TECHNICAL NOTE/NOTA TÉCNICA

AGRONOMIC PERFORMANCE OF 'SAUVIGNON BLANC' VARIETY TRAINED IN Y-TRELLIS AND VERTICAL SHOOT POSITION TRELLIS IN A HIGH-ALTITUDE REGION OF SOUTHERN BRAZIL

COMPORTAMENTO AGRONÓMICO DA VARIEDADE 'SAUVIGNON BLANC' CONDUZIDA EM Y E ESPALDEIRA NUMA REGIÃO DE ALTITUDE ELEVADA DO SUL DO BRASIL

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SUMMARY

The objective of the present work was to compare the effect of the training systems Y-trellis (Y) and Vertical Shoot Position trellis (VSP) on the production efficiency and chemical characteristics of grapes and wine from 'Sauvignon Blanc' cultivated in high altitude regions of Santa Catarina State, Brazil. The study was carried out in 2013, 2014 and 2015 harvests in a commercial vineyard located in the municipality of São Joaquim - SC (28º 17 '38 "S and 49º 55'54" O, altitude 1350 m). The obtained data were subjected to analysis of variance (ANOVA) with F Test ($p \leq 0.05$). The relationship between the vegetative growth and the yield was influenced by the training system. For the 'Sauvignon Blanc' cultivar, the yield was 93% higher in the Y-trellis training system, resulting in better vegetative-productive balance. The technological and phenolic maturation of the grapes were similar in both training systems. The results of this study show that the Y-trellis training system is an alternative to use in Santa Catarina altitude regions because it provides an increased productivity on the 'Sauvignon Blanc' variety without compromising the composition of grapes, when comparing to the VSP training system.

RESUMO

O presente trabalho teve como objetivo avaliar a produtividade e as características químicas da uva e do vinho da variedade 'Sauvignon Blanc' quando conduzida em "Y" (Manjedoura) e Espaldeira em regiões de altitude elevada do Estado de Santa Catarina, Brasil. O estudo foi realizado durante as vindimas de 2013, 2014 e 2015 numa vinha comercial localizada no município de São Joaquim – SC (28º 17' 38" S e 49º 55'54" O, altitude 1350 m). Os dados obtidos foram submetidos à análise de variância (ANOVA) com Teste F ($p \leq 0,05$). A relação entre o crescimento vegetativo e a produção foi influenciada pelo sistema de condução. Para a variedade 'Sauvignon Blanc', a produtividade foi 93% superior no sistema de condução 'Y' (manjedoura), tendo sido obtido melhor equilíbrio entre vegetação e produtividade. A maturação tecnológica e fenólica das uvas foi similar nos sistemas de condução avaliados. Os resultados deste estudo evidenciam que o sistema de condução "Y" (mangedoura) é uma alternativa em relação à utilização do sistema Espaldeira nas regiões de altitude de Santa Catarina por proporcionar um aumento da produtividade na variedade 'Sauvignon Blanc' sem comprometer a composição das uvas.

Key words: *Vitis vinifera* L., training systems, vegetative-productive balance, productivity, grape quality.
Palavras-chave: *Vitis vinifera* L., sistemas de condução, equilíbrio vegetativo-produtivo, produtividade, qualidade da uva.

INTRODUCTION

The high altitude regions of Santa Catarina State, Brazil, are characterized by having vineyards between 900 and 1400 meters above sea level, longer phenological cycles, greater solar availability and greater thermal amplitude in comparison to other Brazilian wine-growing regions (Brighenti *et al*., 2013). Due to these characteristics, the cultivation of the *Vitis vinifera* L. varieties is favored, reaching maturity indexes that allow elaboration of wines differentiated by their intense color, aroma and acidity (Marcon Filho *et al*., 2015).

The production of wine grapes in high altitude regions is based on vertical shoot position trellis (VSP), and the vines are pruned in spur cordon (Falcão *et al*., 2008). However, the use of VSP generally results in excessive vegetative growth in the vineyards due to the high water availability (Bem *et al*., 2016), combined with high concentrations of organic matter in the soil (Zalamena *et al*., 2013) and choice of vigorous rootstocks. According to Marcon Filho *et al.,* (2015), in grapevines, as in most fruitful species, the balance between the fruit load (drain) and the leaf area (source) induce the quantity and quality of production. The balance between these two parameters is determinant for the composition and maturation of grape berries.

