RESEARCH REGARDING THE INFLUENCE OF BETA IRRADIATION ON THE ENZYMATIC ACTIVITY OF BAKER'S YEAST

CERCETĂRI PRIVIND INFLUENŢA RADIAŢILOR BETA ASUPRA ACTIVITĂŢII ENZIMATICE A DROJDIILOR DE PANIFICAŢIE

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The biotechnological properties and the maltase activity of baker's yeast were investigated by irradiation with beta radiations in doses of 9.76 Gy, 12.20 Gy, 17.08 Gy and 22.96 Gy. We observed that the maltase activity is greater in yeast irradiated with lower doses (9.76 Gy, 12.20 Gy and 17.08 Gy) indicating that the beta radiation have a stimulating effect on the fermenting capacity of baker's yeast. This fact is valid also after 90 days. A higher dose induces a regress of this process. The baker's yeast exposed at beta radiations produced cultures more vigorous, resistant and with higher biotechnological properties.

Key words: *Saccharomyces cerevisiae*, enzimatic activity, beta irradiation.

Introduction

Microbial biotechnologies have produced the so-called biorevolution in accordance with the actual consumer demands by using natural mechanisms manipulation.

The biological and technological properties of yeast strains can be improved by different approaches such as genetic and fermentative technologies.

The enzyme maltase present in yeast is very important for the baking processes, based on yeast capacity to produce glucose

Materials and Methods

The enzymes were prepared from 4 yeast strains DC1, DC2, DC3, DC4, as follow: 4 control samples and 4 samples irradiated with beta radiation at doses 9.76 Gy. 12.20 Gy. 17.08 Gy and 22.96 Gy. In the present study we analysed the maltase activity of yeast strains of *Saccharomyces cerevisiae* isolated in pure culture under the influence of beta radiation applied in the following doses: 9.76

Gy. 12.20 Gy. 17.08 Gy and 22.96 Gy. at 28°C. and 32°C. The yeast strains were monitorized for 24 hours by determining the maltase activity.

The maltase activity express itself in glucose mg which was form in one hour at 37°C from 100 g maltase as a result of the one metric centimetre of enzyme extract activity.

The dose debit through the glass tube, in the very location where the yeast samples were placed one by one, was measured using a RFT- KD27012 dosimeter with an ion chamber.

Results and Discussion

Based on the previous determinations we considered that these strains own good biotechnological characteristics for our present investigation. The baker's yeast *Saccharomyces cerevisiae* isolated in pure culture represents a continous interest for food industry because the numerous applications. The properties of these strains can be improved under the influence of external factors of stimulation. The obtained results are presented in figures 1 -4.

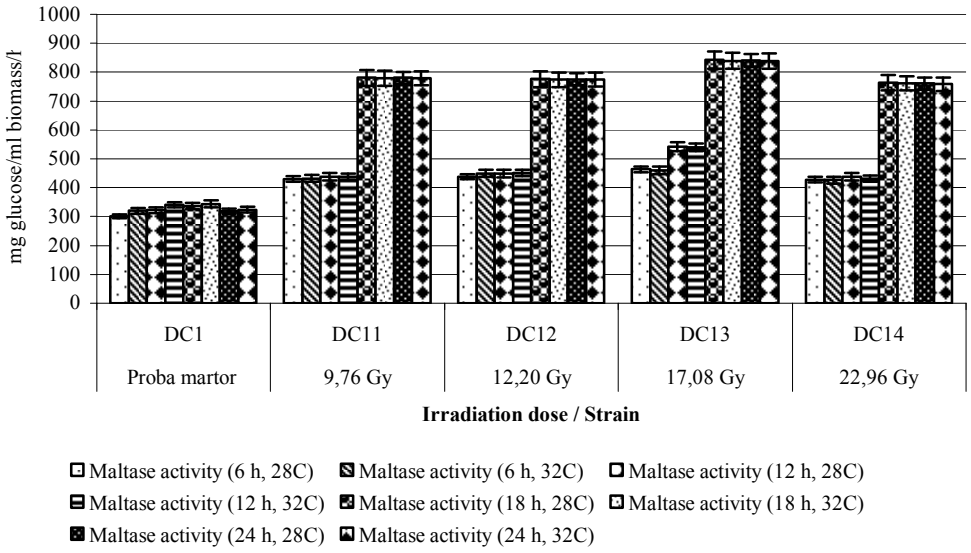

Figure 1. The evolution of maltase activity of control yeast strains (DC1) and irradiated samples (DC11, DC12, DC13, DC14) as function of temperature and fermentation time.

