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Evaluation of oenological potential on clonal selections of cv. Cabernet Sauvignon from Chile

C. Ceppi de Lecco, Ph. Pszczólkowski, J. Pérez-Harvey, S. Najera, and C. Tastets

PUC Pontificia Universidad Católica de Chile, Departamento de Fruticultura y Enología, Chile

Abstract. 13 clonal selections of cv Cabernet Sauvignon, established in Nancagua VI Region, Chile (34.39 °S 71.17 °W). The genetic identity of the vines was confirmed by ampelography and microsatellite markers (SSR). Evaluations in the 2012–2013 season include: performance, analytical and sensorial parameters on the wines made by microvinification. The results were statistically analyzed with the Statgraphics Plus program and multiple comparison test of Tukey at 95% confidence level. Sensorially, the wines were evaluated by a panel of 12 experts. The results were likewise analyzed by testing principal components (PCA) with covariance matrix without rotation. In the season studied the selection 108 highlighted with a high yield (kg/plant), in the composition of the wine selections generally highlighted for contents of total polyphenols and anthocyanins over average. The results show typical sensory characteristics of wines from that grape variety, and it was possible to group the selections by their attributes (PCA) with cherry red wines at different intensities, but without significant differences, with fruity and vegetal aromas, interesting complex flavors and with structured tannins.

1. Introduction

Chile has positioned itself in the world as a producer of high-quality red wines.

It is currently standing at fourth place in the wine-exporting countries. Standing out among others with wines from cv. Cabernet Sauvignon, the excellence and authenticity of their wines [1].

In Chile, the cultivar Cabernet -Sauvignon with an area of 42,195 Ha of a national total of 130361 Ha [2], ranks first in area of red cultivars [3].

Since the country has a high diversity of genetic material from vines originated with the importation of century XIX noble strains, before the destruction of European vineyards by phylloxera, which is why is it possible to select clones of good quality wine.

The objective of this study was to evaluate the similarities and differences of wine making potential of 13 clonal selections of Chilean cv. Cabernet Sauvignon.

2. Materials and methods

During the agricultural season 1999–2000 at the Catholic University of Chile, a search for clones of different varieties began in the central-south area of the country [4].

The genetic identity of the vines was confirmed by ampelography and microsatellite markers (SSR).

This Clonal Selection Program, currently located in the commune of Nancagua, Region VI Libertador Bernardo O'Higgins (34.39 °S 71.17 °W), has 13 selections of cv Cabernet Sauvignon, which were established in the 2008–2009 season [5]. This cultivation zone is characterized by a semiarid Mediterranean climate, with hot summers and cold winters, high thermal amplitudes and prolonged dry season of 7 to 8 months [2].

The trial was designed in randomized complete block with 3 replications, using as experimental unit a group of 12 plants. Clonal selections were established rootstock on trellises, NS orientation.

In this study are presented the results of evaluations of productive, analytical and sensorial parameters from wines of the 2012–2013 season.

The grapes of the 13 selections were harvested at approximately 25 °Brix and the obtaining of the wines was performed by microvinification, in which the maceration is mild compared to industrial.

The results were statistically analyzed with the Statgraphics Plus program and multiple comparison test of Tukey at 95% confidence level. Sensorially the wines were evaluated by a panel of 12 experts. The results were likewise analyzed by testing principal components (PCA) with covariance matrix without rotation.

The aspects evaluated were: visual characters (evolution and intensity), olfactory characters (fresh fruit, dried fruit, vegetable, dry vegetable), gustatory characters (alcohol, acidity, astringency intensity, dryness and body) and overall quality; which were evaluated on a scale of 1 (lowest perception) to 9 (highest perception).

2.1. Results and discussion

2.2. Yield components

Looking at the results, berry weight, cluster weight and yield (kg/plant) (Table 1) shows that the cluster in the selection 108 is 48.4% heavier than the average, however

Table 1. Yield componets: Berry wt (**g),** cluster wt (g), and yield (kg-vine) of selections of cv. Cabernet-Sauvignon (season 2012–2013) Nancagua, VI región. Chile.

