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Influence of the vintage, clone and rootstock on the chemical characteristics of Syrah tropical wines from Brazil

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ABSTRACT
In the Northeast of Brazil, vines can produce twice a year, because annual average temperature is 26°C, with high solar radiation and water availability for irrigation. Many cultivars have been tested according to their adaptation to the climate and soil, and the main variety used for red wines is Syrah. This work aimed to evaluate five clones of Syrah, grafted on two rootstocks, in two harvests of the second semester of 2009 and 2010, according to the chemical analyses of the wines.The clones evaluated were 100, 174, 300, 470 and 525, the rootstocks were Paulsen 1103 and IAC 313 (*Golia* x *Vitis caribeae*). Grapes were harvested in November 2009 and 2010 and the yield was evaluated. Climate characteristics of each harvest was determined and correlated to the results. Wines were elaborated in glass tanks of 20 L, with alcoholic fermentation at 25°C for seven days, then wines were pressed and malolactic fermentation was carried out at 18°C for 20 days. The following parameters were analyzed: alcohol content, dry extract, total anthocyanins, total phenolic index. High performance liquid chromatography was used to determine tartaric, malic, lactic and citric organic acids. Results showed that wines presented different concentrations of classical analyses, phenolics and organic acids according to the harvest date, rootstocks and clones. Principal component analysis was applied on data and clusters with wine samples were formed, explaining the variability, and results are discussed.

Keywords: **Vitis vinifera L.**, ***organic acids, phenolic compounds, wines.***

1 INTRODUCTION

In the Northeast of Brazil, the states of Pernambuco and Bahia are the wine region of the Sub-middle São Francisco Valley, located in a tropical semi-arid region, between 8 and 9° of South latitude. The climate presents an intra-annual variability, which enables the production of grapes and wines during many months in the year (1). The wine grape quality depends of many factors: the climate conditions, soil characteristics, genetic of the vegetative material, viticulture practices and winemaking process, influencing wine composition (2-7). The clone of a cultivar can affect the performance, growth, berry size, yield, grape and wine composition (3, 8). Rootstocks present different vigor and can influence the vegetative growth, productivity, grape and wine composition (9, 10). The cv. Syrah has been used for red wines in the Northeast of Brazil (11-14). Studies to evaluate the adaptation of clones and rootstocks in the region have been made with different cultivars (15). In this way, this work aimed to evaluate grape production and Syrah wine quality according to different vintages, rootstocks and clones in the Northeast of Brazil.

2 MATERIALS AND METHODS

The experimental trial was installed in "Santa Maria" farm, belonging to a private company (Vinibrasil-Vinhos do Brasil/GlobalWines), located at Lagoa Grande-PE, Brazil (9° 2'S, 40° 11' W). The climate of this region is a BSwh' by the Köppen classification and the majority of the soils are podzols. The vineyard design was installed in casual blocks with two factors (rootstocks and clones), trained in vertical shoot positioning and unilateral spur pruned cordon. The density of plantation is 3333 vines/ha (3 x 1 m) and row orientation is North-South. In this study, 5 clones of Syrah were chosen and evaluated: 100, 174, 300, 470 and 525. All of them were grafted onto 2

rootstocks: Paulsen 1103 and IAC 313. Thirty plants were selected, yield and cluster weight were detremined in two harvests, November 2009 and November 2010, in order to determine the productivity of the interactions clones x rootstock. For winemaking process, 80 kg of grapes were harvested and sent to Embrapa. Alcoholic and malolactic fermentations were performed at 25 and 18°C, respectivelly. After corrected with sulphur dioxide and bottled, the wines remained in the cellar for 30 days, then they were analyzed to determine classical, spectrophotometric and chromatographic
analyses for flavonöls and organic acids (2, 16, 17).

