ACCELERATION OF AGEING ON LEES IN RED WINES BY APPLICATION OF ULTRASOUNDS

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INTRODUCTION

A transfer of parietal polysaccharides and mannoproteins is produced during aging on lees [1]. This transfer of compounds to wine is carried out after cell death. It comes to breakdown of polysaccharides from cell wall (yeast autolysis).

This technique increases the density in wines [2] and gives more body and structure. Interactions between yeast polysaccharides and wine tannins will result in decrease of tannic perception (decrease of astringency). Increase of varietal characteristics is produced.

The main disadvantage of the ageing on lees is the time that the process requires. Usually, nine months are necessary at least for obtaining a noticeable effect in wines. The objective of this work is the acceleration of this process using ultrasounds to lyse the yeast cell wall. In addition, the influence of this technique in different red wine quality parameters was studied.

MATERIAL AND METHODS

The yeast lees were obtained by growing *Saccharomyces cerevisiae* strain CTPL22 (enotecUPM) in YPED medium [3], the biomass was lyophilized and preserved at -18 ºC.

The samples were prepared using a red wine from Comenge Bodegas y Viñedos (*V. vinifera* L. cv. Tempranillo) and model medium (water, 13% v/v of ethanol and 3.5 of pH). The biomass was added in 0.8 g/L, oak chips were added in 5g/L.

The samples were treated with ultrasounds during 15 minutes 2 times per week. The final time of ultrasound was 170 minutes. Monitoring of the samples was carried out for 135 days of aging on lees.

The wines were analyzed to determine dissolved oxygen, color parameters [4], total polyphenol index and volatile acidity. Polysaccharides [2] and protein content [5] was determined in samples of model medium.

RESULTS AND DISCUSSION

The samples treated with ultrasound show a greater amount of dissolved oxygen than the other samples. When the treatment is finished the dissolved oxygen begin a significate reduction in these samples (Fig.1).

During the first eighty days of aging, wines with ultrasound treatment have obtained the highest values of color intensity compared with their controls (Fig. 2). In addition, the samples with low values are wines in aging on lees without ultrasound treatment. In the end of this trial, all treatments have obtained significantly lower values than the control wine.

After fifty days of aging, the samples begin to modify their tonality significantly. The samples than have been treated with ultrasound finally increase their tonality compare to their controls (Fig. 2). The greatest tonality is obtained in control wines with ultrasound, this is possibly due to antioxidation protection of lees. At the end of the trial, there are not significant differences between untreated wines.

Model medium has been used to determinate polysaccharides and protein content after cellular autolysis. Wines with ultrasound treatment show significant higher values than samples without treatment (Fig. 4). This increase in polysaccharides and protein may be due to an increase velocity in cellular autolysis.

There were no significant differences in the total polyphenol index of the samples (Fig. 3). In the same way, the volatile acidity does not increase when ultrasounds are applied. Samples aging on lees with chips and ultrasound treatment show the lowest values of volatile acidity (Fig. 3); thus, this parameter is not affected by the application of ultrasounds.

