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INFLUENCE OF STORAGE TEMPERATURE AND ETHYL ALCOHOL CONTENT ON THE SHELF-LIFE OF ASTI SPUMANTE DOCG

V. GERBI*, L. ROLLE, D. GHIRARDELLO, M. GIORDANO and G. ZEPPA

University of Turin, Department of Exploitation and Protection of the Agricultural and Forestry Resources, Food Technology Sector, Via L. da Vinci 44, 10095 Grugliasco (TO), Italy

*Corresponding author: Tel. +39 011 6708552, Fax +39 011 6708549, e-mail: vincenzo.gerbi@unito.it

ABSTRACT

'Asti' or 'Asti Spumante' is an aromatic Italian sparkling wine produced exclusively with 'Moscato bianco' grapes growing in Piedmont (North West Italy) and commercialized as a sweet *dessert* wine. In this work, relationships among alcohol concentration, storage temperature and shelf-life of product have been defined. Three 'Asti' wines produced from the same must but having different alcohol concentrations and stored at three temperatures were used for the trial. Colour, acetaldehyde, volatile compounds and sensory analysis were used for defining the effect of storage. The results show that product shelf-life is directly correlated to the alcohol concentration of wine and inversely correlated to the storage temperature.

Key word: Asti Spumante, storage temperature, volatile compounds, dessert wine

INTRODUCTION

The 'Muscat' family of aromatic grapes grow all over the world and are largely used in winemaking, as table grapes and raisins. Muscat white is the most important 'Muscat' grape variety cultivated in Italy and is used for Asti DOCG sparkling wine and Moscato d'Asti DOCG wine production.

The shelf-life of these products is very short (ca. 1 year) and aged products show an intense yellow colour, low odour and oxidised aroma. Previous researches showed that high acidity, high temperature and exposure to light could accelerate the ter-

penoid chemical degradation and reduce the shelf-life of white wines (Oliveira *et al.*, 2002; Silva Ferreira *et al.*, 2003a, 2003b; Gonzalez-Viñas *et al.*, 1998; Sivertsen *et al.*, 2001), but little data about Muscat wines shelf-life have been published (Castino and Di Stefano, 1981; Di Stefano and Ciolfi, 1983).

In this work, relationships among alcohol concentration, storage temperature and product shelf-life have been determined using sensory analysis.

MATERIALS AND METHODS

Samples

Winemaking (10000 L) was performed in autoclaves, with a homogeneous Muscat must clarified and filtrated and three wines with 6.5, 7.5 and 9.5 % of alcohol concentration were obtained. Bottles were stored at three temperatures (5, 15 and 22 °C) for one year and analysis was carried out every four months.

Chemical analysis

The optical absorbance of wine at 420 nm (10 mm of optical path) was used as to quantitatively evaluate colour. The concentration of acetaldehyde was determined with an enzymatic test (R-Biopharm, Cerro al Lambro, MI, Italy). Free terpenoidic compounds were determined according to Di Stefano (1991). Compound identification was achieved with a Shimadzu GC-17A gas chromatograph coupled with a Shimadzu QP-5000 quadrupole mass spectrometer (Shimadzu Corporation, Kyoto, Japan). Three analyses were performed for each sample.

Sensory analysis

A ranking test (ISO 8587) with twenty-five selected and trained tasters was performed. For each sample only the overall evaluation was defined. Three replicates of each tasting session were performed.

Statistical analysis

Data analysis was performed with the Statistica software package (ver. 6.0; StatSoft Inc., Tulsa, OK, USA).

RESULTS AND CONCLUSIONS

Factorial analysis of variance shows a significant effect of temperature and ethanol concentration for the overall evaluation. Also interaction between these two factors is significant for overall evaluation at each storage time. As shown in Figure 1, samples stored at 22 °C were less appreciated than others even after only four months after bottling. For the other two examined temperatures an ethanol effect can be highlighted. With a temperature of 15 °C but ethanol concentration of 9.5% the product shelf-life is longer than with an ethanol concentration of 6.5%. Storage also caused a change in the terpenoidic profile of wines. Linalool decreases due to transformation into α-terpineol, while furanic linalool oxides increase along with Ho-trienol according to Di Stefano (1989). At the time of bottling all samples showed a similar linalool content (about 500 μg/L), but wines with an ethanol concentration of 9.5% and stored at 15 and 5 °C show higher linalool concentrations at the end of the test. A correlation among the terpenoidic profile and sensory evaluation was then highlighted (Table 1). Also for colour intensity a correlation with overall evaluation was determined. No such correlation was observed between overall evaluation and acetaldehyde concentration. It is generally believed that acetaldehyde

