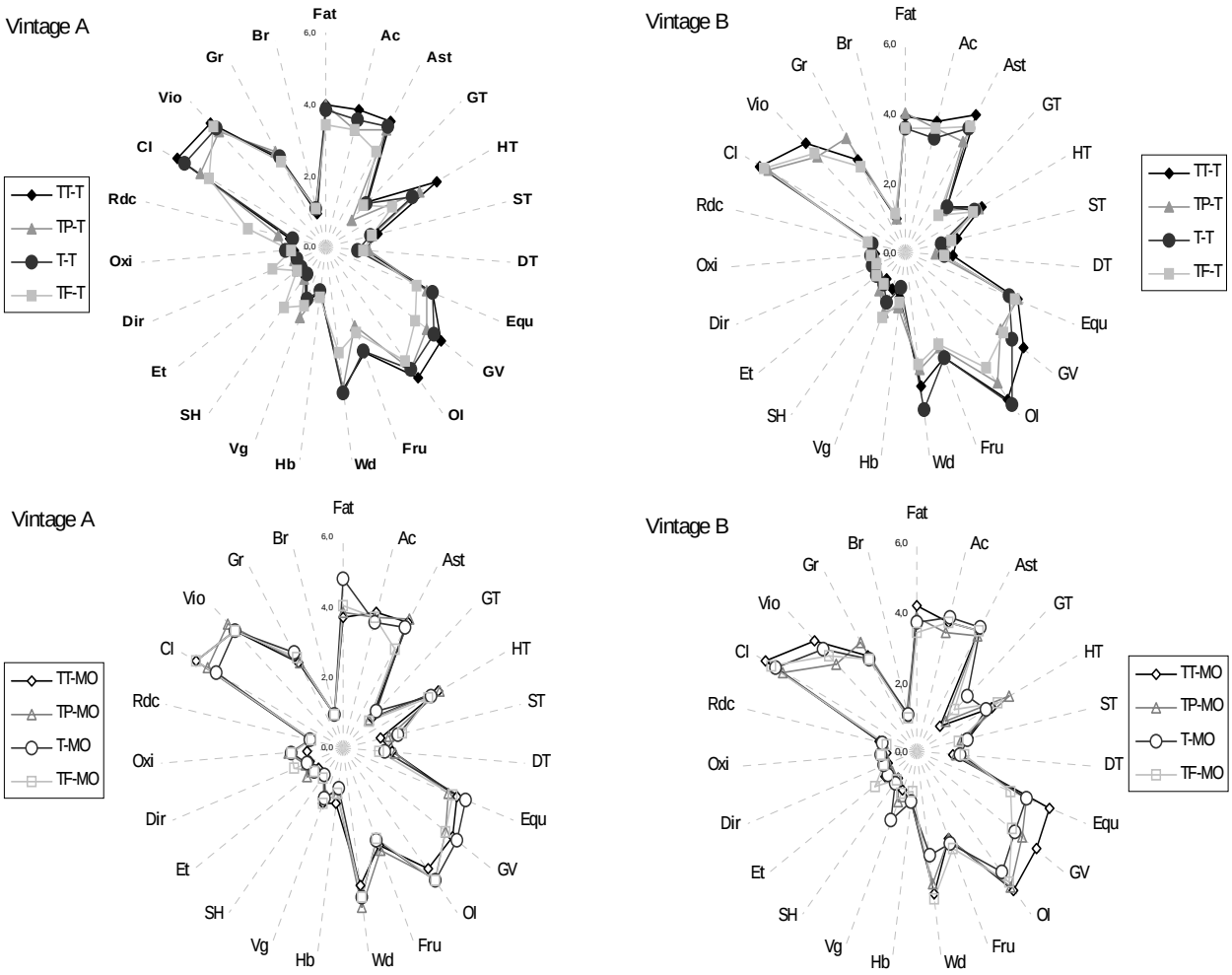

Figure 2 Graphical representation of the sensory profile of the sixteen studied wines after 12 months of aging in barrels. T, test or control wines. MO, wines with microoxygenation treatment. TT, Tinta de Toro. TP, Tinta del País. T, Tempranillo. TF; Tinto Fino. CI, colour intensity. Vio; violet. Gr, Garnet. Br, orange-brown. OI, olfactory intensity. Fru, fruity. Wd, woody. Hb, herbaceous. Vg, vegetal. SH, sulphidric. Et, ethanal. Dir, dirty. Ox, oxidation. Rdc, reduction. Fat, fatty. Ac, acidity. Ast, global astringency. GT, green or unripe tannins. HT, hard tannins. ST, smooth or complex tannins. DT, dry tannins. Equ, equilibrium. GV, global value (GV).

After one year of aging, the general sensory profile of the studied wines was maintained, although some of the differences detected among wines of each zone for parameters as colour intensity, fruity, vegetal, reduction, dirty and astringency notes decreased. It was detected that olfactory intensity differences remained, probably due to the different increase of woody note on each wine. Microoxygenated wines were evaluated with higher values of woody note than their respective controls (only one exception was detected).

Judges gave similar scores to violet note of all aged wines of the first vintage, however significant differences were detected among the scores gave to aged wines of the second vintage. Then, it was not possible to obtain a clear effect of the aging on this parameter.

Conclusions

Wines made from grapes from different local variants of Tempranillo, which were cultivated in different regions of Castilla y León (Spain) showed similar sensory profile although some significant differences were also observed, which can be modulated by winemaking process such as microoxygenation, specially those related with negative aspects as excessive astringency, vegetal, and dirty or reduced aromas. These results are positive or negative depending on which were the desiderate effect. So, they can be considered positives because differences among wines are reduced and defects are corrected; or they can be considered negative from the point of view that avoiding differences among wines can reduce wine personality. It will be the oenologists' responsibility does that positive aspect prevalence on negative ones.

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