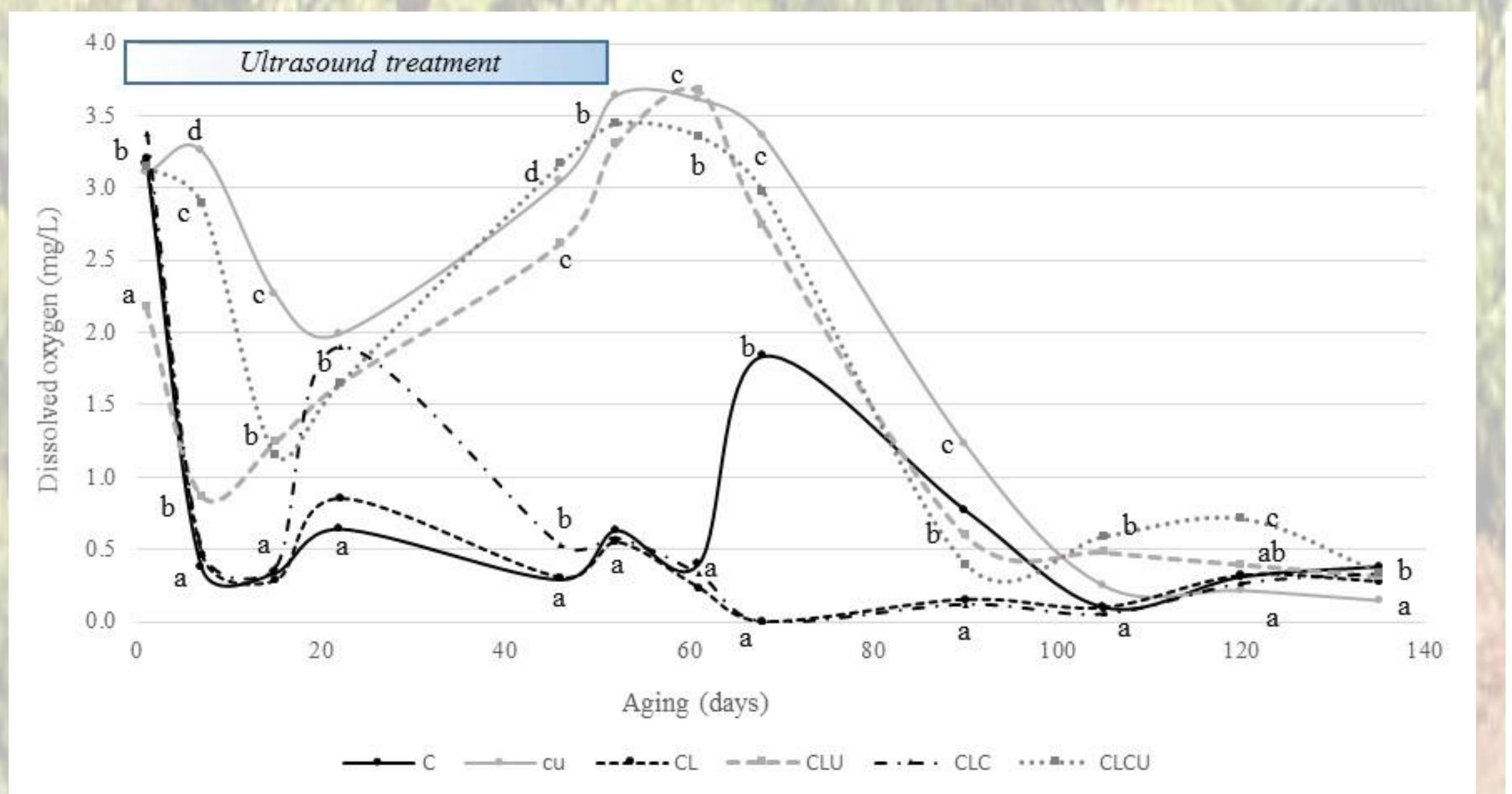

Fig. 1. Dissolved oxygen during aging. C: control wine; CU: wine treated with ultrasounds; CL: wine aged on lees; CLU: wine aging on lees and ultrasound treatment; CLC: wine aging on lees and oak chips; CLCU: wine aging on lees with oak chips and ultrasound treatment. Values with the same letter are not significantly different ($p < 0.05$).

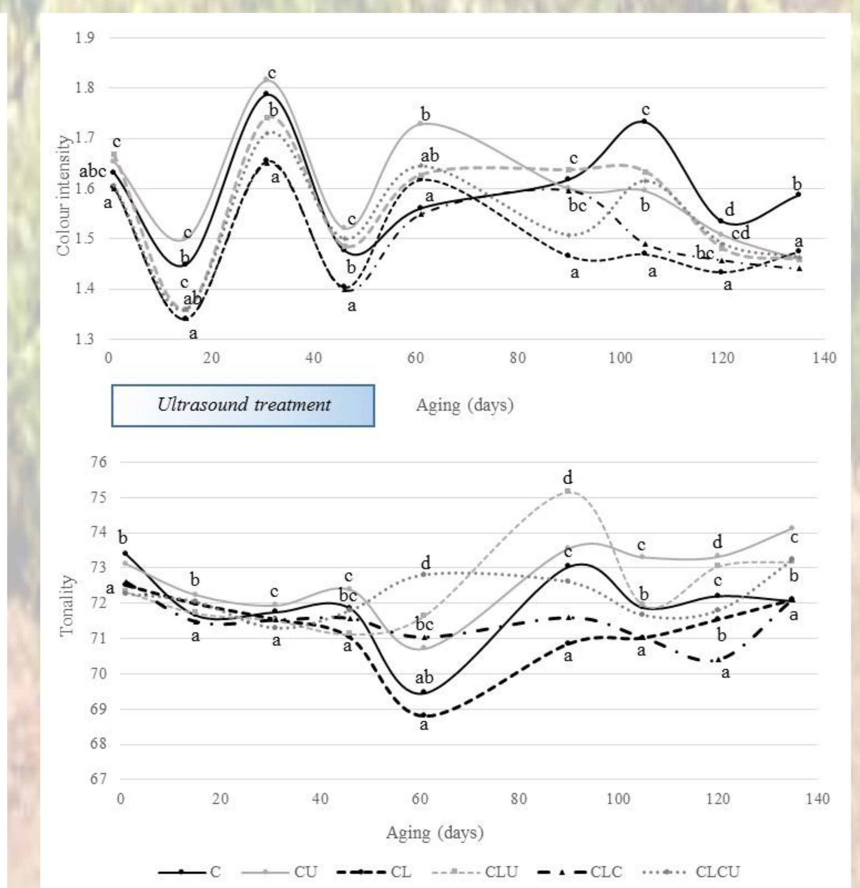

Fig. 2. Chromatic characteristics, color intensity (absorbance units) and tonality (adimensional) by spectrophotometry absorbance. Values with the same letter are not significantly different ($p < 0.05$).

