

# MACERATION TIME EVALUATION ON CHARACTERISTICS OF TROPICAL WINES FROM BRAZIL

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## ABSTRACT

The tempranillo variety is native from Spain and was introduced in a little over four years ago in Sub-middle of the São Francisco river Valley becoming the second in importance between the red wines in the region. The aim of this study was to evaluate the effects of different maceration times on the physicochemical composition and sensory characteristics of Tempranillo wines, elaborated in the Northeast of Brazil. Vinification was done using the traditional method, with different maceration times: T1- 4 days, T2-8 days; T3-12 days, which were evaluated by physicochemical and sensory analyses. All the analyses were done in triplicate and the results submitted to analysis by ANOVA and Tukey means test ( $p=5\%$ ). Results showed that the evaluated maceration times significantly influenced the composition of Tempranillo wines.

**Key-words:** *Vitis vinifera* L., climate variability, grapes, wine, phenolic compounds, sensory analysis.

## RESUMO

A cultivar Tempranillo é originária da Espanha e foi instalada em pouco mais de quatro anos no Vale do Submédio São Francisco, sendo a segunda em importância para vinhos tintos na região. O presente trabalho teve como objetivo avaliar os efeitos de diferentes tempos de maceração na composição físico-química e características sensoriais de vinhos tropicais Tempranillo elaborados no Nordeste do Brasil. A vinificação foi realizada por meio do método tradicional, utilizando diferentes tempos de maceração: T1- 4 dias; T2- 8 dias; T3- 12 dias, os quais foram avaliados por análises físico-químicas e sensoriais. Todas as análises foram realizadas em triplicata e os resultados submetidos à análise de variância e teste de médias de *Tukey* ( $p=5\%$ ). Os resultados permitiram verificar que os tempos de maceração avaliados influenciaram significativamente a composição dos vinhos Tempranillo.

**Palavras - chave:** *Vitis vinifera* L., variabilidade climática, uvas, vinhos, compostos fenólicos, análise sensorial.

## INTRODUCTION

The Sub-middle of the São Francisco river Valley is located between latitude 8° and 9° S with tropical semi-arid climate, average annual temperature of 26° C and rainfall of 550 mm, concentrated between the months of January and April, at about 330 m altitude. The region has shown a great potential for fine wines production, considered the second largest producing region of Brazil (AGRIANUAL, 2006). Climatic conditions allow the production of

grapes throughout the year, making possible to harvest two to three times annually. (TONIETTO, TEIXEIRA, 2004).

Tempranillo cultivar is originally from Spain, and it is largely grown in the world, mainly in the Iberian Peninsula, occupying the 18th position, equivalent to 85,000 hectares (CHILE, 2006). In the São Francisco River Valley, the Tempranillo was introduced few years ago, and actually there are about 70 hectares, demonstrating good results for red wines production (PEREIRA, 2009).

Characterized by its aromatic richness and balance, the wines obtained from the different types of maceration can provide young or wines with aging capacity, according to the polyphenols richness and its nature (FLANZY, 2000). Maceration also favors a greater extraction of water-soluble substances such as acids, minerals and phenolic compounds (PEYNAUD, 1997).

Grape phenolic compounds contribute to the color of red wines, the aroma, the taste sensations, such as body and structure, bitterness and astringency, and it is extremely rich in anti-oxidizing substances, forming wine largest system of protection against oxidation phenomena (BIASOTO et al. 2010; DAUDT; POLENTA, 1999).

Given the importance of the variety Tempranillo for the Brazilian tropical red wines, this study aimed to evaluate the effect of different maceration times on the physicochemical and sensory characteristics of Tempranillo wines elaborated in the Northeast of Brazil, as alternatives to increase the product range and improve the quality and typicity of wines in the region.

## **MATERIAL AND METHODS**

The variety was conducted in a commercial vineyard at a partner company. The grapes were harvested in November 2009 and vinified by the traditional method (PEYNAUD, 1997). Three treatments were used according to maceration time: T1-4 days, T2-8 days; T3-12 days.

