

## EFFECTS OF MICROWAVE EXPOSURE ON CELL VIABILITY OF *SACCHAROMYCES CEREVISIAE* DURING GLUCOSE FERMENTATION

ALEXANDRU Vlaicu<sup>1\*</sup>, PETRE Chipurici<sup>2</sup>, IOAN Calinescu<sup>2</sup>,

<sup>1</sup>INCDCP-ICECHIM Bucharest, 202 Spl. Independentei, 6<sup>th</sup> district, Romania

<sup>2</sup>Faculty of Applied Chemistry and Material Science, University Politehnica of Bucharest, 1-7 Gh. Polizu, Bucharest, Romania

\*Corresponding author: alexvlaicu16@yahoo.co.uk

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### Introduction

The aim of this paper was to study the effects of microwave exposure during batch fermentation processes of glucose by *Saccharomyces cerevisiae*, on cell viability in comparison to conventional batch fermentation processes. Overall microwave effects might be classified as thermal, corresponding to augmentation of reaction rates based on a temperature increase, specific, thermal effects which can't be obtained when using convention heating and non-thermal. Thermal effects are directly proportional to the radiation intensity while non-thermal effects occur in certain frequency regions only, and depend on the interaction between the exposed sample and microwaves [1, 2].

### Materials and methods

Experiments were carried out using Red Ethanol yeast, glucose as the substrate and the fermentation broth was prepared using distilled water and the following nutrients:  $(\text{NH}_4)_2\text{SO}_4$ ,  $\text{KH}_2\text{PO}_4$ ,  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ , Citric acid,  $\text{Na}_2\text{HPO}_4$ , the concentrations of which were maintained for all carried out experiments. Cell viability was estimated using Trypan Blue to stain dead cells, pictures of which were taken using an optical microscope coupled with a digital camera. SEM, flow cytometry and GC analysis were also carried out.

### Results

In the experimental setup which was used an optimum Specific Absorption Rate domain was determined, with higher fermentation rates being achieved through microwave irradiation without the prolonged exposure being detrimental towards cell viability. Through both SEM analysis and optical microscopy of the exposed and control samples, no significant stress was observed on either cell wall integrity or on cell viability. Experiments were carried out at different substrate levels, yeast concentrations and different temperatures, and in all cases microwaves exposure didn't lead to an increase in number of death cells, yet in some cases microwave exposure proved to be beneficial towards increasing fermentation rates [3].

### Conclusions

Based on gas chromatography analysis couple with SEM and optical microscopy analysis, microwave exposure was proved to be useful during the fermentation process by increasing fermentation without having a significant negative effect on either cell viability, cell morphology or number of cells.

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