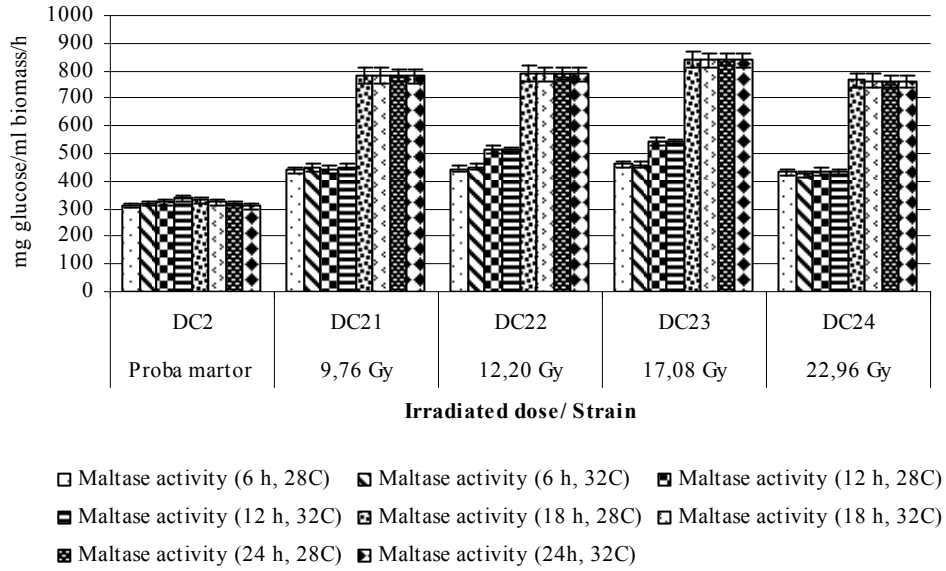

Figure 2. The evolution of maltase activity of control yeast strains (DC2) and irradiated samples (DC21, DC22, DC23, DC24) as function of temperature and fermentation time.

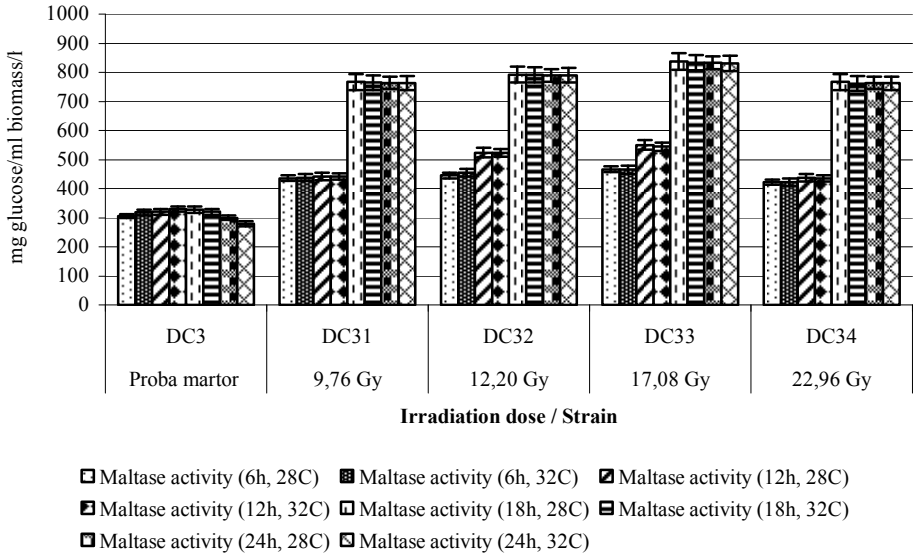

Figure 3. The evolution of maltase activity of control yeast strains (DC3) and irradiated samples (DC31, DC32, DC33, DC34) as function of temperature and fermentation time.

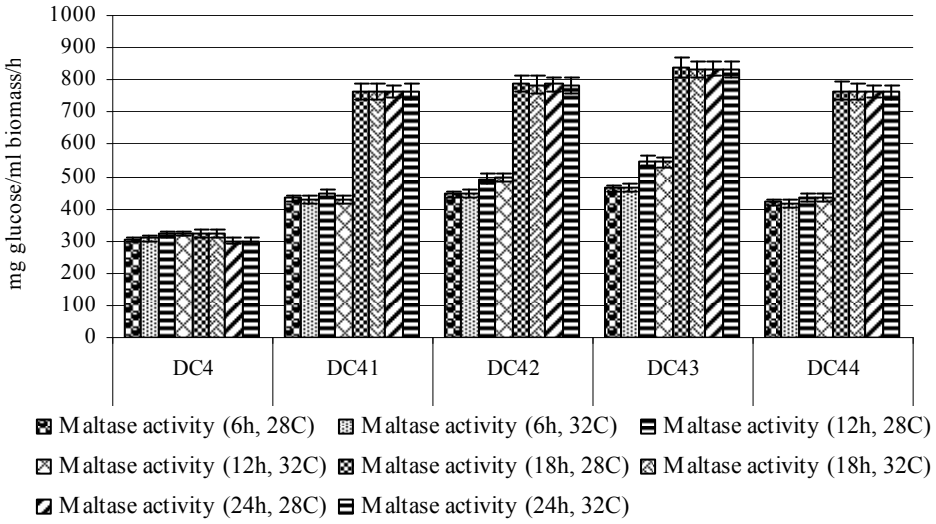

Figure 4. The evolution of maltase activity of control yeast strains (DC4) and irradiated samples (DC41, DC42, DC43, DC14) as function of temperature and fermentation time.