The wines were elaborated in glass bottles of 20L, in triplicate, being alcoholic and malolactic fermentations conducted at 25° and 18°C, respectively. After stabilization, the wines were bottled and analyzed after 60 days. It was evaluated the pH, total and volatile acidity, alcohol content, density, volatile acidity, free sulfur dioxide and total phenolic compounds (I-280), tonality, color intensity, and anthocyanins. The total acidity analysis was performed using 0.1 N NaOH until the solution reaches pH 8.2. The pH was determined using a pH meter (brand TECNAL), previously calibrated with pH buffers solutions of 7.0 and 4.0, at a temperature of 20° C.

For the analysis of volatile acidity and alcohol content wine was distilled using automatic distiller Super DEE, and the alcohol content measured in automatic balance brand Gibertini, The same equipment was used to determine density and dry extract. The volatile acidity, total and free SO<sub>2</sub> were determined by titration with 0.1 N NaOH and 0.02 N Iodine. The total polyphenol index, tint, color intensity, and anthocyanins were determined according to Rizzon (2006).

Using quantitative descriptive analysis - QDA® (STONE et. al., 1974; STONE and SIDEL 2004), the sensory profile of the three wines samples have been evaluated by 9 selected and trained panellists (3 males and 6 females), concerning to visual, olfactory and gustatory characteristics, using a 9-cm unstructured scale anchored in the left and right extremes with the terms “none/ weak” and “strong”, respectively.

The sensory and chemical were evaluated by ANOVA and Tukey means test ( $p=5\%$ ) using the SAS statistical software version 9.1.3 (SAS<sup>®</sup> Institute Inc., Cary, N.C., 2003). Additionally, for the sensory results, the polar coordinate graph was obtained using the means of the 27 descriptors selected to characterize the three wines.

## RESULTS AND DISCUSSION

All physical-chemical parameters evaluated showed significant difference ( $p < 0.05$ ), demonstrating that the maceration time influenced the composition of the wines.

The prolonged maceration time and the solid parts of grapes explain the high values of dry extract (SILVA, 1999). However, these data were not confirmed in this study, where treatment 2 showed lower dry extract (Tab. 1), as compared with the treatment 1. The same was verified for the density value.

This fact can be explained by the alcohol content of treatment 1, which was lower as compared to the other treatments, suggesting that this wine has higher residual sugar content. According to Rizzon and Miele (2003), the density of wine is a consequence of alcohol content and the amount of residual sugar present.

Table 1 - Results of physicochemical analysis of the three maceration treatments maceration of wines, T1 = 4 days, 8 days = T2 and T3 = 12 days.

Variables	Samples		
	Treatment 1	Treatment 2	Treatment 3
Density	0.9941 ± 0 b	0.9935 ± 0 c	0.9949 ± 0 a
pH	3.2 ± 0.06 c	3.5 ± 0 a	3.4 ± 0 b
Total acidity (meq/L)	102.7 ± 1.15 a	76.7 ± 1.15 c	97.3 ± 1.15 b
Volatile acidity (meq/L)	4.0 ± 0 c	7.1 ± 0.09 a	5.4 ± 0.51 b
Alcohol (°GL)	12.92 ± 0.06 c	13.11 ± 0.04 b	13.53 ± 0.09 a
Total sulfur dioxide (mg/L)	39.3 ± 1.48 b	21.3 ± 1.48 c	121.2 ± 2.96 a
Free sulfur dioxide (mg/L)	13.65 ± 1.48 c	16.21 ± 1.48 b	44.37 ± 1.48 a
Dry extract (g/L)	28.53 ± 0.21 b	27.67 ± 0.21 c	32.43 ± 0.25 a
Color intensity	7.84 ± 0.05 c	8.49 ± 0.06 b	9.27 ± 0.02 a
Tonality	0.73 ± 0 c	0.81 ± 0.01 a	0.77 ± 0.01 b
Anthocyanins (mg/L)	116.0 ± 2.93 c	154.6 ± 5.72 b	371.7 ± 0.39 a
Total polyphenols (I-280)	39.00 ± 0.06 c	47.80 ± 0.00 b	62.60 ± 0.12 a

\*Means followed by same letter in columns do not differ significantly by Tukey test at 5% probability.

