Scientia Agraria Paranaensis – Sci. Agrar. Parana.
ISSN: 1983-1471 – Online
DOI: https://doi.org/10.18188/sap.v21i1.29237

CHEMICAL AND PHENOLIC PROFILE OF 'SAUVIGNON BLANC' WINES MADE IN ALTITUDE REGION OF SANTA CATARINA STATE - BRAZIL

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SAP 29237 Received: 11/12/2021 Accepted: 20/03/2022
Sci. Agrar. Parana., Marechal Cândido Rondon, v. 21, n. 1, jan./mar., p. 21-29, 2022

ABSTRACT - The profile of secondary compounds, such as polyphenols, directly influences the wines sensory characteristics and, therefore, these substances are widely used to differentiate the geographic region of origin of these products. The objective of this work was to perform a characterization of chemical and phenolic profile of 'Sauvignon Blanc' wines produced in the altitude region of Santa Catarina State. The study was carried out with samples of commercial wines, in 2012 and 2013 vintages, selected from nine wineries. Two samples were taken from each winery to carry out the characterization of chemical compounds, evaluating, in triplicate: ethanol, residual sugar, pH, total acidity, color, total polyphenols and individual phenolic compounds. The results of chemical and phenolic evaluations of commercial wines 'Sauvignon Blanc' demonstrate the quality of these products, with high alcohol content and preservation of organic acids, due to the climatic characteristics of the region, which influence grape maturation. All evaluated samples presented reducing sugar values lower than 5 g L^{-1}, indicating that they were all dry wines. In addition, they presented a coloration (Abs 420nm) of 0.12, these values can be considered low, indicating the absence of oxidation process in the wines. The phenolic compound most present in the wines was caftaric acid, in both vintages. With the exception of p-coumaric acid and GRP the commercial 'Sauvignon Blanc' wines, vintage 2013, presented the highest values of individual phenolic compounds.
Keywords: *Vitis vinifera* L., altitude wines, white wine, phenolic compounds.

PERFIL QUÍMICO E FENÓLICO DE VINHOS DE 'SAUVIGNON BLANC' PRODUZIDOS EM REGIÃO DE ALTITUDE DO ESTADO DE SANTA CATARINA - BRASIL

RESUMO - O perfil de compostos secundários, como os polifenóis, influencia diretamente as características sensoriais de um vinho, e consequentemente sua quantificação pode diferenciar a região de origem desses produtos. Objetivou-se com o presente trabalho, realizar uma caracterização do perfil químico e fenólico de nove vinhos 'Sauvignon Blanc' elaborados na região de altitude de Santa Catarina, identificando e compreendendo as características dos vinhos Sauvignon Blanc elaborados na região. O presente trabalho foi realizado com amostras de vinhos comerciais, safras 2012 e 2013, selecionados de nove vinícolas localizadas nas regiões de altitude catarinense entre 900 e 1427 m, dos municípios de São Joaquim, Urubici, Urupema, Painel, Campo Belo do Sul e Água Doce. De cada vinícola foram retiradas duas amostras para a realização da caracterização dos compostos químicos, avaliando-se, em triplicata: etanol, açúcar residual, pH, acidez total, coloração, polifenóis totais e compostos fenólicos individuais. Foi realizado a descrição em tabelas para os resultados das análises realizadas. Os resultados das avaliações químicas e fenólicas dos vinhos comerciais 'Sauvignon Blanc' demonstram a qualidade desses produtos, com teor alcoólico superior e preservação dos ácidos orgânicas, devido as características climáticas da região, que influenciam na maturação das uvas. Todas as amostras avaliadas apresentaram valores de açúcares redutores inferiores a 5 g L-1, indicando serem todos vinhos secos. Além disso, apresentaram coloração (Abs 420nm) de 0,12, pode-se considerar estes valores baixos, sendo indicativo da não presença do processo de oxidação dos vinhos. O composto fenólico mais presente nos vinhos foi o caftaric acid, nas duas safras avaliadas. Com exceção do p-coumaric acid e o GRP, os vinhos comerciais 'Sauvignon Blanc', safra 2013, apresentaram os maiores valores de compostos fenólicos individuais.
Palavras-chave: *Vitis vinifera* L., vinhos de altitude, vinho branco, compostos fenólicos.

