Evaluation of the impact of a fungal-origin chitosan preparation on Brettanomyces in the context of wine aging

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Introduction

Brettanomyces bruxellensis development in wines is a continuous threat for wine quality. This undesirable yeast is able to develop during aging under difficult conditions, and to produce negative aromatic compounds such as volatile phenols related to sensory descriptors as animal-like, horse, barnyard, band aid and medicinal. Chitosan of fungal origin has been introduced as a new potential tool to control Brettanomyces in winemaking [1]. Recent studies showed the impact of chitosan application (racked off after 10 days) on contaminated wines, leading to the elimination of Brettanomyces cells [2]. Due to the necessity to control wine microbiological stability during aging in barrels, our research focuses on a new, long term application of an enological chitosan preparation, to prevent wine from Brettanomyces along the aging period (up to 9 months) at both experimental winery and at winery-scale.

Material and methods

The fungal origin chitosan preparation used (No Brett Inside®) is a powder with particles of average size of 50 µm, extracted from Aspergillus niger, produced by KitoZyme (Herstal, Belgium). 4 g/L were added in the treated wines.

Several experiments were run during 2 years in Tuscany, Italy.

At pilot-scale:
- 2 wines (Sangiovese and Merlot, 2011) after MLF;
- 3 different treatments (25L stainless-steel tanks):
  - control (untreated);
  - chitosan 4 g/L, no rack-off, no batonnage;
  - chitosan 4 g/L, no rack-off, batonnage once a week.
- After the treatments, each tank was inoculated with pre-adapted Brettanomyces cells at 10⁷ UFC/mL, and followed up to 6 months.

Quantification of Brettanomyces cells was performed at the trials set-up and every month during the aging period, by plating on selective medium. Quantification of volatile phenols was performed at the trials set-up and at the end of aging by HPLC.

Impact of the treatments at pilot-scale

In this experiment, where Brettanomyces was inoculated on wines after the chitosan treatment, we observed a clear impact of chitosan on the evolution of Brettanomyces population along the 6 months. The best control of Brettanomyces contamination was achieved with batonnage on the Sangiovese wine, and with or without batonnage on the Merlot wine (Figure 1). It is important to mention that wines had been previously desulphited and no SO₂ was added, which may explain the regrowth of Brettanomyces on the long-term.

Impact of the treatments at winery-scale

On 2011 Merlot wines (Figures 2a & 2b), Brettanomyces wild population was always below 100 UFC/mL, except for the control from spontaneous MLF. Chitosan addition, with or without batonnage, clearly helped to prevent Brettanomyces growth up to 6 months. On 2011 Sangiovese wines (Figures 2c & 2d), where Brettanomyces populations were slightly higher, it is interesting to notice the positive impact of bacteria co-inoculation on Brettanomyces contamination, as previously described [3]. Furthermore, Brettanomyces development occurred earlier in untreated wines, confirming chitosan impact. Again, no SO₂ addition was done during the 6 first months. The 9 months of chitosan contact, did not show any effect on the chemical and sensory properties of the wine.

Observations made on 2011 regarding the impact of chitosan on the long-term application to protect wines against Brettanomyces, were confirmed on a 2012 Sangiovese wine. The addition of chitosan without batonnage during aging led to lower Brettanomyces contamination and volatile phenols concentration.

Acknowledgements

This work was carried out thanks to the collaboration of «Castello di Fontenutoli – Marchesi Mazzei» winery, Castellina in Chianti, Italy. Authors specially thank Dr Luca Biffi, chief winemaker, who took care of the trials.

References


Wine Active Compounds Symposium, Beaune, France, 26-28th March 2014