The statistical analysis regarding the correlation between the evolution of maltase activity and the level of irradiation at the same time of exposure showed the following results:

- Regardless the time of exposure, the total maltase activity increased at the dose level of 17,08 Gy. By irradiation with the doses in the interval 17,08-22,96 Gy, the maltase activity diminished. If we consider maltase activity on unit of irradiation, the activity registered a continous decrease. This fact leads to the conclusion that maltase activity decreases with the increase of the dose of irradiation, but not proportionally.
- Because the amount of maltose on the unit of irradiation, at the same level of irradiation, varies with the time of exposure, the mathematical modelling of the function regarding the influence of the irradiation level must be realized for each value of the time of exposure.
- Determination of a complex regresssion function which should express the evolution of the maltase activity either under the influence of time of exposure or the level of irradiation Q(t,Gy), involves not only time consuming calculations but also determination of measurements for constant intervals of modifications of the dose level and for constant and low intervals of time of exposure.

According to the first observation, we made a graphical representation of the evolution of maltase activity on the unit of radiation. For practical reasons, we considered the data for the final time of exposure, 24 hours, the resulted mean values being 47,8; 39,3; 29;81 şi 9,36.

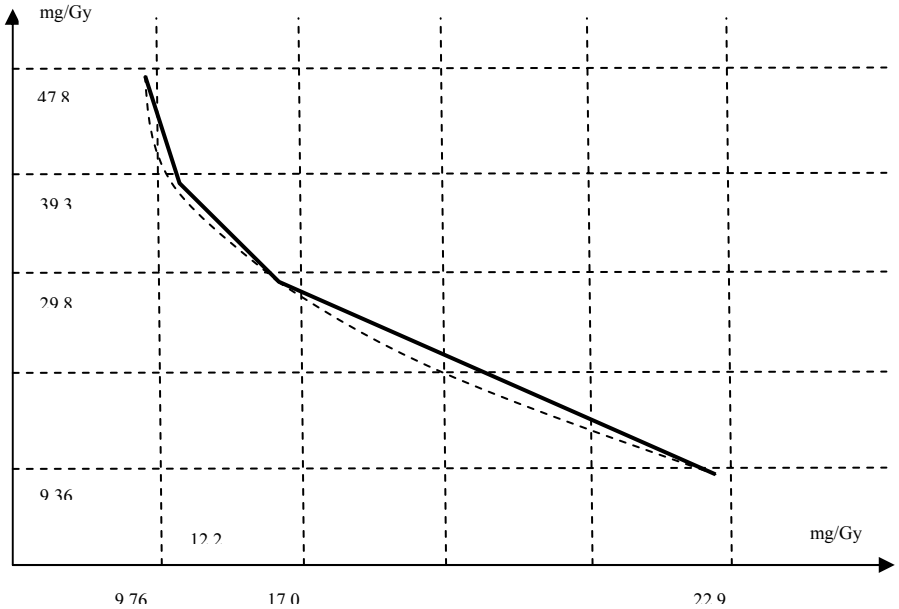

Figure 5. The evolution of the maltase activity on the unit of beta radiation.

The form of the graph (continue line) revealed the tendency of a hyperbolic evolution (discontinue line) of the maltase activity on the unit of radiation, as shown in figure 26. The tendency of the function is ascendent for the same time of exposure but for increased doses of radiation with the mathematical resulted value of 30 Gy. In accordance with the proposed model at 45 Gy the maltose amount starts to decrease progressivelly.

Conclusions

Accepting the possible errors, we can afirm that beta radiation have a clear influence on maltase activity of baker's yeast.

- The influence of beta irradiation of baker's yeast *Saccharomyces cerevisiae* on their maltase activity. The conditions of cultivtion was culture medium with yeast extract 1%, peptone 2% and glucose, at temperatures 28ºC and 32ºC, for 24 hours. The level of irradiation of the 4 strains was 9,76 Gy, 12,20 Gy, 17,08 Gy and 22,96 Gy. The purpose of beta irradiation was to obtain a superior maltase activity which is beneficial for the technological processes.
- We obtained a superior maltase activity compared to the control sample for low dose irradiation (9,76 Gy, 12,20 Gy, 17,08 Gy).
- In similar irradiation conditions we obtained good biotechnological results in conditions of 28ºC compared to the experiments at 32ºC.

- The yeast cultures irradiated at low dose of beta radiation are more vigourous and with a superior time related resistance.

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