INTRODUCTION

Grapevines cultivated in highland regions of Santa Catarina State, Brazil (26º and 28ºS, at altitudes between 950 and 1,400 m), show potential to produce quality wines, mainly due to the great availability of solar radiation and low night temperatures (MALINOVSKI et al., 2016). Due to the lower air temperatures in these regions, the vine vegetative and reproductive cycle is longer, resulting in slower grape maturation for the production of quality wines (GRIS et al., 2010; VIEIRA et al., 2011; MALINOVSKI et

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al., 2012). In addition, maturation occurs in less rainy months (April and May), which results in grapes with with less rot and higher oenological quality (BRIGHENTI et al., 2015).

These characteristics allow the production of better quality white wines with high aromatic intensity, complexity and typicality (MARCON FILHO, 2015). Among the White varieties introduced and cultivated in the highlands of Santa Catarina, Sauvignon Blanc stands out, showing good adaptation to this region, with late budbreak, avoiding problems related to the occurrence of late frosts (BRIGHENTI et al., 2013). Wines made from 'Sauvignon Blanc' grapes have a marked acidity with fresh flavor (WÜRZ et al., 2018; WÜRZ et al., 2020; CALIARI et al., 2021).

The wine final quality depends on several factors, such as the origin of the raw material, the environmental factors involved during grape cycle, cultural practices on the vineyard management, the fermentation and possible reactions that occur during this process (KARASZ et al., 2005; LOVATO; WAGNER, 2012).

The wines chemical characterization allows evaluating the control in the elaboration, which can be related to the main technological factors used during their production. Determining the wine chemical composition allows to assess the relationship between its components and the technology of grape production and winemaking used by the grower, proving its stability, even allowing to characterize wines from specific regions and attesting the wine quality (OUGH, 1992; CASTILHOS; BIANCHI, 2011). Because the final quality of the product, related to aspects of flavor, aroma, consistency and wine appearance, depends on wine chemical constitution, and on the interaction between them and their quantities (OLIVEIRA et al., 2011).

The profile of secondary compounds, such as polyphenols, directly influences the wines sensory characteristics and, therefore, these substances are widely used to differentiate the geographic region of origin of these products (RIBÉREAU-GAYON et al., 2006; JACKSON, 2008; GREEN et al., 2011). In wines, polyphenols are a quality parameter due to their contribution to organoleptic characteristics, particularly color and taste sensations such as astringency and bitterness (phenolic acids and flavanol) (RIBÉREAU-GAYON et al., 2006; GÓMEZ-ALONSO et al., 2007). Other substances, such as organic acids, participate in physicochemical and biochemical reactions, from grape maturation to wine stability, influencing the taste and aromatic balance of wines (BORDIGNON-LUIS; BURIN, 2021).

It is essential to evaluate the chemical and phenolic composition of 'Sauvignon Blanc' wines, and in this context, the aim of this work is to carry out a characterization of chemical and phenolic profile of nine 'Sauvignon Blanc' wines made in highlands of Santa Catarina State - Brazil, and thus identify and understand the main characteristics of these wines.

MATERIAL AND METHODS

The present study was carried out with samples of commercial wines, vintages 2012 and 2013, selected from nine wineries located in the altitude regions of Santa Catarina State, between 900 and 1427 m a.s.l. (Table 1), in the municipalities of São Joaquim, Urubici, Urupema, Painel, Campo Belo do Sul and Água Doce. For each wine, the vineyards characteristics were described. The information was collected through a questionnaire completed by the technical responsible of each winery, as indicated in Table 2.

TABLE 1 - 'Sauvignon Blanc' wine samples used for chemical characterization according to winery, altitude and vintage.

