

The use of immobilized yeast technology for the production of rose and white sparkling wine from grape varieties of the Zitsa region, in Greece

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Introduction

The immobilized yeast technology, presents a relatively new approach for the sparkling wine production and brand development of a traditional local sparkling wine of the *Zitsa* wine region in Greece. The objective of this work was to study different approaches concerning the production of double immobilized yeast beads (manual, semiautomatic) and the sodium alginate concentrations for the double layer gel beads, as well as their effect on cell leakage, fermentation kinetics and overall wine quality.

Experimental devices and conditions

White and Rose sparkling wine was produced from *Debina*, and *Debina*, Vlachico and Bekari musts (16/2/2 ratio), respectively, with 182 g/L of sugars, pH 3.17, total acidity 6.22 g/L as tartaric acid. After a first fermentation 24 g/L of sucrose was added and oenological yeast *Saccharomyces cerevisiae* strain NT 45 (ANCHOR, South Africa) was immobilized in sodium alginate, carrageenan and CaCl₂, producing beads that were enclosed in a second layer of sterile sodium alginate to stop cell leakage.

Immobilization techniques

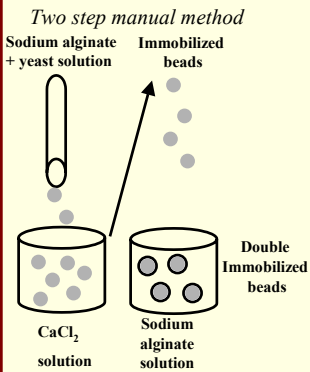


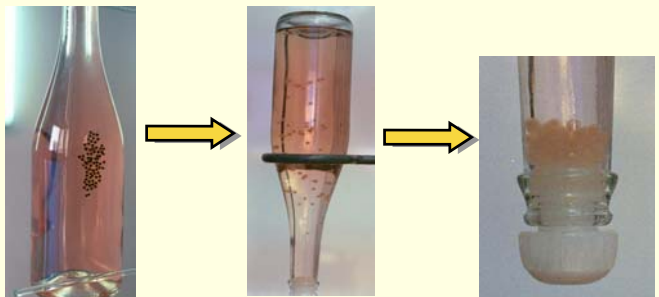
Table 1. Composition of double layer gel beads

Inner layer	Outer layer	Results
Sodium alginate 2.5% + yeast	Sodium alginate 2%	Normal beads
Sodium alginate 2.5% + yeast	Sodium alginate 1%	Normal beads
Sodium alginate 2.5% + yeast	Sodium alginate 0.5%	Normal beads
CaCl ₂ 0.5% + yeast	Sodium alginate 2% or 2.5%	strands
CaCl ₂ 0.5% + glycerol + yeast	Sodium alginate 2% or 2.5%	strands
Carrageenan + yeast	Sodium alginate 2% or 2.5%	Abnormal beads
Carrageenan + glycerol + yeast	Sodium alginate 2% or 2.5%	Abnormal beads

Yeast concentration 2.10⁹ cells per gram of gel

Introduction of immobilized yeast & wine
Fermentation in the bottle

Separation by gravitation of yeast beads in only 20 seconds

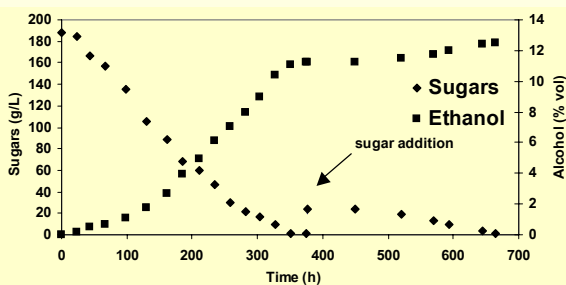


Conclusions :

- ◆ Beads with inner layers from Carrageenan or CaCl₂ produced abnormal beads or strands
- ◆ Beads made exclusively from sodium alginate containing 2.10⁹ yeast cells per gram of gel with 50 beads per bottle did not present any cell leakage

Fermentation Kinetics

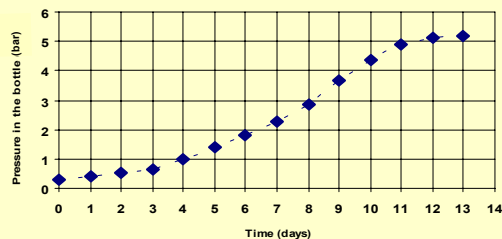
First fermentation (in tank) and second fermentation in bottle with double immobilized yeast beads



Conclusions :

- ◆ The second fermentation in the bottle at 15 °C, was completed in 13 days
- ◆ Carbon dioxide production was in accordance with the quantity of sugars added
- ◆ Disgorging could be done immediately thus saving months of labor

Pressure evolution due to CO₂ production in the bottle with double immobilized yeast beads



Sensory characteristics (panel of 16 experts)

- ◆ **Rose wines:** 20% lower in fruity notes, but 35% higher in complex buttery notes
- ◆ **White wines:** high acidity, freshness, light yellow color and distinguishable fruity aroma with predominant apple notes together with hints of cinnamon.

Conclusions

- ◆ The use of double immobilized yeast in gel beads has allowed a significant reduction of time and cost in the sparkling wines production as a result of the elimination of the " remuage " step in the traditional "Champenoise" method and less necessary space in the wine factory.
- ◆ The method gives clear wine without significant differences from the traditional, but much faster and with lower cost.
- ◆ Small or medium wineries can use these advantages for rapid brand development of local sparkling wines.