The grapevine has a great diversity of architecture in its canopy and perennial parts, constituting different training systems (Wurz *et al*., 2019). To overcome the problem of excessive vigor, changing the shape of the canopy can be an alternative to achieve a balance between vegetative growth and production. In addition, it can be done by the canopy division, which simultaneously increases the production and can improve grape composition (Reynolds and Vanden Heuvel, 2009). According to Clímaco *et al*., (2003), excessive vigor induces less productivity. One alternative of canopy division is the adoption of the Y-trellis, which has been used in many regions of Brazil (Falcão *et al*., 2008; Hernandes *et al*., 2013). This training system, despite having higher initial implantation cost than the VSP, has the advantage of increasing production without loss of grape quality, besides facilitating the installation of plastic cover for protected cultivation (Pedro Junior *et al*., 2015).

Besides influencing the plant ecophysiology (Favero *et al*., 2010), the training systems can affect vineyard productivity (Hernandes *et al*., 2013; Pedro Junior *et al*., 2015; Wurz *et al*., 2019), grape quality (Palliotti, 2012; Wurz *et al*., 2019), wine sensory properties and phenolic characteristics (Fragasso *et al*., 2012), and diseases epidemiology (Bem *et al*., 2016; Bem *et al*., 2017).

Among the varieties grown in areas above 900 m in Santa Catarina State, there is 'Sauvignon Blanc', the white variety that is well adapted to altitude conditions. In addition to better adaptation to edaphoclimatic conditions of high altitude regions of Santa Catarina, 'Sauvignon Blanc' wines presents high quality with specific features such as high aromatic complexity and quality (Brighenti *et al*., 2013). The objective of the present work was to compare the effect of the training systems Y-trellis and VSP on the yield efficiency and chemical characteristics of 'Sauvignon Blanc' cultivated in high altitude regions of Santa Catarina State, Brazil.

MATERIAL AND METHODS

The study was conducted during the 2013, 2014 and 2015 vintages in a commercial vineyard located in the municipality of São Joaquim – Santa Catarina (SC) (28º13'86"S and 49º81'14"W, altitude 1350 m above sea level). The climate of the region is humid mesothermic (Cfb) according to the Koppen classification (Peel *et al*., 2007), and the soil type is Cambisol, which is characterized by high levels of clay (485 g/kg) and organic matter (69 g/kg). A large amount of precipitation occurs in this region from October to March, during which the average rainfall is approximately 145 mm per month.

The variety 'Sauvignon Blanc' grafted on the rootstock Paulsen 1103 was used, with spacing of 3.0 m between rows and 1.5 m between plants. The experimental design was based on randomized blocks with five replications and five plants per plot.

The implantation of the vineyard was carried out in the winter of 2009. The training systems Y-trellis and VSP were compared. The vines were pruned in bilateral spur cordon with two buds for VSP and two to four buds for Y-trellis, which corresponded to an average of 45 and 74 buds per plant, respectively. Management practices (pruning, leaf removal, shoot trimming and phytosanitary treatments) were carried out by the company in accordance with the recommendations of the technicians in charge.

The grapes were harvested on 02/25/2013, 03/06/2014 and 02/12/2015, according to the winery standards. At harvest, five plants per plot were selected to obtain the number of clusters, production per plant and productivity per hectare. The production per plant was determined with an electronic scale, and the results were expressed in kg/plant. Estimated productivity (t/ha) was obtained by multiplying production per plant by planting density (2222 plants/ha).

The leaf area was estimated during the grape harvest. Ten shoots per plot, located in the middle third of the plant, were selected. The central vein

length of all leaves of the shoot was measured using a ruler graduated in cm. Total leaf area per shoot was obtained according to mathematical models developed by Borghezan *et al.* (2010). The total leaf area per plant (cm²) was determined from the average leaf area of the shoot, multiplied by the average number of shoots per plant.