Winery code	Altitude (m)	Vintage 2012	Vintage 2013
A	1250	x	x
B	1150	x	x
C	1250	x	x
D	1130	x	x
E	1300	x	x
F	900	(1)	x
G	1260	x	(1)
H	1427	x	(1)
I	935	(1)	x

(1) = samples not available for analysis. x = samples available for analysis

TABLE 2 - Vineyards characteristics that originated the grapes for elaboration of 'Sauvignon Blanc' wine samples used for chemical characterization.

Winery code	Coordinates			Planting Year	Spacing (m)		Rootstock	Training System
	Latitude	Longitude	Altitude (m)		Line	Plant		
A	28º17' S	49º55' W	1250	2004	3.0	1.2	1103 P	VSP(1)
B	28º22'04" S	49º49’52” W	1150	2001	3.0	1.2	1103 P	VSP
C	---	---	1250	2005/06	2.5	1.0	1103 P/101-14 Mgt	VSP
D	---	---	1130	2006/08	3.5	1.5	1103 P	VSP
E	28º08'32” S	49º48’4” W	1300	2005	3.0	1.5	1103 P	VSP
F	27º 11.026' S	51º10’9” W	900	2005	3.0	1.0	1103 P	VSP
G	26º43’48” S	51º30’10” W	1260	2005	2.9	1.5	1103 P/3309 C	VSP
H	28º19’01” S	49º54’00” W	1427	2007	3.0	1.2	1103 P	VSP
I	27º40’12” S	50º44’39” W	935	2006/07/09/10	3.0	1.0	1103 P	VSP

(1)VSP = vertical shoot position trellis. --- = not informed.

Two samples (750 mL bottle) were taken from each winery to carry out the characterization of chemical compounds in 'Sauvignon Blanc' wines. One of the samples was stored as a control, and the other was transported to University of Auckland in New Zealand, for chemical and phenolic analysis. The samples were kept in a room with controlled temperature (18ºC) until the moment of analysis. Immediately after opening the bottles, total and individual polyphenols and conventional analyzes were performed.

Total acidity (TA), pH, residual sugar and ethanol content (%v/v) were performed on a WineScan (FOSS, Hillerød, Denmark). pH was measured utilising a Thermo Orion 420 A + pH metre (ThermoFisher Scientific, Waltham, MA). Wine tristimulus colour was obtained by full spectrum scanning from 280 to 780 nm at 5-nm increments using a Shimadzu, UV-1700 spectrophotometer (Kyoto, Japan), followed by integration utilising the method set forth in the Compendium of International Methods of Wine and Must Analysis (OIV, 2014). Wine samples were placed into 10-mm glass cuvettes and spectra obtained in the transmittance mode. Values for L∗, a∗, and b∗ were obtained through integration and the tables provided within the reference literature.

Total phenolic content was established by the Folin–Ciocalteu assay, as described by Bajčan et al. (2013). In a 50 mL volumetric flask, 1.0 mL of wine or gallic acid standard and 5.0 mL of 18 Ohm water were added. To this 0.25 mL of Folin–Ciocalteu reagent and 3.0 mL of 20% sodium carbonate were added. The flasks were brought to volume with distilled water and placed at room temperature, shielded from light for 90 min. The sample absorbance was then measured at 765 nm. Folin–Ciocalteu reagent was obtained from Sigma-Aldrich (St. Louis, MO).