3 RESULTS AND DISCUSSION

3.1 Yield of the vines

The results of vine productivity according to the vintages, rootstocks and clones are shown in the Figure 1. In 2009 vintage, only productivity of the clones 174, 525 and 470 were different, on the rootstock IAC 313, while in 2010 the highest productivities were observed for the clones 470 and 300, on the rootstocks IAC 313 and Paulsen 1103, respectivelly. In 2009 the grape productivity ranging from 9 to 14 ton.ha^{-1}, while 2010 was between 11 to 17 ton.ha^{-1}. Productivity is an important factor for grape quality, because influences directly the the phenolic maturation and the oenological potential of the grapes (3, 6).

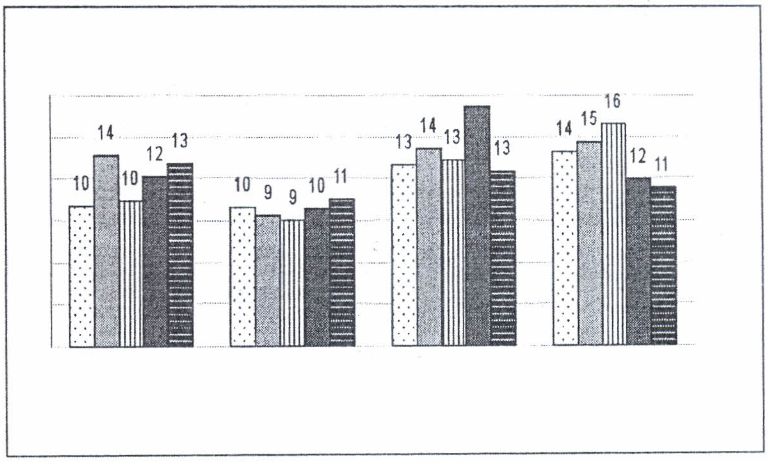


Figure 1. Productivity of grapes cv. Syrah at harvest, from five clones (100, 174, 300, 470 and 525) x two rootstocks (IAC313 and 1103 Paulsen) x two vintages (2009 and 2010), in Lagoa Grande – PE, Northeast of Brazil.

3.2 Wine composition

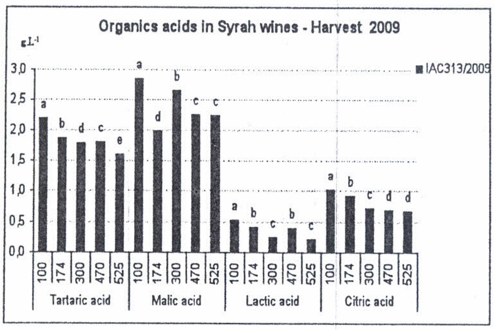
Classical analyses showed different responses according to the interaction between vintage, clone and rootstock (Table 1). Wines from 2009 presented the highest values of alcohol content, specially for the clone 300 on Paulsen 1103 (18.9°GL). This values can be explained by the highest radiation solar and maximal temperature observed in this season, as compared with 2010 vintage (data not shown). Total polyphenol index and total acidity presented the highest values for wines of 2009 from clone 100 on IAC 313 rootstock. Total anthocyanins were highest for wines of 2009, from clone 525 and rootstock IAC 313 (Table 1). These results were higher than other studies, explained by climatic conditions (3, 5, 8, 18).

Clones	Clone x rootstock x harvest			
	IAC313 (2009)	IAC313 (2010)	1103P (2009)	1103P (2010)
	Alcohol content (v/v%)			
100	15.97a	12.00b	16.28c	12.92b
174	15.47b	12.89a	17.44b	12.39c
300	16.19a	12.92a	18.91a	12.70b
470	14.18c	12.80a	15.00c	13.49a
525	16.18a	12.83a	17.49b	11.20d
	Total Polyphenol Index (I 280nm)			
100	63.27a	28.93e	38.83d	40.87a
174	60.00 b	36.57b	41.02c	39.63b
300	60.00b	35.70c	45.60b	37.03d
470	38.00c	31.50d	50.18a	37.87c
525	35.37d	38.83a	41.01c	25.77e
	Total acidity ($g.L^{-1}$ of tartaric acid)			
100	7.22a	4.91c	5.28d	5.71a
174	6.95b	5.10b	5.75c	4.80[b]
300	6.61c	4.18d	6.91b	3.94d
470	6.98b	4.16d	7.52a	4.78b
525	6.65c	5.35a	5.30d	4.26c
	Total anthocyanins ($mg.L^{-1}$)			
100	477.26c	339.24c	368.94a	457.64c
174	496.67b	489.11b	244.47c	479.18b
300	570.37d	489.93b	279.38b	545.53a
470	435.82d	487.24b	487.31b	457.64c
525	570.38a	498.13a	236.69d	297.67d