The measurement of balance between vegetative and productive growth was carried out through the ratio between production per leaf area (kg/m²), obtained by the ratio between the average values of production per plant and leaf area. The Ravaz Index (IR) was also calculated, which is the quotient between the average mass of clusters, produced by a given plant in kg, and the average mass of shoots in kg, produced by the same plant, measured during winter pruning.

At harvest, five clusters per plot were randomly sampled to carry out the physical analyzes: cluster length (cm), measured using a digital caliper; cluster weight (g) and rachis weight (g), measured with an analytical scale; number of berries per cluster, obtained by manual counting of berries.

Berry weight (g) was calculated from [(cluster weight - rachis weight) / Number of berries]. The cluster compactness index was obtained by the [(cluster weight) / (cluster length)²] as proposed by Tello and Ibáñez (2014). The berry diameter (cm) was measured by transversal measurement of diameter from 20 berries per plot.

At harvest, 100 berries per plot were collected to determine grape technological and phenolic maturity. The berries were taken to the Enology Laboratory of Santa Catarina State University, where they were weighed and separated from skins.

From the must obtained from flesh maceration, soluble solids (°Brix), total acidity (meq/L) and pH were determined, according to the methodology proposed by OIV (2009).

The extract solutions were obtain through the methodology described by Marcon Filho *et al.*, (2015); the concentration of total polyphenols in the skins was determined by the spectrophotometry method of Singleton and Rossi (1965), using the Folin-Ciocalteu reagent (Vetec), and gallic acid as standard, with absorbance measurement at 760 nm.

The data were submitted to analysis of variance (ANOVA) with F Test ($p \leq 0.05$) in a 2 x 3 factorial scheme, considering the vintage as a factor. The variables significantly influenced by the vintage were also submitted to principal components analysis (PCA).

RESULTS AND DISCUSSION

The production variables (number of clusters, production per plant and yield per hectare) of 'Sauvignon Blanc' grown in high altitude regions were influenced by the training systems (Table I). On average, 81 clusters per plant for Y-trellis and 54 clusters per plant for VSP were observed. Higher bud load left after winter pruning was related with higher number of clusters obtained in Y-trellis. A similar result was reported by Pedro Junior *et al.* (2015) when evaluating the same training systems for 'Cabernet Sauvignon'. Regarding the production and yield, Y-trellis presented, in all evaluated vintages, higher averages than VSP. Production ranged from 3.1 to 6.0 kg per plant in VSP and from 6.7 to 12 kg per plant in Y-trellis. The increase in production observed in both training systems from 2013 to 2015 is due to plant development, given that the evaluations started in a four-year vineyard. The production found in this work was higher than the values found by Borghezan *et al.*, (2011). In a previous study that evaluated the productive behavior of 'Sauvignon Blanc' in a high altitude region, it was found production values of 2.7 kg per plant (Borghezan *et al.*, 2011). As much as the work was carried out in the same growing region, this difference in production is due to vegetative conditions of each vineyard.

The plants trained in Y-trellis were on average 93% more productive than theplants trained in VSP, with an accumulated yield in three vintages of 59.1 t/ha, while VSP accumulated 30.5 t/ha. Higher productivity in training systems that allow canopy division were also reported by Hernandes *et al.* (2013) with 'Niágara Rosada' and by Pedro Junior *et al.* (2015) with 'Cabernet Sauvignon', both in Brazil. The Y-trellis is recommended because it favors higher number of buds and shoots, increasing yield and allowing better vegetative reproductive balance, without losses in grape quality (Marcon Filho *et al.*, 2015).

The higher values of yield components (number of clusters, cluster weight and number of berries per cluster) observed in plants trained in Y-trellis explain the difference in productivity between the two training systems. Vines with divided canopy tend to have higher yields than those in undivided canopy, generally because of better leaf area exposure and light interception, as well as the higher number of buds that are left per length unit in the pruning line (Reynolds and Vanden Heuvel, 2009).