Phenolic compounds were determined by HPLC using the method described by Olejar et al. (2015). Wine and standard solutions were filtered through 0.2-µm syringe filter and 20 µL of the filtrate were injected into an Agilent 1100 HPLC with UV/Vis detector (Santa Clara, CA) and an ESA Coulochem III electrochemical detector (Waltham, MA). Chromatography occurred at 1.0 mL/min. over 30 min. at 40 °C on a 3.0 × 100 mm, 3 µm, Supelco Ascentis RP-amide column (Bellefonte, PA). Analyte separation was performed using a gradient elution of mobile phase A: 30 mmol phosphate buffer at pH 2.6, and mobile phase B: a mix (30:10:60) of 100 mmol phosphate buffer, methanol, and acetonitrile at pH 2.6. The gradient was 0-10 min. 12% B, 10-15 min. 30% B, 15-17.5 min. 55% B, 17.5-21 min. 55% B, 21-23 min. 100% B, and 23-25 min. 0% B. Detection of analytes was done at 280, 305, 320 and 365 nm, as well as at 450 and 750 mV. Methanol, etanol and acetonitrile were obtained from Scharlau (Sentmenat, Spain). 18-Ohm water was produced with a Barnsted Nanopure water system (Thermo Scientific, Waltham, MA). The standards anhydrous gallic acid (≥98%), (+) - catechin (≥98%), epicatechin (≥98%), caftaric acid (≥98%), 2-S-glutationiltrans-caftaric acid (GRP) (≥98%), p-coutaric (≥ 98%), caffeic acid (≥98%) and p-coumaric acid (≥98%) were obtained from Sigma-Aldrich (Darmstadt, Germany).

For each sample, a duplicate reading was performed and when a variation > 10% was detected, a third reading was performed. Samples of wines from vintage 2012 (n=9) and vintage 2013 (n=9) were used. A description was performed in tables for the results of conventional analyzes and phenolic compounds. All analyzes were performed in triplicate, data were analyzed using descriptive statistics (mean and standard deviation).

RESULTS AND DISCUSSION

The data regarding chemical composition of 'Sauvignon Blanc' commercial wines are described in Table 3.

TABLE 3 - Chemical composition (ethanol, total acidity and pH) of commercial 'Sauvignon Blanc' wines produced in altitude regions of Santa Catarina State, Brazil. Vintages 2012 and 2013.

Winery	Ethanol (%)		Total acidity (g L^{-1})		pH	
	2012	2013	2012	2013	2012	2013
A	11.9	12.8	6.5	6.2	3.16	3.28
B	13.6	12.8	5.4	6.3	3.30	3.21
C	14.0	14.4	6.2	6.4	3.28	3.20
D	13.9	13.9	5.1	7.0	3.41	3.08
E	13.8	12.6	6.7	7.1	3.17	3.06
F	---	11.9	---	7.3	---	3.16
G	12.4	---	6.8	---	3.17	---
H	14.2	---	6.0	---	3.34	---
I	---	11.5	---	6.6	---	3.22
Average*	13.4 ± 0.9	12.9 ± 1.0	6.1 ± 0.6	6.7 ± 0.4	3.26 ± 0.10	3.17 ± 0.08

*Average ± standard deviation. --- = not informed.

The variable ethanol presented, among the nine samples, an average value of 13.4% in 2012 and 12.9% in 2013. The total acidity variable presented mean values of 6.1 g L^{-1} and 6.7 g L^{-1}, for wines from 2012 and 2013 vintages, respectively. The pH value observed in the samples was 3.26 for wines from vintage 2012 and 3.17 for wines from vintage 2013. In this context, there was a reduction in values of ethanol and pH from vintage 2012 to the vintage 2013, and an increase in the value of total acidity, this difference being related to diferences in the level of grape ripeness. The results indicate that Sauvignon Blanc wines meet the identity and quality standards established by the Ministry of Agriculture, Livestock and Supply for fine dry white wines (BRASIL, 2018). In addition, the wines presented very similar values between the two evaluated vintages.

The color of 'Sauvignon Blanc' commercial wines presented identical values in both evaluated vintages (A 420nm), with a value of 0.12 (Table 4). However, it is noteworthy that in the vintage 2012, the evaluated samples have similar color values, ranging from 0.10 to 0.14, while in the vintage 2013, there were variations in color from 0.09 to 0.16. Color is one of the most important properties of must and wines from white varieties. The oxidation process that occurs frequently in white wines is a well-known problem in the winemaking industry because the color of musts and wines can be modified (CEJUDO-BASTANTE et al., 2010). An increase in absorbance values is an indication of oxidative coloration occurring in wine (SKOUROUMOUNIs et al., 2005). This is due to the oxidation of phenolic compounds to their corresponding o-quinones, in several degrees of polymerization, causing yellow-brown coloration (DU TOIT et al., 2006).