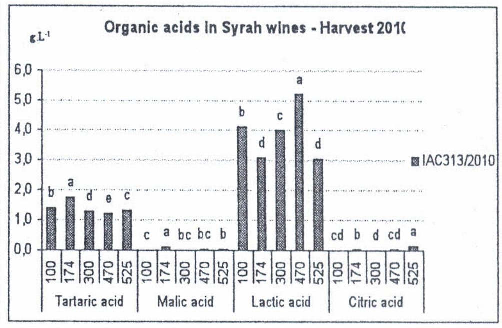
Means followed by the same letter in the columns did not differ statistically at 5% probability level Tukey test.

Table 1. Classical analysis of 'Syrah' tropical wines in 2009 and 2010 vintages.

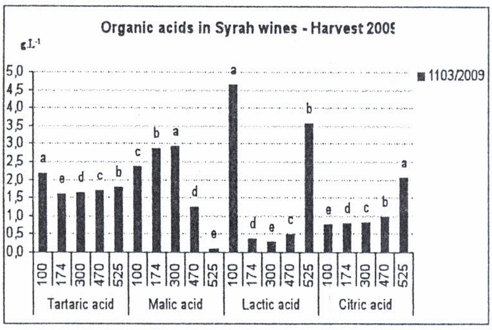
The Figure 2 shows the results of the organic acids determined in the wines, presenting statistical differences ($p < 0.05$) according to the vintage, clone and rootstock. Wines from clone 100 on Paulsen 1103 in 2009 vintage presented the highest values of tartaric acid (2.2 $g.L^{-1}$). The literature suggests that the tartaric acid concentration normally found in wines is between 1.5 $g.L^{-1}$ to 3.0 $g.L^{-1}$, but it depends strongly of the climate conditions (3-6). For malic acid, the highest values were found in the Syrah wines clone 174 on Paulsen 1103 in 2009 vintage (2.9 $g.L^{-1}$). Wines from 2009 did not finish the malolactic fermentation-MLF, because the high alcohol content in this vintage. All wines from 2010 presented low concentration of malic acid (below 0.2 $g.L^{-1}$), showing that these one finished the MLF. In the other hand, high values of lactic acid were observed in all wines from 2010 vintage, specially for the clone 525 on Paulsen 1103 (4.9 $g.L^{-1}$), showing that the MLF was made correctly. For citric acid, wines from 2009 presented the highest values.



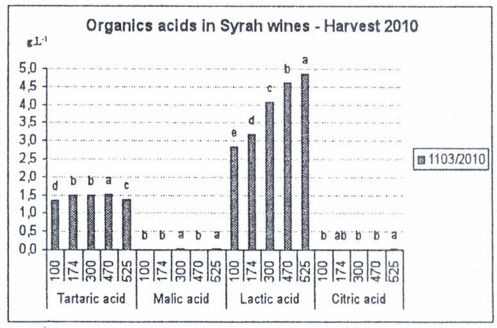
(a) Rootstock IAC 313-2009



(b) Rootstock IAC 313-2010



(c) Rootstock Paulsen 1103-



(d) Rootstock Paulsen 1103-2010

Means followed by the same letter in the columns did not differ statistically at 5% probability level Tukey test.

Figure 2 (a, b, c, d). Results of the organic acids determined by HPLC, in the Syrah wines from two vintages, two rootstocks and five clones.

4 CONCLUSIONS

The 2010 vintage had the highest productivity as compared with 2009 in both rootstocks. Wines from different clones and rootstocks had different responses in both vintages and were also influenced by the rootstocks.

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