The pigment of red grapes is influenced by the pH and acidity of the grapes. The brilliant color in fruits from moderate to high acidity and low pH tends to be dark blue in fruits with low acidity (MOTA, 2006). This fact was proven in Tempranillo wine, because the tonality was darker in treatment 2 which had a pH of 3.5 and acidity of 76.7 meq / L.

Anthocyanins are the phenolic compounds responsible for the color of young red wines (RIZZON. 2006). As verified in this study, treatment 3 showed higher contents of anthocyanins, total polyphenols and colour intensity. The values found in this treatment are a result of prolonged maceration time (T3 = 12 days) because, according to Lucchese (2004) anthocyanins are extracted from grapes during the maceration and react together, forming a very large number of compounds.

The sensory profiles of wines elaborated with different maceration times are represented in Fig. 1. For the most of the 27 descriptors generated by the trained panel, no significant differences ( $P \leq 0.05$ ) were found among the three samples listed in Table 2, except for the attributes visual fluidity, fresh vegetable, chemical, nutty and caramelized aromas. None significant wine\*judge interaction ( $P \leq 0.05$ ) was detected, proving the adequate training of the descriptive panel.

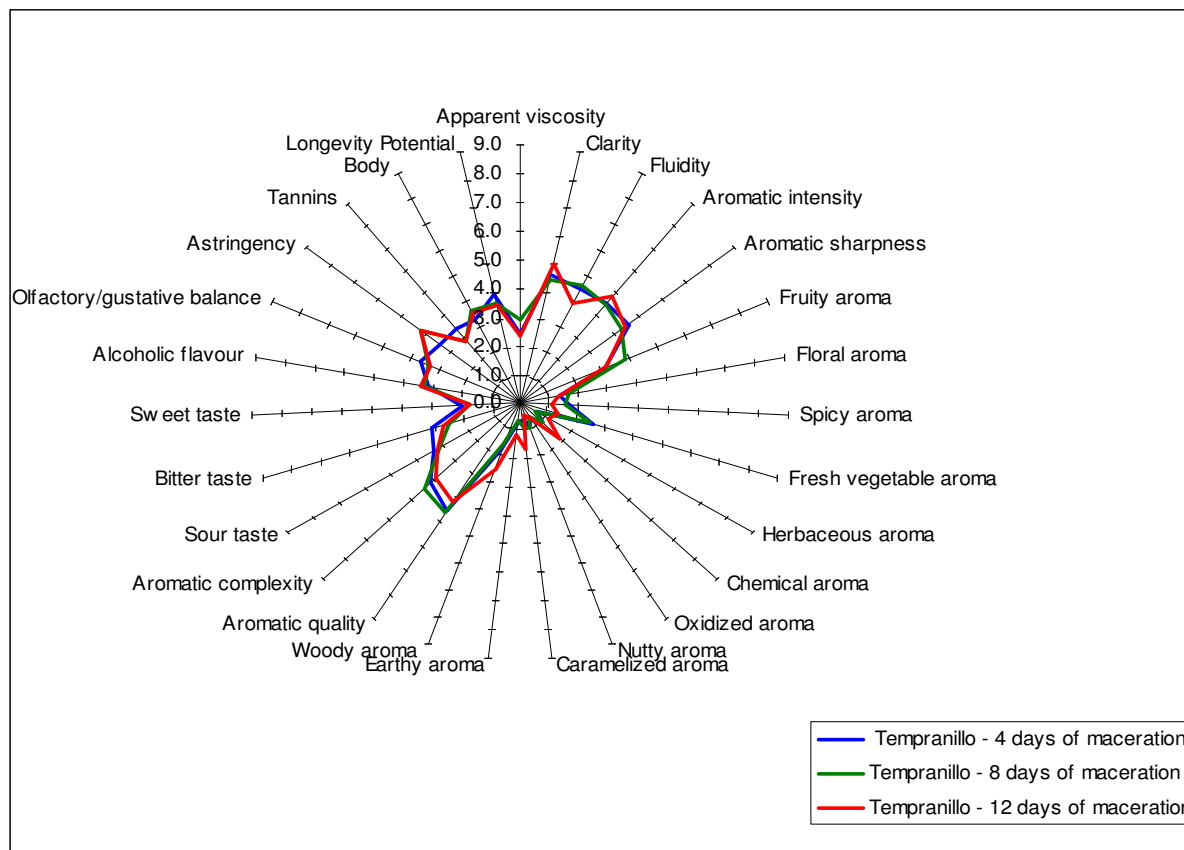


Fig1. Sensory profile of the wines elaborated with different maceration time.

The Treatment 3, Tempranillo elaborated with 12 days of maceration, showed highest intensity of chemical aroma, that include notes of sulphur derivate as “hydrogen sulfide”. “burnet match”, “wet dog”, “garlic”, among others, cited by the sensory panel. Notes considered as promoters of flavours when presents in the wines, and representatives by the presence of compounds generally formed by reduction reactions. On the other hand, the Treatments 1 and 2, Tempranillo elaborated with 4 and 8 days of maceration respectively, obtained the higher scores of vegetative fresh aromas, differed significantly of the Treatment 3, notes of “bell pepper”, “eucalyptus” and “mint”; considered positives notes in wines and expected in the quality wines. Although without significant difference, these two wines (Treatment 1 and 2) showed the smaller intensity of sour and bitter tastes, alcohol flavor and astringency.