Table I

Effect of Y-trellis and VSP training systems on 'Sauvignon Blanc' production variables in high altitude region of SC. 2013, 2014 and 2015 vintages

Efeito do sistema de condução Y e Espaldeira nas variáveis produtivas na 'Sauvignon Blanc' em região de elevada altitude de SC. Vindimas de 2013, 2014 e 2015

Parameters	Vintage	Training System		F Test (ANOVA)
		Y	VSP	p<0.05
Number of clusters per plant	2013	55 ± 8	27 ± 4	*
	2014	93 ± 16	74 ± 9	ns
	2015	93 ± 9	60 ± 9	*
	Average	81 ± 21	54 ± 21	*
Production (kg/plant)	2013	6.7 ± 1.0	3.1 ± 0.6	*
	2014	8.0 ± 0.8	5.0 ± 0.9	*
	2015	12.0 ± 0.9	6.0 ± 1.4	*
	Cumulative	26.5 ± 0.7	14.1 ± 1.1	*
	Average	8.9 ± 2.5	4.9 ± 1.5	*
Yield (t/ha)	2013	14.8 ± 2.3	6.8 ± 1.4	*
	2014	17.7 ± 1.9	11.0 ± 2.1	*
	2015	26.6 ± 1.9	12.7 ± 3.0	*
	Cumulative	59.0 ± 2.2	30.4 ± 2.6	*
	Average	19.7 ± 5.5	10.2 ± 3.3	*

* = significant. ns = not significant. Average $\pm$ standard deviation.

Regarding clusters and berries physical characteristics, influence of the training systems on some evaluated variables was observed (Table II). The cluster weight and the number of berries per clusters were higher for Y-trellis, but the berry diameter and berry weight were not affected by training systems in all evaluated vintages. The compactness index did not differ by F Test (p ≤ 0.05) when comparing the training systems within the same vintage. However, in three vintages average there was a tendency that clusters produced in plants trained in Y-trellis to present higher compactness than those produced in VSP (Table 2).

In a previous study evaluating botrytis bunch rot in two training systems (VSP and Y) with 'Sauvignon Blanc', Bem *et al.* (2017) observed higher compactness in clusters produced in Y-trellis, which also resulted in higher incidence and severity of botrytis bunch rot. The Y-trellis tends to reduce vine vigor, leading to a better balance between vegetative growth and production (Reynolds and Vanden Heuvel, 2009); however, due to the higher nutrient flow to the berries, there is also an increase in cluster compactness (Hernandes *et al.*, 2013). The cluster compactness index is considered an important factor to assess grape quality (Tello and

Ibáñez, 2014). This condition can make plants more susceptible to fungal diseases, especially *Botrytis cinerea* (Evers *et al.*, 2010; Bem *et al.*, 2017).

Technological (soluble solids, total acidity and pH) and phenolic (total polyphenols) maturity of 'Sauvignon Blanc' at harvest was not influenced by the training systems in all evaluated vintages (Table III). The soluble solids (SS) content and total acidity (TA) of the must were similar in 2013 and 2014 vintages, around 20 ºBrix and 106 meq/L, for both systems. However, lower values of SS and higher TA were found in 2015 vintage; such situation was due to the occurrence of hail in the vineyard, which caused injuries on the plants, forcing the company to anticipate the grape harvest.

However, it is important to emphasize that, in the first two evaluated years, the levels of SS and TA were appropriate for the production of quality wines. Borghezan *et al.* (2011) and Brighenti *et al.* (2013) also found similar values when they studied the variety 'Sauvignon Blanc' in high altitude regions of Brazil. It is noteworthy that, due to the cold climate of these regions, acids degradation will always be slower and, as a consequence, the levels of titratable acidity are high at harvest.

