

Adaptability of *Chardonnay* clones at different altitudes.

Note 2: Organoleptic characteristics of wines

Adaptation von *Chardonnay* Klonen an verschiedene Höhen. 2. Teil: Organoleptische Charakteristiken der Weine

Iacono F., Stefanini M., Porro D., Nicolini G.
Istituto Agrario S. Michele all'Adige (Trento)- Italy

F. Iacono, M. Stefanini, D. Porro, G. Nicolini (1993): Adaptability of *Chardonnay* clones at different altitudes. Note 2: organoleptic characteristics of wines. *Vitic. Enol. Sci.* 48, 187-189

Abstract

Different clones of *Chardonnay* were cultivated at 250 mt. and 700 mt. above sea level. After studies on ripening, 50 kg. of grapes from each clone in both environments, were collected during two years and vinified under controlled conditions. After 4 months the wines were analyzed and tasted.

For the sensory analysis a parametric and not structured schedule was used, worked out after the definition of the characteristic aroma profile of the wines. The data were studied in order to show the interaction between year, environment and clone.

The altitude was always a strong factor of variability as well as the year. Some clones proved more flavoured than others.

The organoleptic results gave good information on the adaptability of the clones to extreme cultural conditions and showed strong relationships with sugar accumulation rate in berries during ripening time.

Key Words: *Chardonnay*, clone, microvinification, sensory evaluation, factor analysis

1. Introduction

The study of the adaptability of clones at different environments is an important factor in order to optimize the interaction genotype x environment. From the viticultural point of view, the problem can be solved by closely examining the variance of some parameters related to the specific factors of variability (year, genotype and environment) (Bogoni et al., 1992).

In Note 1 the authors have proposed a mathematical model fitting the sugar accumulation rate in berries during ripening time. This approach pointed out that, in order to discriminate between the different clones, it was more important to study the sugar accumulation rate than the sugar content in berries at harvest time.

However, Iacono et al. (1990) attributes more importance to sensory analysis for organoleptic judgement. The possibilities offered by today's statistical knowledge of multifactorial analysis (Pages et al., 1987) lead to an investigation of the problem based on descriptive sensory methods. In this respect, a precise definition of the descriptors is necessary for the quality of the examined results.

It is therefore possible to study the relationship between data on must and wine quality to define the adaptability of clones in different environments.

This contribution intends to demonstrate how different altitudes can modify the qualitative response of different *Chardonnay* clones.

2. Materials and Methods

The trial was carried out with *Chardonnay* grapes picked at two different altitudes: 250 m a.s.l. and 700 m a.s.l. 13 clones were chosen in order to provide a large selection variability. The clonal material originated from different French and Italian areas.

In 1990 and 1991, from each altitude, 50 kg of grapes were picked simultaneously and microvinified using standard technology.

In January the wines were sensorially analysed.

A panel of wine tasters belonging to the Istituto Agrario di S. Michele all'Adige was selected and trained. Firstly, their training focussed on the investigation and knowledge of the wine type. Secondly, it involved the development of a common descriptive card for the

Table 1: Tasters card for the evaluation of *Chardonnay*

Data were elaborated after standardization by tasters in order to compare the different use of the judgement scale.

Sensory Analysis Group I.S.M.A.

NAME: _____ DATE: _____

Sample code : _____

Taste	
Acid	_____
Bitter	_____
Sapid	_____
Structure	_____
Persistence	_____
Aroma Tropical fruit	_____
Sour apple	_____
Floral (lime tree)	_____
Floral (geranium)	_____
Lemon	_____
Spicy (thymus)	_____
Tobacco-tea	_____
Grass cut green	_____
Butter	_____

wines. Descriptors were defined after several degustation sessions, and the relevant terminology underwent standardization (tab. 1).

3. Results and Discussion

3.1. Definition of new complex descriptors

Through the application of Factor Analysis Procedure (Varimax Rotation Method), the number of variables describing the organoleptic profile of Chardonnay wine was reduced. Five factors were found to be sufficiently representative to account for 61.82 % of the total system's variability. Every single factor was then regarded as a new variable containing information about more than one descriptor at the same time (tab. 2).