	Peso baya (g)	Peso racimo (g)	Rdto./planta (kg)
102	1.50 a	122.5 a	2.27 a
104	1.50 a	147.4 a	2.40 a
106	1.53 a	135.4 a	2.37 a
108	1.60 a	205.0 b	4.60 b
112	1.50 a	127.5 a	2.43 a
201	1.53 a	134.2 a	2.43 a
202	1.53 a	126.0 a	2.43 a
206	1.53 a	130.2 a	2.10 a
208	1.40 a	122.7 a	2.03 a
301	1.33 a	129.0 a	2.77 a
308	1.53 a	126.5 a	2.80 a
401	1.47 a	149.0 a	2.43 a
408	1.50 a	139.3 a	2.93 a
Mean	1.50	138.1	2.62

Values followed by different letters are different according to the Tukey procedure of significant difference, $P < 0.05$.

Table 2. Anthocyanins, total polyphenols (ITP), color intensity (IC) , selections of cv. Cabernet-Sauvignon (season 2012–2013) Nancagua, VI región. Chile.

	Antocianas (mg/L)	Polifenoles totales	Intensidad colorante
102	372.7a	45.6a	8.03a
104	409.0a	43.0a	6.61a
106	347.7a	46.0a	7.37a
108	378.7a	43.0a	7.32a
112	363.3a	51.1a	8.51a
201	354.3a	62.6b	8.24a
202	377.7a	50.3a	6.90a
206	368.0a	47.6a	6.54a
208	337.3a	50.8a	7.41a
301	358.3a	42.7a	6.61a
308	350.3a	50.0a	7.51a
401	349.0a	47.3a	7.16a
408	292.7a	44.1a	5.47a
Mean	358.4	48.0	7.21

Values followed by different letters are different according to the Tukey procedure of significant difference, $P < 0.05$.

the selection 102 presented the lowest weight in their clusters (11.3% less) compared to the average. Presented significant differences in performance 108 is a 50% higher than average, and 208 showed a 22.5% lower yield.

2.3. Wine analysis

The average concentration of anthocyanins was 358.4 mg/L, with the lowest value of 292.7 mg/L for selection 408, and the greatest of 409.0 mg/L for selection 104, with no significant differences between selections. (Table 2).

The values of total polyphenol index (IPT) average was 48.0, 42.7 being the lowest in the selection 301 and the largest 62.6 in the selection 201, there was significant difference.

Table 3. Titratable acidity, pH, alcohol vol % of the wines of the 13 clonal selections of cv. Cabernet-Sauvignon (season 2012–2013), Nancagua, VI región. Chile.

	Acidez titulable (g/L H_2SO_4)	pH vino	Grado alcohólico
102	4.00 a	3.82 abc	14.6 a
104	3.22 a	4.05 c	13.5 a
106	3.64 a	4.05 c	14.3 a
108	3.47 a	4.02 c	13.6 a
112	4.12 a	3.61 a	14.6 a
201	3.67 a	3.92 abc	14.4 a
202	3.20 a	4.03 c	13.8 a
206	3.29 a	3.91 abc	13.6 a
208	4.00 a	3.64 ab	14.4 a
301	3.58 a	3.78 abc	14.0 a
308	3.43 a	3.98 c	14.1 a
401	3.41 a	3.99 c	14.1 a
408	3.32 a	3.95 bc	13.9 a
Mean	3.57	3.90	14.1

Values followed by different letters are different according to the Tukey procedure of significant difference, $P < 0.05$.

In color intensity (CI), no significant difference was found between selections, the average was 7.21 with a range of values from 5.47 to 8.51, corresponding to selections 408 and 112 respectively.

The titratable acidity in the wines showed no differences between the selections the average value was 3.57 g/L H_2SO_4.

As for pH there were differences between the values, with the selection 112 which gave wines with lower pH (3.61), and the 104 and 106 selections with higher pH (4.05).