Table 2 - Results of sensory analysis for the different winemaking vinification process.

Variables	Samples		
	Treatment 1	Treatment 2	Treatment 3
Apparent viscosity	2.20 a	2.54 a	2.35 a
Clarity	4.50 a	4.42 a	5.00 a
Fluidity	4.59 a	4.55 ab	3.65 b
Aromatic intensity	4.63 a	4.31 a	4.93 a
Aromatic sharpness	4.47 a	4.12 a	4.60 a
Fruity aroma	3.02 a	3.47 a	2.82 a
Floral aroma	1.02 a	1.37 a	0.97 a
Spicy aroma	1.35 a	1.20 a	0.75 a
Fresh vegetable aroma	2.28 a	2.04 a	0.89 b
Herbaceous aroma	0.19 a	0.18 a	0.47 a
Chemical aroma	0.37 b	0.44 b	1.36 a
Oxidized aroma	0.20 a	0.20 a	0.22 a
Nutty aroma	0.46 a	0.31 ab	0.10 b
Caramelized aroma	0.09 b	0.41 b	1.12 a
Earthy aroma	0.30 a	0.66 a	0.52 a
Woody aroma	1.49 a	1.49 a	2.01 a
Aromatic quality	4.60 a	4.70 a	4.10 a
Aromatic complexity	3.90 a	4.08 a	3.68 a
Sour taste	2.94 a	2.71 a	3.07 a
Bitter taste	2.59 a	2.33 a	3.03 a
Sweet taste	1.81 a	1.50 a	1.41 a
Alcoholic flavor	2.70 a	2.78 a	3.10 a
Olfactory/gustative balance	3.80 a	3.47 a	3.19 a
Astringency	3.12 a	3.82 a	4.11 a
Tannins	3.19 a	2.92 a	2.70 a
Body	3.19 a	3.42 a	3.34 a
Longevity Potential	3.71 a	3.67 a	3.22 a

\*Means followed by same letter in columns do not differ significantly by Tukey ( $p= 5\%$ ). T1: 4 days; T2: 8 days; and T3: 12 days.

## CONCLUSION

Maceration times evaluated in this study significantly influenced the composition of Tempranillo tropical wines, being the third treatment, longer maceration, the treatment that provided the highest concentration of polyphenols, color intensity and anthocyanins, as compared to the other two treatments. In contrast, for the sensory analysis, the parameters visual fluidity, fresh vegetable, chemical, nutty and caramelized aromas presented significant and treatments 4 and 8 days presented some positive descriptors.

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