Table II

Effect of Y-trellis and VSP training systems on 'Sauvignon Blanc' physical characteristics of clusters and berries in high altitude region of SC. 2013, 2014 and 2015 vintages

Efeito do sistema de condução Y e Espaldeira nas características físicas dos cachos e bagos na 'Sauvignon Blanc' em região de elevada altitude de SC. Vindimas de 2013, 2014 e 2015

Parameters	Vintage	Training System		F Test (ANOVA)
		Y	VSP	p<0.05
Cluster weight (g)	2013	126.8 ± 7.4	111.6 ± 8.4	*
	2014	86.7 ± 7.2	66.8 ± 1.9	*
	2015	128.7 ± 5.9	96.5 ± 14.0	*
	Average	114.1 ± 21.0	91.7 ± 21.1	*
Number of berries (berries/cluster)	2013	88 ± 4	75 ± 5	*
	2014	75 ± 8	60 ± 4	*
	2015	98 ± 11	75 ± 7	*
	Average	85 ± 13	71 ± 9	*
Berry weight (g)	2013	1.9 ± 0.1	1.9 ± 0.0	ns
	2014	1.7 ± 0.1	1.6 ± 0.0	ns
	2015	1.7 ± 0.1	1.8 ± 0.1	ns
	Average	1.7 ± 0.1	1.8 ± 0.1	ns
Berry diameter (cm)	2013	1.5 ± 0.0	1.5 ± 0.0	ns
	2014	1.5 ± 0.0	1.5 ± 0.1	ns
	2015	1.4 ± 0.0	1.5 ± 0.0	ns
	Average	1.5 ± 0.1	1.5 ± 0.1	ns
Compactness index	2013	1.0 ± 0.1	0.9 ± 0.0	ns
	2014	0.8 ± 0.1	0.7 ± 0.0	ns
	2015	1.2 ± 0.1	1.1 ± 0.1	ns
	Average	1.0 ± 0.2	0.9 ± 0.1	ns

* = significant. ns = not significant. Average ± standard deviation.

The freshness sensation of wines is directly related to pH and total acidity. In addition, wine pH between 3.3 and 3.6 guarantees better microbiological and physicochemical stability (Jackson, 2014). It was observed, in both training systems, that grape must pH was below 3.3. In this case, lower pH is preferred, because pH tends to increase during and after fermentation.

Regarding the content of total polyphenols in the grape skin, a variation betweenfrom 260.9 to 580.5 mg/L was observed for Y-trellis and from 303.0 to 542.4 mg/L for VSP. This variation is not directly related to the training system, since there was no difference between training systems for polyphenol content in each vintage. Therefore, this variation is ascribed to the effects of climate, nutritional and water status of the plant and grape ripening status at harvest time (Reynolds and Vanden Heuvel, 2009). The skin polyphenols contents observed for 'Sauvignon Blanc' were similar to those obtained by Brighenti *et al.* (2014) in white varieties like 'Vermentino', 'Verdicchio' and 'Prosecco' grown at altitude, and are higher than those found by Wurz *et al.* (2018) in the 'Sauvignon Blanc' variety grown at altitude. Similar results were observed by Bavougian *et al.* (2012), who did not verify the effect of training system on the accumulation of total polyphenols in grape berries.

The relationship between vegetative growth and production of 'Sauvignon Blanc' was influenced by the training systems (Table IV). Considering the results, an index between leaf area and grape production from 16.0 to 19.1 cm²/g for Y-trellis and from 24.9 to 34.6 cm²/g for VSP was observed. The literature reports an interval of 7 to 14 cm² of leaf area per gram of grape to reach berries maturation (Howell, 2001). In high-altitude vineyards, the ideal relationship between leaf area and production was 23 cm²/g for 'Merlot' (Borghezan *et al.*, 2011) and 16 cm²/g for 'Syrah' (Silva *et al.*, 2009).

Table III

Effect of Y-trellis and VSP training systems on 'Sauvignon Blanc' technological and phenolic maturity in high altitude region of SC. 2013, 2014 and 2015 vintages

Efeito do sistema de condução Y e Espaldeira na maturação tecnológica e fenólica na 'Sauvignon Blanc' em região de elevada altitude de SC. Vindimas de 2013, 2014 e 2015