For alcoholic strength, there were no statistically significant differences, however the range of values was 13.5° for the selection 104 to 14.6° for the selections 102 and 112.

2.4. Sensory evaluation of wines

En cuanto a intensidad de color la puntuación sobre la media fue para las selecciones 201, 102, 108 (Table 4).

As for color intensity the score over average were for selections 201, 102, 108 (Table 4).

As for the olfactory characters, no significant differences between wines were found for fresh fruit, whose values range from 4.40 to 5.80 for the wines of the selections 206 and 112 respectively.

For dried fruit, it had a range of values from 4.73 for the wines of selection 206, to 5.60 for the wines of the selections 112 and 401, being the average 5.23.

In aromas of fresh vegetable (pepper grass, asparagus, olives, etc.) no differences were found between wines, scores were slightly higher for selections 201, 206, 106, 104 and 408.

To dry flavors such as tea, snuff and/or spices plant no significant differences were found between wines of different selections, the values ranged from 4.27 to 6.07 for the wines of the selections 208 and 206 respectively.

Table 4. Colour and Aromas sensory attributes of the wines of the 13 clonal selections of cv. Cabernet Sauvignon (season 2012–2013), Nancagua, VI region. Chile.

	Intensidad de color	Fruta fresca	Fruta seca	Vegetal fresco	Vegetal seco
102	6.00 a	5.60 a	5.40 a	4.40 a	4.37 a
104	5.13 a	4.73 a	5.13 a	4.47 a	4.34 a
106	5.47 a	4.87 a	5.53 a	5.07 a	4.74 a
108	5.80 a	5.60 a	5.00 a	4.53 a	4.33 a
112	5.53 a	5.80 a	5.60 a	4.40 a	4.57 a
201	6.07 a	5.00 a	5.27 a	4.53 a	4.50 a
202	5.07 a	5.00 a	5.27 a	4.40 a	4.24 a
206	5.53 a	4.40 a	4.73 a	6.07 a	5.37 a
208	5.20 a	5.40 a	5.33 a	4.27 a	4.34 a
301	5.33 a	5.20 a	5.07 a	4.47 a	4.74 a
308	5.40 a	5.07 a	4.93 a	5.07 a	4.74 a
401	5.53 a	5.27 a	5.60 a	4.67 a	4.34 a
408	5.07 a	5.27 a	5.07 a	4.93 a	4.87 a
Mean	5.47	5.17	5.23	4.71	4.57

Values followed by different letters are different according to the Tukey procedure of significant difference, $P < 0.05$.

Table 5. Mouth-feel sensory attributes of the wines of the 13 clonal selections of cv. Cabernet-Sauvignon (season 2012–2013) Nancagua, VI región. Chile.

	Alcohol	Acidez	Astringencia
102	5.53 a	5.87 a	5.73 a
104	5.80 a	4.60 a	5.20 a
106	5.60 a	5.13 a	5.67 a
108	5.80 a	5.73 a	4.93 a
112	5.53 a	5.87 a	5.47 a
201	5.00 a	4.87 a	5.33 a
202	5.33 a	5.20 a	4.80 a
206	5.53 a	5.20 a	5.07 a
208	5.53 a	5.13 a	4.93 a
301	5.67 a	4.87 a	4.40 a
308	5.67 a	5.87 a	5.13 a
401	5.73 a	5.73 a	4.80 a
408	5.80 a	4.87 a	4.93 a
Mean	5.58	5.30	5.11

Values followed by different letters are different according to the Tukey procedure of significant difference, $P < 0.05$.

With regard to gustative characteristics (Tables 5 and 6) alcohol, acidity, astringency and body dryness were determined. Besides the overall quality of the wines was determined (the results can be seen in Table 6).

For parameters: alcohol, acidity, astringency, body and dryness no differences between the different wines were found. In overall quality all wines achieved a high average rating.

In order to visualize more easily the differences and sensory trends in clonal selections a Principal Component Analysis (PCA) for the 13 selections Cabernet Sauvignon (Fig. 1) was performed.