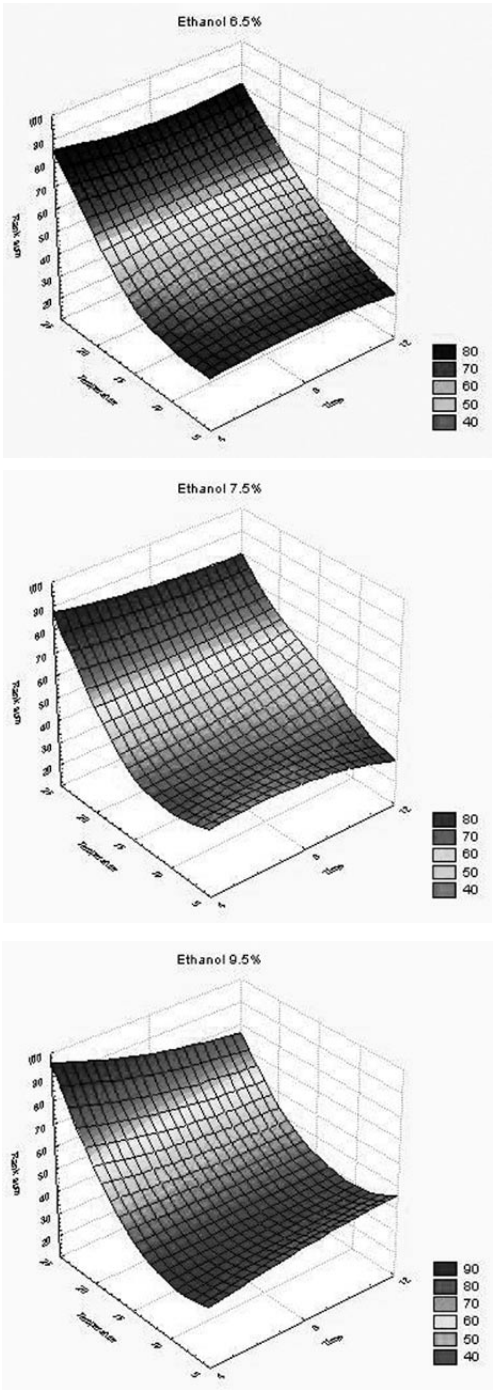

Fig. 1. Surface plots for rank sum computed for overall evaluation defined at each ethanol concentration related to storage times and storage temperatures.

Table 1. Correlation coefficient between overall evaluation defined as rank sum and chemical parameters.

Acetaldehyde mg/L	0,0924
Color intensity	0,5012**
Geraniol µg/L	0,0284
Ho-trienol µg/L	0,5176**
Oxide A µg/L	0,7227***
Oxide B µg/L	0,7200***
Oxide C µg/L	0,0821
Oxide D µg/L	0,3007
Geranyl Acetate µg/L	0,4549*
Linalool µg/L	-0,7555***
Diol 1µg/L	-0,1371
Diol 2 µg/L	0,1577
Citronellol µg/L	0,0725
α-terpineol µg/L	0,5760**
2-Phenyl ethyl acetate µg/L	-0,1658
2-Phenyl ethanol µg/L	-0,2164
2-Ethyl phenol µg/L	0,2836
Nerol µg/L	-0,3235
1-Hexanol µg/L	0,1945

* Significant at $p \leq 0,05$; ** significant at $p \leq 0,01$; *** significant at $p \leq 0,001$.

is the main aroma generated during wine oxidation and so this compound is often used to describe the loss of wine aroma by oxidation (Noble *et al.*, 1987; Halliday and Johnson, 1992). For Moscato sparkling wine this relation was not demonstrated.

In conclusion, our results demonstrate that storage conditions are also very important for the shelf-life of 'Asti'; The storage time is >1 year only with storage temperatures <5 °C . The shelf-life is also directly correlated to the ethanol concentration.

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