**A Study of Grape Skins as Support Material for Whole-Cell Immobilization during Malolactic Fermentation in Model Wine**

### Introduction

**Malolactic fermentation (MLF):** desirable for most red wine and certain types of white wine. However, MLF process is usually done by batch process in wine industry, which is not very efficient.

**Oenococcus oeni:** a type of MLF bacteria that converts malic acid to lactic acid to reduce the tannins and acidity in wine.

**Grape skins:** the outer layer of grapes. In this study, the grape skins were obtained after the crush process in winemaking.

**Whole-cell immobilization:** an alternative to enzyme immobilization. It is defined as “the physical confinement or localization of intact cells to a certain region of space with preservation of some desired catalytic activity”.

### Objectives

- Determine a good concentration of grape skins for efficient whole-cell immobilization with *Oenococcus oeni*
- Study malolactic fermentation using immobilized cells in model wine

### Methods and Materials

- HPLC analysis was done after 8 and 17 days MLF
- The amount of immobilized cell on grape skin was determined by weight

### Microorganism Preparation

- Incubate for 48 hours @ 28 °C under static condition
- Centrifuge at speed of 5000 RPM for 15 min at 4 °C
- Collect O. oeni cells

### Methods and Materials

- **Grape Skins Preparation**
  - Grape skins obtained after crush
  - Wash with DI water and dry at 60 °C
  - Sterilize at 121 °C in autoclave machine

- **Cell Immobilization**
  - Grape skins with immobilized cells in Complex media

- **Malolactic Fermentation**
  - Take out grape skins from complex media
  - Wash grape skins with sterilized water
  - Transfer grapes into fermentation flask and incubate at 25 °C for 17 days

### Results

- **The results for 10g/l grape skins were not determined.**
- As the concentration of grape skin increased from 20 g/l to 30 g/l, the quantity of immobilized cells (per gram of grape skins) at least doubled

### Conclusions and Future Work

- Grape skins, at the concentration of 30 g/l were the optimized concentration for O. oeni immobilization.
- The maximum malic acid conversion was 30.8% ± 5.1% for O. oeni immobilization during MLF in model wine.
- Grape skins are natural products and they are often taken out after grape juice extraction in winemaking process, therefore, it is a very environmental friendly approach and it can also improve economic efficiency.
- Further study on higher concentration of grape skins can be performed to test the maximum limit of affinity.
- More detailed investigation on HPLC analysis of residual sugar, lactic and malic acids are needed for sound winemaking practices.

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### References

[5] Honors Poster Session

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**Figure 1:** Comparisons of O. oeni Cell Immobilization Efficiency on Different Concentrations of Grape Skins

**Figure 2:** Malic Acid Consumption after 8 and 17 days of MLF with 10g/l Grape Skins Compared with Controls

**Figure 3:** Malic Acid Consumption in Malolactic Fermentation after 17 Days in Model Wine

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