Table 2: Factor analysis (Varimax rotation method) for Chardonnay wine. Percentage of variability = 61.8%

Descriptors	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Taste					
Acid	0.44494	0.321371	0.29847	0.14596	-0.06930
Bitter	0.31807	-0.08485	0.55999	-0.12401	-0.16105
Sapid	0.73629	0.06403	0.21903	0.02902	0.11927
Structure	0.82399	0.03170	-0.15662	0.05081	0.07148
Persistence	0.85913	0.05130	-0.05067	0.09667	-0.00077
Aroma					
Tropical fruit	0.17534	-0.04403	0.10092	0.77180	-0.08654
Sour apple	0.16799	0.74040	0.00386	0.13042	-0.00411
Floral (lime tree)	0.01173	0.06267	-0.11842	0.80057	0.16468
Floral (geranium)	0.02234	0.35643	0.50264	-0.34959	0.16520
Lemon	0.00101	0.79205	0.06514	-0.13199	0.13129
Spicy (thymus)	0.01997	0.08015	0.11525	0.13688	0.76009
Tobacco-tea	0.10730	0.03339	-0.04108	0.07443	0.83311
Grass cut green	-0.05313	0.39906	0.64469	0.04636	0.05583
Butter	-0.16853	-0.36304	0.61602	0.22433	0.27457

In particular, Factor 1 represented utmosty acid and sapid taste as well as structure and persistence in the mouth. All of the parameters were correlated positively to give the factor an additive effect defined as „body“ of the wine.

Positively correlated to sour apple and lemon descriptors. Factor 2 was defined „sour fruity“ character.

As Factor 3 was compounded by a bitter taste and floral (geranium), grass cut green, and butter descriptors, it was defined „sweet pungent“ character. Factor 4, positively correlated to tropical fruit and floral (lime tree) descriptors, was defined „varietal fruity“ character. The last Factor, positively correlated to spicy and tobacco-tea descriptors was defined „sweet spicy“ character.

3.2. Influence of variability factors on wine organoleptic profiles

The Analysis of Variance showed that clones modified all the factors significantly which were elaborated during factor analysis (tab. 3). Year and altitude were also very important. The interactions did not seem to significantly influence the wine organoleptic profiles.

Table 3: Results of Analysis of Variance of Chardonnay organoleptic profile

Factors	year	alt.	clone	year*alt.	year*clone	alt.clone
1	**	n.s.	*	n.s.	s.	n.s.
2	***	**	*	n.s.	s.	n.s.
3	n.s.	**	*	***	**	n.s.
4	n.s.	**	**	n.s.	s.	n.s.
5	*	n.s.	*	n.s.	s.	n.s.

1991 produced wine with high „body“, „sour fruity“ and „sweet spicy“ characters. Year did not modify „sweet pungent“ and „varietal fruity“ characters (fig. 1).

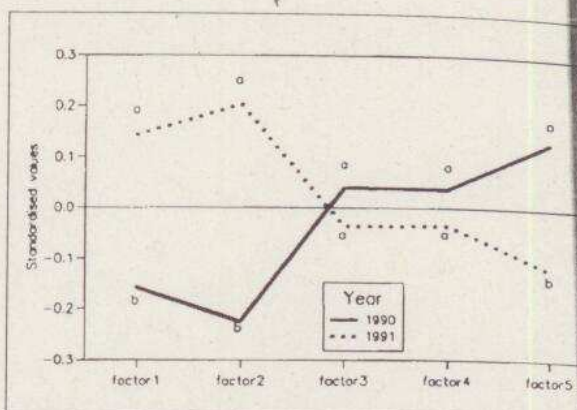


Fig. 1: Organoleptic profile of Chardonnay wines in relation to year

High cultivation altitude improved „body“, „sour-fruity“, „sweet pungent“, and „varietal fruity“ characters. The cultivation altitude modified the main organoleptic descriptors of Chardonnay wine (fig. 2).