The plane explains 65% of the original variability in the data (23% dimension 1 and 42% on dimension 2) where dimension 1 (Dim1) separates the selections for its identification code and groups them into:

– those selections associated with the visual feature of color intensity, aromas of fresh fruit, dried fruit and structure in the mouth (astringency, body, acidity, alcohol) as are the selections 102, 112, 108 and 208.
– most notably by the intensity of aroma fresh and dry vegetable selections as 106, 104, 408, 201 and 206, the latter located in the vector of dried vegetable.
– locates in the space that shows lower intensity the attributes of the selections 308, 301, 401, 202.

Table 6. Mouth-feel sensory attributes and quality of the wines of the 13 clonal selections of cv. Cabernet-Sauvignon (season 2012–2013) Nancagua, VI región. Chile.

	Alcohol	Acidez	Astringencia
102	5.53 a	5.87 a	5.73 a
104	5.80 a	4.60 a	5.20 a
106	5.60 a	5.13 a	5.67 a
108	5.80 a	5.73 a	4.93 a
112	5.53 a	5.87 a	5.47 a
201	5.00 a	4.87 a	5.33 a
202	5.33 a	5.20 a	4.80 a
206	5.53 a	5.20 a	5.07 a
208	5.53 a	5.13 a	4.93 a
301	5.67 a	4.87 a	4.40 a
308	5.67 a	5.87 a	5.13 a
401	5.73 a	5.73 a	4.80 a
408	5.80 a	4.87 a	4.93 a
Mean	5.58	5.30	5.11

Values followed by different letters are different according to the Tukey procedure of significant difference, $P < 0.05$.

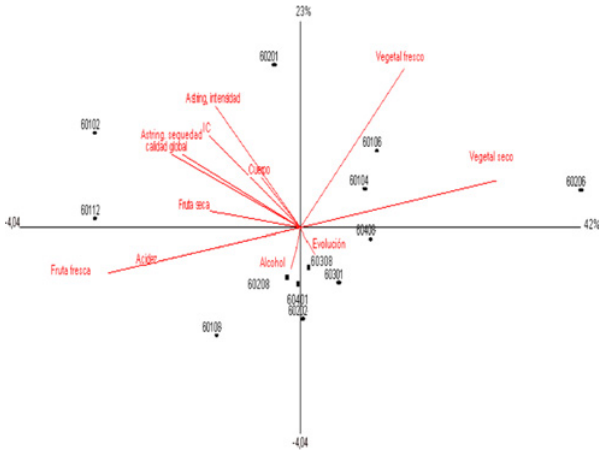

Figure 1. PCA Sensory analysis of the main components CP1 and CP2 wines of the 13 selections of cv. Cabernet Sauvignon. Season 2012–2013 Nancagua, Chile.

3. Conclusions

For the 13 selections of Cabernet Sauvignon, studied and evaluated during the 2012–2013 season, it may be noted that their wines obtained by microvinification possess in their chemical composition, varietal characteristics averages to high average.

Sensorially the wines of the 13 selections have average to high averages varietal characteristics and even some excel in certain attributes, making it possible to group them according to the intensity of the attributes evaluated.

The yield (kg/plant) average was 2.6 kilos. The selection 108, presented a production (4.6 kg/plant) by 50% over average, which is given by larger clusters.

References

[1] L. Muñoz, X. Moncada, P. Hinrichsen, IX Congreso Latinoamericano de Viticultura y Enología. (2003)
[2] Dirección Meteorológica de Chile. `http://www.agroclima.cl` (2013)
[3] SAG. Catastro vitícola nacional 2013 (2014)
[4] J. Pérez, C. Ceppi de Lecco, C. Lillo, E. Bordeu, Ph. Pszczólkowski. IX Congreso Latinoamericano de Viticultura y Enología (2003)
[5] C. Ceppi de Lecco, Ph. Pszczólkowski, L. Pérez-Harvey. XIV Congreso Latinoamericano de Viticultura y Enología, Tarija, Bolivia (2013)