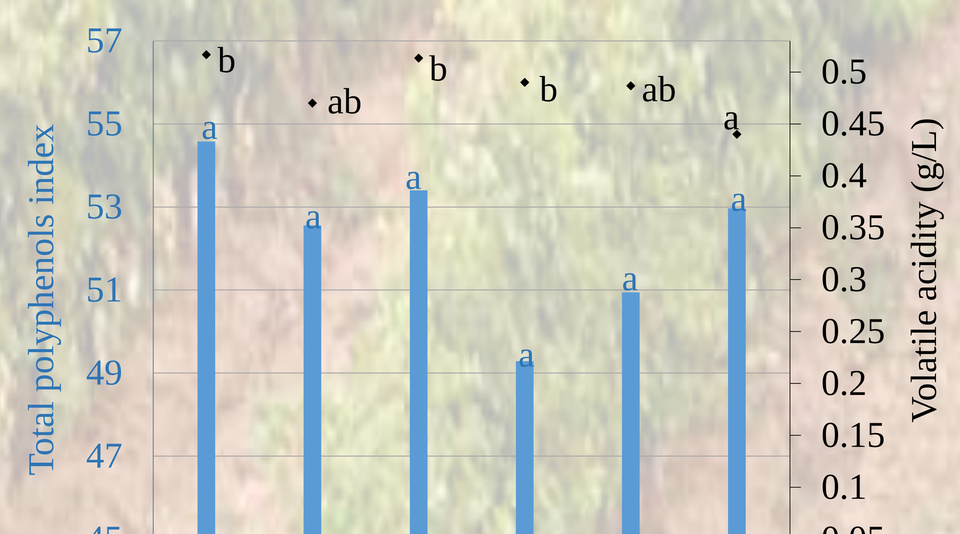

Fig 3. Total polyphenol index (absorbance units) and volatile acidity (g/L) after aging. Bars with the same letter are not significantly different ($p < 0.05$).

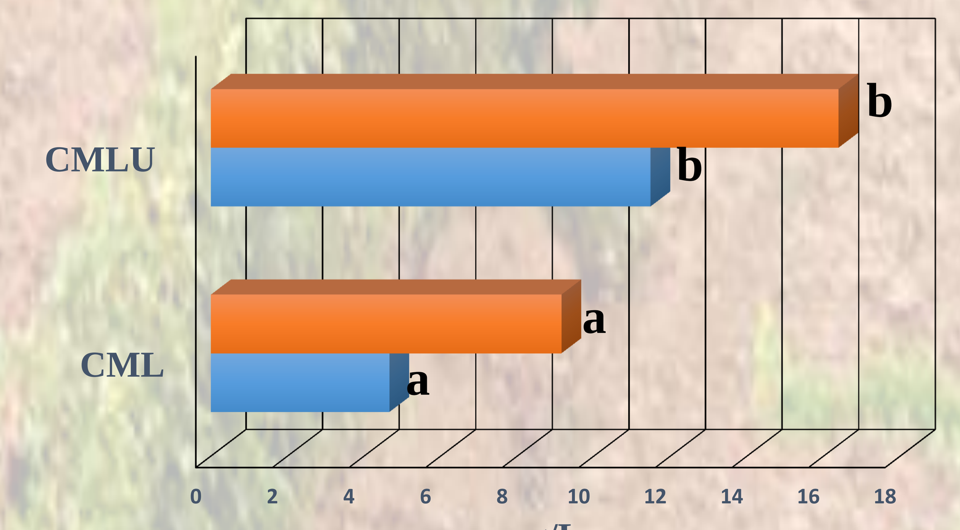

Fig. 4 Protein (mg/L) by Bradford method and polysaccharides content (mg/L) by HPLC-IR in medium model at the end of the aging. Bars with the same letter are not significantly different ($p < 0.05$)

CONCLUSIONS

The application of ultrasounds in aging on lees wines is an interesting technique to improve the cellular autolysis. With this technique polysaccharides content can be duplicated for the same period. However ultrasounds can affect other enological parameters like color intensity and tonality.

References

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