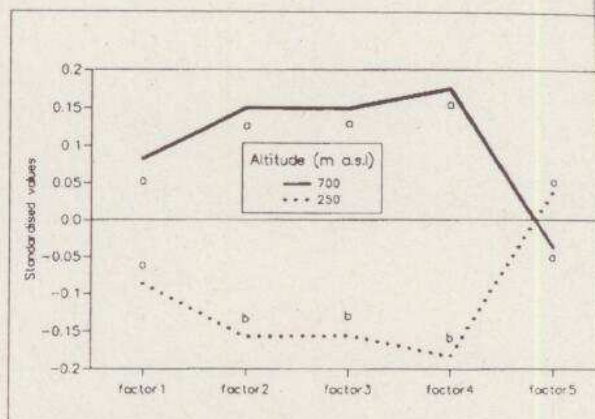


Fig. 2: Organoleptic profile of Chardonnay wines in relation to altitude

Also the clones showed considerable differences in the organoleptic profile (tab. 4). The most „varietal fruity“ wines were produced with clones 119 and 75. The „sour fruity“ character is high in clones 116, 117, 123, 130, and 76; but the same character was low in clones 128, 95, and 96. The most structured wines were produced with clones 130, 76, 78, and 95.

3.3. Relationship between must quality and wine organoleptic profile

In the Note 1 a Cluster Analysis was applied in order to create groups of likelihood for the clones in relation to the sugar accumulation estimation model during ripening time. The groups were formed in a different way in relation to altitude, showing that clones similar at 250m a.s.l. are different at 700m a.s.l (Stefanini et al., 1993).

At 250 m a.s.l. the first group, with a regular sugar accumulation rate, gave more complex wines, while the second one produced wines with the highest „sweet pungent“ character and the lowest „varietal fruity“ character (fig. 3). The first group is opposite to the second one. Also at 700m a.s.l. the group with regular sugar accumulation rate, produced complex and aromatic wines (fig. 4). Fast ripening is linked to wines with low „sweet spicy“ character.

It was shown that only clones 76, 78, and 95 showed regular sugar accumulation rate at both altitudes. These clones did not show interaction with altitude and produced the most aromatic and complex wines.

Table 4: Effects of Chardonnay clones on wine organoleptic profile

clone	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
116	-0.069 AB	-0.310 A	-0.051 AB	-0.612 C	-0.304 B
117	0.012 AB	0.313 A	0.467 A	-0.240 ABC	0.211 A
119	-0.045 AB	-0.103 AB	0.042 AB	0.348 A	0.176 A
123	-0.365 B	0.146 A	-0.253 AB	-0.136 ABC	0.100 A
124	-0.079 AB	0.005 AB	-0.213 AB	-0.120 ABC	0.032 A
128	-0.207 B	-0.204 B	-0.195 AB	-0.132 ABC	-0.187 B
130	0.375 A	0.230 A	0.013 AB	0.244 AB	0.211 A
277	-0.215 B	-0.148 AB	0.408 A	-0.473 BC	0.218 A
75	-0.000 AB	-0.126 AB	0.033 AB	0.404 A	0.106 A
76	0.063 A	0.390 A	-0.045 AB	0.001 ABC	-0.144 B
78	0.259 A	0.040 AB	-0.127 AB	0.297 AB	-0.220 B
95	0.147 A	-0.207 B	-0.351 B	0.144 ABC	-0.296 B
96	-0.191 AB	-0.211 B	0.394 A	-0.001 ABC	-0.015 AB

Numbers in columns within dates followed by the same letter are not significantly different at P=0.05 according to Duncan's new multiple range test.

