

EFFECT OF MICROWAVE RADIATION ON THE ABILITY OF *SACCHAROMYCES CEREVISIAE* TO PRODUCE TOXINS

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Abstract

The importance of this research lies in knowing the potential damage that occurs from the use of radiation emitted by the microwave device that is used most frequently at the moment, by knowing its effect on baking yeast cells. This study aims to find out the susceptibility of *Saccharomyces cerevisiae* to fermentat sugars and install the cell wall when directly or indirectly exposed for one minute to microwave rays with heat using the microwave oven, in addition to knowing the effect of exposure of the culture media used in yeast development to microwave rays at different intervals using an air microwave device.

We used a sample of bread yeast collected from the local markets of Mosul city, in which according to its shape and ability to ferment different types of sugars *Saccharomyces cerevisiae* was detected. The culture medium's cells' physiological behaviour was studied, using two methods, microwave oven, and an air microwave device. The first method involved the use of microwave rays produced by a microwave oven with a power of approximately 90 watts and a constant frequency of 2.54 GHz for one minute, divided into three variants (control Petri dishes, direct exposure Petri dishes, an indirect exposure Petri dishes). The second method involved treating the cultivar medium to microwave rays using an air microwave device using frequency of 10 GHz and 20 mW, and was used vertically and for different periods of time: 60, 40, 20, and 10 minutes, after which yeasts were planted on the medium and the dishes were incubated for 24 hours under the temperature 30 °C. The Petri dishes were divided into two groups: dishes exposed to the microwave rays and dishes not exposed to the microwave rays (control treatments), each group contained three variants of media in Petri dishes: A - Sabouraud agar, B - Sabouraud agar containing antifungal chloramphenicol 50 mg/L with gentamycin 50 mg/L, and C - Sabouraud agar containing 5% of sodium chloride. The separation of cell wall proteins from yeast cells was also performed using electrophoresis, by growing yeast on Sabouraud culture medium glucose agar and exposing it to microwave rays for different periods of time and vertically on the Petri dishes, and then incubated for 24 hours under a temperature of 30 °C to obtain the final results of the effect of radiation exposure.

The results showed, that exposure of *S. cerevisiae* yeast to microwave rays produced by a microwave oven for a minute led to cell deformation, slowed growth, a decrease in fermentation, and failure to produce toxins. Meanwhile, when Petri dishes containing the cultivar medium are processed with microwave rays using an air microwave device for 10, 20, 40, and 60 minutes, this temporarily inhibits cell growth and increases the rate of fermentation. The product of separation of cell wall proteins using electrophoresis showed that the components of the control sample (yeast cells are not exposed to microwave radiation) protein included two large bands: both visible on the separate gelatine with dimensions of 0.6 cm and 1.3 cm. In comparison, when the yeast cells were exposed to microwave radiation for an hour to radiation without heat, we noticed the decay and loss of the two bands, and the appearance of one band in the middle. In contrast, when the yeast cells were exposed to heat and radiation for one minute, we noticed that the first band had crept to 0.8 and the second band to 3.2, while exposing the medium before cultivation to microwave radiation, which was very similar to the effect of direct exposure in that we noticed the appearance of two bands at 0.9 and 3.7, respectively. Finally, the exposure of the food medium to microwave radiation for very long periods changes the organism's characteristics in its protein construction.

Conclusions from this study that when *S. cerevisiae* yeast was exposed to microwave radiation for 10, 20, 40, and 60 minutes, led to an increase in yeast's susceptibility to fermentation of sugars.

Key words: *Microwave, Electrophoresis, Saccharomyces cerevisiae.*