Regarding the residual sugar of 'Sauvignon Blanc' commercial wines, vintage 2012, had value of 2.3 g L^{-1}, while wines vintage 2013 had a value of 1.9 g L^{-1}. In both vintages it was observed that the wines presented a variation of residual sugar from 1.3 to 2.5 g L^{-1}, with the exception of sample E, vintage 2012, which presented 4.4 g L^{-1} of residual sugar. Regarding on the values of residual sugars, all samples are classified as dry wines (BRASIL, 2018).

TABLE 4 - Chemical composition (color and residual sugar) of commercial 'Sauvignon Blanc' wines produced in altitude regions of Santa Catarina State, Brazil. Vintages 2012 and 2013.

Winery	Color (A420 nm)		Residual sugar (g L^{-1})	
	2012	2013	2012	2013
A	0.14	0.14	2.9	1.6
B	0.10	0.09	1.3	1.5
C	0.13	0.16	2.2	2.2
D	0.11	0.11	1.5	1.5
E	0.10	0.09	4.4	2.5
F	---	0.13	---	2.4
G	0.13	---	2.3	---
H	0.12	---	1.7	---
I	---	0.13	---	1.7
Average*	0.12 ± 0.02	0.12 ± 0.03	2.3 ± 1.1	1.9 ± 0.4

*Average ± standard deviation. --- = samples not available for analysis.

Polyphenols play important role in sensory characteristics of wine, such as color, astringency, and bitterness (WÜRZ et al., 2020), and they play a major role in wine quality (CONDE et al., 2007). The content of total polyphenols, and the evaluation of individual polyphenols are described in Table 5. It was observed for 'Sauvignon Blanc' commercial wines, vintages 2012 and 2013, values of total polyphenols of 182.7 and 196.1 mg L^{-1}, respectively.

It is noteworthy that in both evaluated vintages, there was variation between the different samples, ranging from 163.6 to 204.9 mg L^{-1} for vintage 2012, and from 163.2 to 247.0 mg L^{-1}, for vintage 2013. There was no major change in the values found between the evaluated vintages. Traditionally, vinification of white wines does not include skin contact with the skin, seeds and rachis of grapes; as result, the polyphenol content in white wines is substantially lower than in red wines. A thorough knowledge of the various polyphenolic structures present in the grape and the mechanisms of its evolution during winemaking is an indispensable basis to development of the technological processes adapted both the vineyard and the winery (WÜRZ et al., 2017).

TABLE 5 - Phenolic compounds (total polyphenol, gallic acid, catechin and epicatechin) of commercial 'Sauvignon Blanc' wines produced in altitude regions of Santa Catarina State, Brazil. Vintages 2012 and 2013.

