Bentonite fining during different white winemaking stages: effect on the chemical and sensory properties of the wine

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OBJECTIVE

The aim of this project is to determine the real effects of using bentonite during fermentation and the best moment to use it. This is done through fermentation in both industrial and bench scale. Bentonite is used in different stages of fermentation, controlling the content of protein, the protein stability of wines and the dose of bentonite to achieve stability in each case.

INTRODUCTION

Macromolecules of the wine, specially the proteins, can generate precipitates or cause turbidity, affecting its stability and visual aspect. Therefore, protein stabilization has direct incident on the quality of the product. The most used procedure nowadays, to stabilize the white wine is the addition of bentonite as adsorbent material across a non continuous process.

Though effective, bentonite fining generates different problems:
- This treatment is not selective enough and may adversely affect wine quality by inducing significant aroma losses and sometime colour alteration
- Bentonite fining also causes substantial volume losses (between 3% and 10%)
- The disposal of spent bentonites constitute a non negligible source of waste.
- Bentonite handling is also of concern for occupational health and safety issues.

In brewery conditions the effect of fermenter scale cannot be separated from the effect of other process parameters

This kind of experiments depends on three factors:
1.- Scientific objectives.
2.- Technical variables (i.e. sampling volume)
3.- Practical considerations (availability of fermenters and medium and the cost of the experiment).

The best choice is usually a compromise between feasibility and how representative the study is in relation to industrial conditions.

EXPERIMENTAL

The whole project will be based on alcoholic fermentation of white grape’s juice to obtain white wines, in industrial and bench scale, with different treatments of bentonite in order to reach protein stability and avoid haze.

Industrial fermentations will be run in different wineries according to their usual protocols during vintage. Bench scale vinifications are intended to reproduce conditions and behaviors of the industrial scale.

Bentonite will be added in different stages of the winemaking process to determine the best moment for its application on the wine and will be used according to the manufacturer indications and in doses coherent with the ones usually used in the wine industry.

Sampling will be performed during the fermentation and samples will be kept in proper conditions to use them for the different test and analyzes programmed along the year.

The fermentations will be carry on the installations of a winery in the case of industrial scale and in Mas del Frares experimental enological station of URV for the bench scale vinifications.

Laboratory tests and analysis will be carried out using the most suitable equipment available in the laboratory of GITA. As well as some of them that will be performed in collaboration with other research groups or scientific services that had developed special or better techniques according to the project’s needs, for example Maldi-tof, KDS or Mosalux.

RESEARCH AND RESULTS SO FAR

The development of the experimental process show the results obtained by four different treatments and a control in both industrial and bench scale, allowing to make a comparative study in both scales used.

A same dose of bentonite was supplied during the fermentation process of a white wine of Macabeu variety in four different moments:
- Must clarification.
- Beginning of fermentation.
- Middle of fermentation.
- End of fermentation.

A control without bentonite addition was done as well.

Assays were done in 50.000 L tank for industrial scale and 100 L tank for bench scale by triplicate.

Results obtained for both scales were similar according to the studied parameters and bentonite application. This means that wineries conditions are able to be replicate in a lower scale, at least for this kind of process.

According to the protein stabilization the treatment on the must wasn’t effective, meanwhile treatments during fermentation produced a diminution on the total final dose of bentonite needed to stabilize the wine.