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WINEMAKING APPLICATIONS OF ULTRASOUNDS: STUDY ON WINE LEES AND PROTEIN STABILITY

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ABSTRACT

Protein haze development is a quality problem in white wine production which has been extensively studied in recent years. Ageing over lees has been demonstrated to have positive effects in wine stability and sensory characteristics but it is a time consuming practice. The technology of ultrasounds results in a direct cavitation damage to microbial cell membranes with leakage of its content and sonochemical structural modifications of the liquid media. Ultrasound could accelerate the release of protective colloids and stabilize wine. This innovative technology already applied in food industry has promising possibilities in the winemaking sector.

This work focused on the study of ultrasounds treatment effects on wine lees and on unstable wine. Wine lees were subjected to an experimental plan designed to find the combination of time and intensity (percentage of wave amplitude) of treatment able to obtain the better results. The best treatment was chosen to be compared with the usual practices of ageing wine over lees and with the enzyme treatment of lees; all samples were monitored for seven months. Because of wine lees difference (depending on yeast strain, stirring and time passed after fermentation), experimental plan was applied to three different lees in order to evaluate probable common effects. Since yeast mannoproteins have a protective role against protein haze, lees treated with ultrasounds were added to unstable wines and protein tests were performed. Moreover, three unfiltered wines were recovered after fermentation and direct effects of ultrasounds were analyzed.

Ultrasounds treatment on wine lees resulted in an increase of total colloids, proteins and polysaccharides in the medium with a reduction of colloids particle diameter. These results were mainly correlated with treatment duration rather than its intensity. Treatment at 90% amplitude for 3 minutes provided results good enough in terms of colloids release and therefore it was used for the comparative study with natural lysis and enzyme treatment. Advantages of this new technology were evident only immediately after treatment but they last for less than one month. The stabilizing effect of the lees treated with ultrasound

addition to wine has not been proven; in fact, heat test results were not satisfactory but for a sample lower values using the ProtoCheck stability test were obtained.

The ultrasounds treatment has an effect on colloids particle diameter increasing the fraction of particles with a lower diameter and reducing the fraction of particles with bigger diameter. This could reduce the risk of aggregation between colloids that can happen after the addition of an adjuvant (e.g. commercial mannoproteins).