Winery	Total Polyphenol (mg L^{-1})		Gallic acid (mg L^{-1})		Catechin (mg L^{-1})		Epicatechin (mg L^{-1})	
	2012	2013	2012	2013	2012	2013	2012	2013
A	204.9 ± 2.22	199.2 ± 8.41	0.5 ± 0.03	0.4 ± 0.02	2.3 ± 0.10	1.6 ± 0.04	0.9 ± 0.04	0.7 ± 0.02
B	163.6 ± 0.62	163.2 ± 4.70	0.2 ± 0.01	1.0 ± 0.002	0.9 ± 0.003	0.3 ± 0.01	0.4 ± 0.003	0.1 ± 0.01
C	204.5 ± 2.38	247.0 ± 2.16	0.6 ± 0.02	1.6 ± 0.02	0.6 ± 0.02	1.9 ± 0.08	0.4 ± 0.01	1.8 ± 0.03
D	186.2 ± 5.72	166.9 ± 3.50	0.4 ± 0.00	0.1 ± 0.001	1.1 ± 0.03	1.3 ± 0.02	0.4 ± 0.01	0.4 ± 0.04
E	186.6 ± 0.94	178.0 ± 3.71	0.7 ± 0.03	0.3 ± 0.01	2.1 ± 0.08	2.1 ± 0.03	0.4 ± 0.002	1.0 ± 0.03
F	---	210.4 ± 5.26	---	0.4 ± 0.01	---	5.1 ± 0.05	---	1.9 ± 0.02
G	168.2 ± 3.04	---	0.4 ± 0.005	---	0.9 ± 0.05	---	0.4 ± 0.002	---
H	164.7 ± 3.39	---	0.2 ± 0.003	---	1.1 ± 0.01	---	0.4 ± 0.03	---
I	---	207.8 ± 0.36	---	0.4 ± 0.004	---	1.5 ± 0.004	---	0.5 ± 0.01
Average*	182.7 ± 17.78	196.1 ± 29.44	0.4 ± 0.19	0.6 ± 0.53	1.3 ± 0.65	2.0 ± 1.50	0.5 ± 0.19	0.9 ± 0.69

*Average ± Standard Deviation**.** --- = samples not available for analysis.

The polyphenol gallic acid had an average value of 0.6 and 1.3 mg L^{-1} for 'Sauvignon Blanc' commercial wines, vintages 2012 and 2013, respectively. There was great variation between samples, with value intervals of 0.2 to 0.7 mg L^{-1} for vintage 2012 and from 0.3 to 1.6 mg L^{-1} for vintage 2013. Gallic acid is originated from the hydrolysis of esters after a few months, it is stable during aging (RIBÉREAU-GAYON et al., 2006). Regarding the polyphenol catechin, mean values of 1.3 and 2.0 mg L^{-1} were observed for vintages 2012 and 2013, respectively. The polyphenol epicatechin showed mean values of 0.5 and 0.9 mg L^{-1} for the samples from vintages 2012 and 2013, respectively.

It was observed for total polyphenols and for individual polyphenols, gallic acid, catechin and epicatechin, a greater variation in the values of commercial wine samples in the vintage 2013. In addition to the greater variation in values between samples, higher values of these three polyphenols were observed in the samples from vintage 2013. Work carried out by Marcon Filho et al. (2021), with wines made from the Sauvignon Blanc grapevine in an altitude region of Santa Catarina State, obtained values higher than those in the present study for the variables Gallic acid, cathecin and total polyphenols.

Flavan-3-ols, represented mainly by catechin and epicatechin are important, because they give astringency to wines (DOWNEY et al., 2003). A study by Salacha et al. (2008), demonstrate a positive correlation between browning of white wines and the presence of catechins. Bitterness and astringency are associated with high levels of flavan-3-ols (CHAPMAN et al., 2004). In this context, low values of catechin and epicatechin are desirable in white wines. These compounds are extracted from grape skins and seeds during the winemaking process and during wine aging, they undergo structural transformations, oxidation and condensation reactions that influence the astringency and color of wines (MATEUS et al., 2003).

The individual polyphenols caftaric acid, GRP and *p*-coutaric acid presented similar values for the samples of 'Sauvignon Blanc' commercial wines, in both evaluated vintages (Table 6 and Table 7). The polyphenol caftaric acid presented values of 16.1 and 16.3 mg L^{-1}, for the samples from vintages 2012 and 2013, respectively. Despite similar values in both vintages, there was a great variation between samples. In vintage 2012, the polyphenol caftaric acid ranged from 1.0 to 26.4 mg L^{-1}, and in vintage 2013, it ranged from 0.2 to 27.9 mg L^{-1}.

TABLE 6 - Phenolic compounds (caftaric acid, GRP, *p*-coutaric acid and caffeic acid) of commercial 'Sauvignon Blanc' wines produced in altitude regions of Santa Catarina State, Brazil. Vintages 2012 and 2013.

