

WINEMAKING TECHNIQUES TO PRODUCE WINES WITHOUT SULFUR DIOXIDE

Pasquale TAMBORRA, Aline T. TOCI, Pasquale CRUPI, Leone CANTARINI, Donato ANTONACCI
Consiglio per la ricerca e la sperimentazione in agricoltura
[Research Unit for Viticulture and Enology in Southern Italy].
Via Casamassima 148 – 70010 Turi (BA) – Italy. Tel. +39.080.8915711
Experimental Winery, Via Vittorio Veneto, 26 – 76121 Barletta (BAT) Tel. +39.0883.521346
Corresponding author e-mail: pasquale.tamborra@entecra.it



INTRODUCTION

The aim of this study was to evaluate, by sensorial analysis, volatile compounds and oenological parameters, the reliability of wines from three different grape varieties (Chardonnay, Pinot and Montepulciano) produced by adding ascorbic acid, lysozyme and tannins replacing sulfur dioxide.

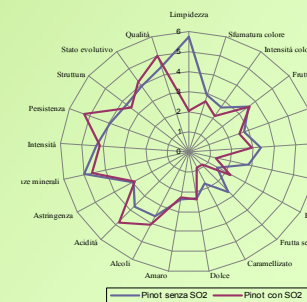
Samples and Winemaking: About 25 kg grapes from each variety were manually harvested and cooled overnight at 8 °C in refrigerated cells. Grapes were de-stemmed and 20 g/hL of gallic tannin and ascorbic acid was added. Grapes were crushed in inert atmosphere. Must was added pectolytic enzyme (1.5 g/hL), decolorizing carbon (20 g/hL) and PVPP(10 g/hL) and clarified by flotation.

After the clarify, the hydrated yeast was inoculated at 25 g/hL (*Saccharomices cerevisiae*) and 20 g/hL of ammonium sulphate, 10 g/hL of PVPP, 5 g/hL of tannin and 50 g/hL of malic and tartaric acids were added. The fermentation temperature was maintained below 18°C. The maceration was carried out for 24 h at 25°C for Montepulciano. After nine days, the wines (reducing sugar < 3 g/L) were decanted in inert atmosphere to another tank and added yeast hulls 15 g/hL and two enzymes: β -glucanase 3 g/hL and 2 g/hL β -glucosidase. The wine was left aging for 3 months, taking care to make 2 batonnage a week before and one in the next few weeks.

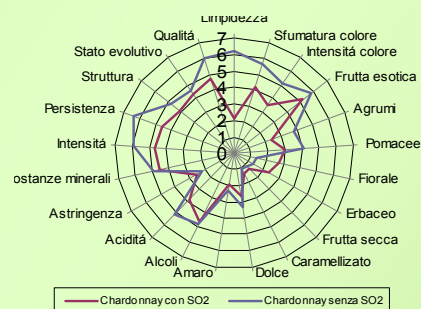
RESULTS AND DISCUSSION

Volatile compounds:

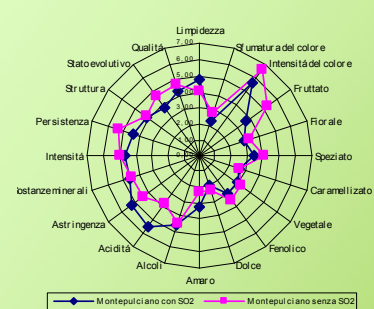
Twenty-nine volatile components were identified in free volatile fraction from Chardonnay, Pinot and Montepulciano wines. In the white wines, the highest total content was found in the samples without SO₂, with an increase of 13% and 20%, for Chardonnay and Pinot, respectively although, for the Chardonnay wine, this increase was not statistic significant. Esters were the main responsible for the highest contents of volatile in the samples without SO₂. The tannins seemed to be the most positive influencing factor on ester production for white wines. As suggested in another papers, this results may be due to the ability of tannins added before fermentation to affect the presence of oxygen in musts and wines, as a consequence of a double mechanism of enzyme inhibition of radical-scavenging activity. Tannins can quickly drop the oxygen availability, contributing to preserve the esters amounts of wines. In general, ethyl esters together with acetates, contribute to the typical fruity aroma of young wines. In another hand, the highest contents of superior alcohols were found in the Pinot and Montepulciano wines with SO₂. Sulfites seems to show a positive influence on alcohols production. It has been reported that during fermentation, sulfites can promote the synthesis of some alcohols by influencing the Ehrlich pathway. These compounds are considered to greatly influence the aromatic properties of wines, so that the levels of 2-methyl-1-propanol and 3-methyl-1-butanol are currently used as a criterion of quality for wines and spirits.



The Pinot wine without SO₂ showed the highest values in almost aroma attributes evaluated and also to the lightness, which proves the effectiveness of the tannins in clarification process.



The Chardonnay wine without SO₂ showed the highest sensory quality, comprising aroma, taste and colour attributes.



The Montepulciano wine without SO₂ showed the highest values in the fruity aroma and the lowest values with regard to bitterness, sour and astringency.

CONCLUSIONS

The replacement of SO₂ with ascorbic acid, lysozyme and oenological tannins influenced the volatile composition, the sensorial quality and the contents of tartaric, malic, lactic and shikimic acids of wines. Wines fermented with SO₂ showed higher total volatile alcohol amounts, while the presence of ascorbic acid, lysozyme and oenological tannins increased the level of volatile esters. The Chardonnay wine showed the best increment in quality caused by the additives, followed by Pinot and Montepulciano wines, showing the improved of these additives in white wines. Although adding SO₂ is still a widespread practice in winemaking process, gathered results are major arguments in favour of the hypothesis to obtain wines of good sensorial quality without using hazardous chemical additives.

Acknowledgements: we would like to thank the Winery Valentina Passalacqua of Apricena (FG), producer of wine made from organic grapes with no added sulfites, for the readiness in the preparation of experimental theses.

References
Tamborra P. (1993). Problemi connessi alla produzione di vino bianco senza aggiunta di SO₂. *L'Enotecnico*, XXIX, 11, 39-46.
Tamborra P. (2000). Impiego del lisozima in ambienti caldi del Sud d'Italia. *Atti del Convegno su Recenti sviluppi nelle tecniche di vinificazione. Asti, 19 Gennaio 2001. Quaderni della Scuola di Specializzazione in Scienze viticole ed enologiche, Università di Torino*, 24, 163-166.
Toci T. A., Tamborra P., Crupi P., Cantarini L., Antonacci D. (2012). Comparison of winemaking techniques to produce wines with low sulphur dioxide. *Proceedings of the 35th World Congress of Vine and Wine (18-22th June 2012, Izmir – Turkey)*.
Tamborra P., Mazzone F., Cantarini L., Antonacci D. (2012). Winemaking techniques to produce wines without sulfur dioxide. *Proceedings of Italian Forum On Industrial Biotech And Bioeconomy (Ifib) Milano, 23-24 Ottobre 2012*.