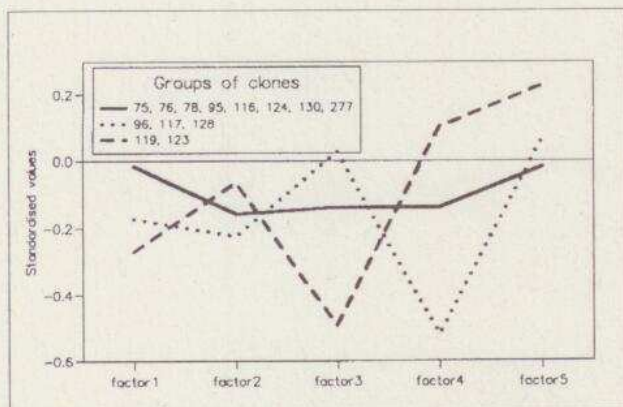


Fig. 3: Organoleptic profile of different groups of Chardonnay clones at 250 m a.s.l.

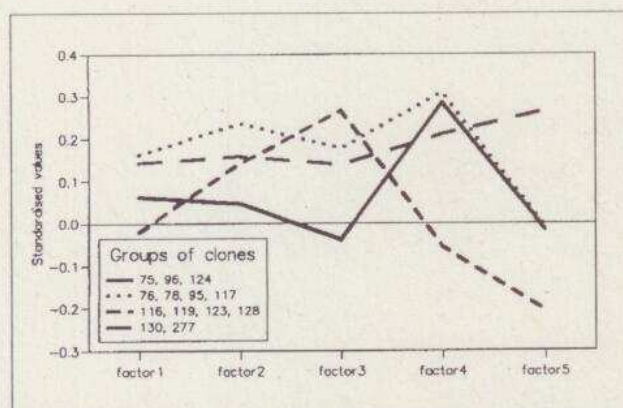


Fig. 4: Organoleptic profile of different groups of Chardonnay clones at 700 m a.s.l.

4. Conclusions

The sensory analysis through descriptive cards and multifactorial analysis elaborations, allows the study of clones adaptability in different environmental conditions.

In the Trentino area, the quality of *Chardonnay* wines is significantly affected by climatic conditions (year), environment (altitude) and genetic characteristics (clone).

In relation to the year of cultivation the wines can be more structured and sour fruity: These characters seemed strongly and positively correlated.

High cultivation altitude produced wines with high „body“ and very complex aromatic profile.

The qualitative characteristics of clones are different but the relation to the sugar accumulation rate in berries during ripening time is very strong. In fact, clones with regular ripening produced the most aromatic and structured wines apart from cultivation altitude. From the organoleptic point of view, the most adaptable clones either at 250m a.s.l. or at 700m a.s.l., are 76, 78, and 95.

In order to improve „varietal fruity“ character at 250m a.s.l. clones 119 and 123 can be cultivated, while at 700m a.s.l. clone 117 seems to produce good results.

From the agronomic and oenological points of view, it has been established that, in relation to altitude, different clones contribute to improve wine quality and this knowledge must be taken into consideration for the future *Chardonnay* vineyards.

5. Literature cited:

- Bogoni M., Falcetti M., Failla O., Mastromauro F., Scienza A. (1992): Interazione „genotip x ambiente“ in *Vitis vinifera* L.: applicazione di alcuni indici di stabilità. *Giornate scientifiche SOI*. 298-299.
- Iacono F., Bertamini M., Dalla Serra A., Falcetti M., Porro D., Versini G. (1990): L'uso dell'analisi chimica e sensoriale per la caratterizzazione di vini *Chardonnay* base spumante prodotti in diversi ambienti del Trentino. *Rivista di viticoltura ed enologia* 4, 3-14.
- Pages J., Asselin C., Morlat R., Robichet J. (1987): L'analyse factorielle multiple dans le traitement des données sensorielles. Application à des vins rouges de la vallée de la Loire. *Sciences des aliments* 7, 549-571.
- Stefanini M., Iacono F., Camprostrini F., Tardaguila L.J. (1993): Adaptability of *Chardonnay* clones at different altitudes. Note I: study of a mathematical model for the definition of the sugar accumulation rate. *Vitic. Enol. Sci.* 48, 114-117