Parameters	Vintage	Training System		F Test (ANOVA)
		Y	VSP	p<0.05
Soluble solids (ºBrix)	2013	20.2 ± 0.3	19.7 ± 0.3	ns
	2014	20.0 ± 0.5	19.8 ± 0.1	ns
	2015	17.3 ± 0.7	16.7 ± 0.7	ns
	Average	19.2 ± 1.5	18.8 ± 1.5	*
Total acidity (meq/L)	2013	106.1 ± 3.4	107.0 ± 11.0	ns
	2014	114.4 ± 15.1	96.8 ± 10.2	ns
	2015	171.3 ± 20.9	155.1 ± 5.5	ns
	Average	130.6 ± 33.1	119.7 ± 27.7	*
pH	2013	-[1]	-[1]	-[1]
	2014	3.24 ± 0.1	3.21 ± 0.2	ns
	2015	2.86 ± 0.0	2.86 ± 0.0	ns
	Average	3.05 ± 0.2	3.03 ± 0.2	ns
Total polyphenols (mg/L gallic acid)	2013	580.5 ± 87.0	542.4 ± 53.1	ns
	2014	289.6 ± 41.1	313.5 ± 38.8	ns
	2015	260.9 ± 41.5	303.0 ± 29.4	ns
	Average	377.0 ± 159.6	386.3 ± 120.6	ns

* = significant. ns = not significant. Average ± standard deviation. [1] Unevaluated data.

Table IV

Effect of Y-trellis and VSP training systems on 'Sauvignon Blanc' for the variables vegetative growth and grape production in high altitude region of SC. 2013, 2014 and 2015 vintages

Efeito do sistema de condução Y e Espaldeira para as variaveis crescimento vegetativo e produtivo na 'Sauvginon Blanc' em região de elevada altitude de SC. Vindimas de 2013, 2014 e 2015

Parameters	Vintage	Training System		F Test (ANOVA)
		Y	VSP	p<0.05
Leaf area: Production (cm²/g)	2013	19.1 ± 2.6	24.9 ± 2.9	*
	2014	16.0 ± 0.7	26.6 ± 6.0	*
	2015	18.1 ± 0.7	34.6 ± 9.0	*
	Average	17.7 ± 2.0	28.7 ± 7.4	*
Production: Leaf area (kg/m²)	2013	0.55 ± 0.08	0.43 ± 0.09	ns
	2014	0.68 ± 0.07	0.45 ± 0.08	*
	2015	0.57 ± 0.04	0.32 ± 0.08	*
	Average	0.60 ± 0.09	0.40 ± 0.10	*
Ravaz index	2013	6.6 ± 1.0	4.5 ± 0.9	*
	2014	8.2 ± 0.9	6.2 ± 1.2	ns
	2015	-[1]	-	-
	Average	7.4 ± 1.2	5.4 ± 1.4	*

* = significant. ns = not significant. Average ± standard deviation. [1] Unevaluated data.

For the index that considers the relationship between production and leaf area, values of 0.55 to 0.68 kg/m² were obtained for Y-trellis and 0.32 to 0.43 kg/m² for VSP. According to Kliewer and

Dokoozlian (2005), in a study in California/USA, the grapevine was in physiological balance with a ratio between 0.5 to 1.2 kg/m^2. In Italy, Intrieri and Filipetti (2000) recommended values from 1.0 to 1.5 kg/m^2 for the production of quality wines. In comparison with the parameters cited by the works above, it was found that Y-Trellis trainning system provides better vegetative and yield relationship, resulting in better vine balance.

Concerning the Ravaz index, values of 6.6 and 8.2 were observed for Y-trellis and 4.5 and 6.2 for VSP. According to Kliewer and Dokoozlian (2005), a Ravaz index between 5 and 10 is required to reach berries maturation. Ravaz index values below 5 do not support the increase of wine grape quality, and indicates that plants invested a bigger amount of energy in shoot growth rather than in cluster development (Allebrandt *et al.*, 2017).

The search for the best production and quality ratio is not always easy, especially in altitude conditions where the humid climate and fertile soil make growth control a challenge. However, it was observed that for Y-trellis the balance indices evaluated resulted in values closer to ideal. The

results obtained indicate that grape production for winemaking is ensured by an adequate leaf area. However, the relation between leaf area and grape production is still outside the ranges reported in the literature; this suggests that it is possible to increase plant productivity in both systems without loss of grape quality.