Winery	Caftaric acid (mg L^{-1})		GRP (mg L^{-1})		p-Coutaric acid (mg L^{-1})		Caffeic acid (mg L^{-1})	
	2012	2013	2012	2013	2012	2013	2012	2013
A	26.4 ± 1.12	14.0 ± 0.08	4.4 ± 0.17	2.1 ± 0.04	2.6 ± 0.11	0.9 ± 0.02	2.1 ± 0.09	1.4 ± 0.01
B	15.9 ± 0.02	16.4 ± 0.05	4.6 ± 0.01	4.2 ± 0.02	2.2 ± 0.01	1.4 ± 0.003	1.4 ± 0.01	1.2 ± 0.01
C	21.1 ± 0.48	0.2 ± 0.00	5.8 ± 0.13	5.1 ± 0.06	0.6 ± 0.01	ND	8.0 ± 0.08	29.0 ± 0.65
D	18.6 ± 0.43	10.9 ± 0.06	3.6 ± 0.06	6.6 ± 0.08	2.1 ± 0.05	1.1 ± 0.01	1.7 ± 0.04	0.9 ± 0.01
E	17.6 ± 0.04	22.0 ± 0.29	3.1± 0.01	2.6 ± 0.19	2.6 ± 0.05	2.6 ± 0.01	3.5 ± 0.01	0.6 ± 0.03
F	---	27.9 ± 0.26	---	4.9 ± 0.28	---	4.1 ± 0.04	---	2.1 ± 0.03
G	12.4 ± 0.11	---	4.2 ± 0.04	---	0.9 ± 0.01	---	3.1 ± 0.04	---
H	1.0 ± 0.004	---	6.7 ± 0.18	---	0.5 ± 0.01	---	0.4 ± 0.003	---
I	---	22.8 ± 0.48	---	5.9 ± 0.14	---	1.8 ± 0.03	---	0.9 ± 0.03
Average*	16.1 ± 7.98	16.3 ± 9.16	4.6 ± 1.25	4.5 ± 1.65	1.6 ± 0.93	1.7 ± 1.34	2.9 ± 2.48	5.2 ± 10.53

*Average ± standard deviation**.** --- = samples not available for analysis.

TABLE 7 - Phenolic compounds (*p*-coumaric acid) of commercial 'Sauvignon Blanc' wines produced in altitude regions of Santa Catarina State, Brazil. Vintages 2012 and 2013.

Winery	*p*-coumaric acid (mg L^{-1})	
	2012	2013
A	0.5 ± 0.04	0.4 ± 0.03
B	0.5 ± 0.005	0.2 ± 0.003
C	2.5 ± 0.05	2.4 ± 0.03
D	0.5 ± 0.01	0.3 ± 0.01
E	1.1 ± 0.01	0.1 ± 0.002
F	---	2.1 ± 0.03
G	0.7 ± 0.01	---
H	0.5 ± 0.01	---
I	---	0.3 ± 0.003
Average*	0.9 ± 0.73	0.6 ± 0.82

***A**verage + **s**tandard deviation**.** --- = samples not available for analysis.

Among the 8 compounds identified, caftaric acid had the highest concentration. According to Vrhovšek et al. (1997) caftaric acid is by far the most abundant hydroxycinnamic acid in white varieties of *Vitis vinifera*. The content of polyphenols in white wines is substantially lower than in red wines, and composed almost mainly of hydroxycinnamic acid derivatives (JACKSON, 2014). The main function of hydroxycinnamic acids is their participation in oxidation reactions that lead to the browning of musts and wines, especially in white varieties, especially caftaric acid, while in red grapes they participate in reactions with anthocyanins, acting as co-pigments. Hydroxycinnamic acids are involved in the appearance of volatile phenols with consequent aromatic changes (RIBÉREAU GAYON et al., 2006; SPÁCIL et al., 2008).