The principal component analysis (PCA) was performed with the variables that showed statistical difference between the training systems in three vintages. Through the PCA, it was possible to observe that PC1 1 and PC 2 explained 78.38% of the total variance (Figure 1). PC 1, which accounted for 47% of the total variance, clearly separated the averages of Y-trellis and VSP into two groups. Plants trained in Y-trellis are positively related to: production, number of clusters, number of berries, cluster compactness, Ravaz index and total acidity. The VSP system is related to the following variables: leaf area/ production and berry weight. Although the results of univariate analysis have detected consistent effects of training systems, a multivariate approach contributes to characterize the effect of training systems in a general context of the evaluated vintages.
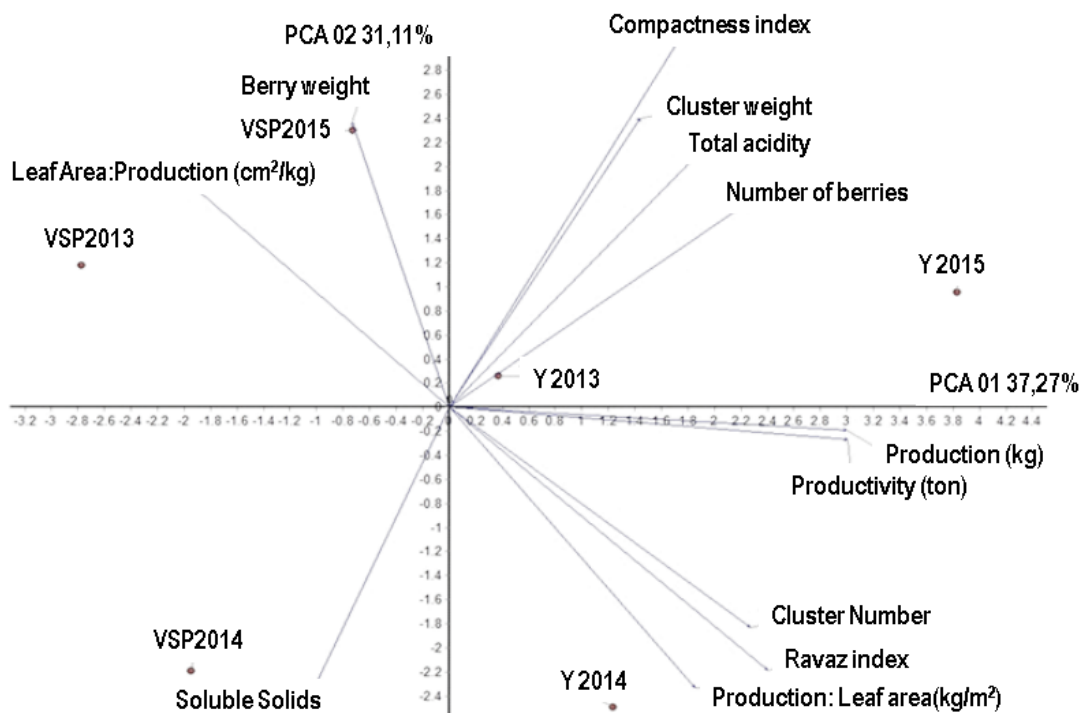

Figure 1. Principal component analysis of productive and vegetative variables: cluster characteristics and berry ripening of 'Sauvignon Blanc' trained in Y-trellis and VSP in high altitude region of SC. 2013, 2014 and 2015 vintages.

Análise de componetes principais das variaveis produtivas e vegetativas: características e maturação dos bagos da 'Sauvignon Blanc' nos sistemas de condução Y e Espaldeira em regiao de elevada altitude de SC. Vindimas de 2013, 2014 e 2015.

CONCLUSIONS

The ratio between vegetative growth and production was influenced by the training systems adopted in high altitude regions of Southern Brazil. Productivity of 'Sauvignon Blanc' was higher in Y-trellis, which resulted in a better vegetative-productive balance.

The technological and phenolic maturity was similar in Y-trellis and VSP training systems.

The results of this study show that Y-trellis is an alternative to use in high altitude regions of Southern Brazil, as it provides increased productivity of 'Sauvignon Blanc' without compromising grape composition, when compared to VSP.

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