In relation to polyphenol GRP, values of 4.6 and 4.5 mg L^{-1} were observed in 'Sauvignon Blanc' commercial wines, vintages 2012 and 2013, respectively, showing less variation between the evaluated samples. Glutathione is an antioxidant tripeptide formed by three acidic amino acids - cysteine, glutamate and glycine - and present in musts and wines. This tripeptide can regenerate the o-diphenol group of enzymatically oxidized trans-cafaric acid, giving rise to 2-S-glutathioltrans-caftaric acid (GRP) and thus inhibiting wine browning (CEJUDO-BASTANTE et al., 2010; KRITZINGER et al., 2013). A similar behavior was observed for the polyphenol *p*-coutaric acid, with more standardized values between the samples, with average values of 1.6 and 1.7 mg L^{-1} of *p*-coutaric acid, for the samples of vintages 2012 and 2013, respectively.

Unlike the polyphenols caftaric acid, GRP and *p*-coutaric acid, higher values were found for caffeic acid in commercial wines from vintage 2013 compared to 2012. While 'Sauvignon Blanc' wines from vintage 2012 presented 2.9 mg L^{-1} of caffeic acid, the vintage 2013 presented values of 5.2 mg L^{-1}. This difference is directly related to the wine sample "C", which presented a value of 29.0 mg L^{-1} caffeic acid in the vintage 2013; the other commercial wines presented values of caffeic acid from 0.6 to 2.1 mg L^{-1}. It is noteworthy that for commercial wines from vintage 2012, the sample "C" also differed from the others. The sample "C" presented 8.0 mg L^{-1} of caffeic acid in 2012, while the other samples varied from 0.4 to 3.5 mg L^{-1}.

The phenolic compound *p*-coumaric acid presented values of 0.9 and 0.6 mg L^{-1}, for 'Sauvignon Blanc' commercial wines, in vintages 2012 and 2013, respectively. They showed less variation between samples. It is noteworthy that the phenolic compound *p*-coumaric was, together with GRP, the only phenolic compounds that showed lower values in the vintage 2013 compared to 2012. For all other evaluated phenolic compounds in 'Sauvignon Blanc' commercial wines, the vintage 2013 presented higher values compared to wines from the vintage 2012. According

to Würz et al. (2017), the importance of p-coumaric acide is related to phenomena of oxidative browning that the musts or white wines can suffer. These compounds, rich in hydroxyl groups, are the first phenolic substances to be oxidized by the phenoloxidase enzymes in the respective quinones. These quinones are involved in reactions that lead to the appearance of compounds, with colorings ranging from yellow to brown, in musts.

Phenolic compounds are important for plant growth and reproduction, also acting as antipathogens (stress conditions such as infections and wounds) and protection against UV radiation (RUSJAN et al., 2012). They still contribute to pigmentation, astringency, aromas and oxidative stability. In viticulture these compounds are responsible for the qualitative and organoleptic composition of wines, such as color, body and astringency (NACZK; SHAHIDI, 2004).

Further studies related to the characterization of wines from the Santa Catarina highlands are essential, especially related to the aromatic and phenolic profile of the wines, and thus monitoring and evaluating the qualitative evolution of the wines produced.

CONCLUSIONS

The results of chemical and phenolic evaluations of commercial wines 'Sauvignon Blanc' demonstrate the quality of these products, with high alcohol content and preservation of organic acids, due to the climatic characteristics of the region, which influence grape maturation.

All evaluated samples presented reducing sugar values lower than 5 g L^{-1}, indicating that they were all dry wines. In addition, they presented a coloration (Abs 420 nm) of 0.12, these values can be considered low, indicating the absence of oxidation process in the wines.

The phenolic compound most present in the wines was caftaric acid, in both vintages. With the exception of p-coumaric acid and GRP the commercial 'Sauvignon Blanc' wines, vintage 2013, presented the highest values of individual phenolic compounds.

ACKNOWLEDGEMENTS

To the researcher Paul Kilmartin of The University of Auckland, who contributed to the analysis of wine samples.

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