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PHYSICO-CHEMICAL RESEARCHES REGARDING THE BIOTECHNOLOGICAL QUALITIES OF YEASTS

CERCETĂRI FIZICO-CHIMICE ASUPRA CALITĂȚILOR BIOTEHNOLOGICE ALE DROJDIILOR

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*In the present study we monitored the evolution of the fermentative capacity of the 8 selected yeast strains *Saccharomyces cerevisiae*, under the influence of the following compounds: perhydrol, lactic acid 90%, acetic acid, chlorhydric acid, sodium chloride, ammonium chloride, magnesium chloride and sodium bisulphite. the greater number of autolysed yeast cells was obtained in case of addition of 90% lactic acid at pH 3, 0.2% sodium bisulphite and acetic acid at pH 3. The lowest number of autolysed yeast cells was obtained with 0.1% ammonium chloride, perhydrol and 0.1% magnesium chloride.*

Keywords: *Saccharomyces cerevisiae*, chemical substances, organic acids

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 (Banu, 2002, Oprean, 2002). By adding of different chemical compounds in the yeast biomass, the proteolysis processes are highly influenced resulting in a decrease of the biotechnological properties of yeast. This effect is produced by zymase inactivation and autolysis processes. In other cases, adding different chemical substances such as organic acids (citric, malic, succinic, tartaric acids) to the yeast cells of *Saccharomyces cerevisiae* in determined conditions (30°C, pH 4.5 and 7.5) lead to an improvement of cells viability and fermentative capacity (Peres, 2005).

Materials and Methods

In the present study we monitored the evolution of the fermentative capacity of the 8 selected yeast strains *Saccharomyces cerevisiae*, under the

influence of the following compounds: perhydrol, lactic acid 90%, acetic acid, chlorhydric acid, sodium chloride, ammonium chloride, magnesium chloride and sodium bisulphite. The strains were cultivated on MEA medium, treated with the above mentioned substances and monitored during a period of 4 days by counting the autolysed cells with the counting Thoma chamber.

Results and Discussion

After 24 hours, the samples treated with perhydrol presented a lower autolysed cells number compared to the other samples. In case of 0,1% perhydrol after 4 days it was registered the lowest percentage of autolysed cells, as shown in figures 1 and 2.

We observed a similar effect in case of 0,1% ammonium chloride and 0,1% sodium chloride by obtaining a decreased number of autolysed cells after 4 days compared to the control sample. Sodium bisulphate and lactic acid are compounds that produce a rapid autolysis of yeast cells.

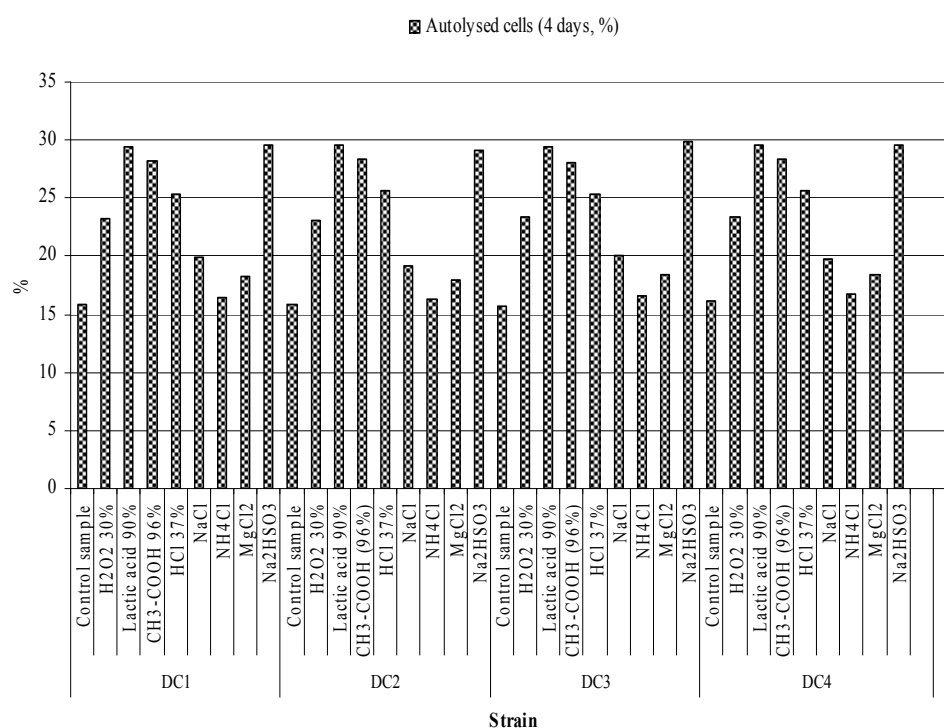


Fig.1. The evolution of the autolysis process of the selected yeast strains (DC1, DC2, DC3, DC4) under the influence of different chemical compounds, at 22°C, for 4 days.

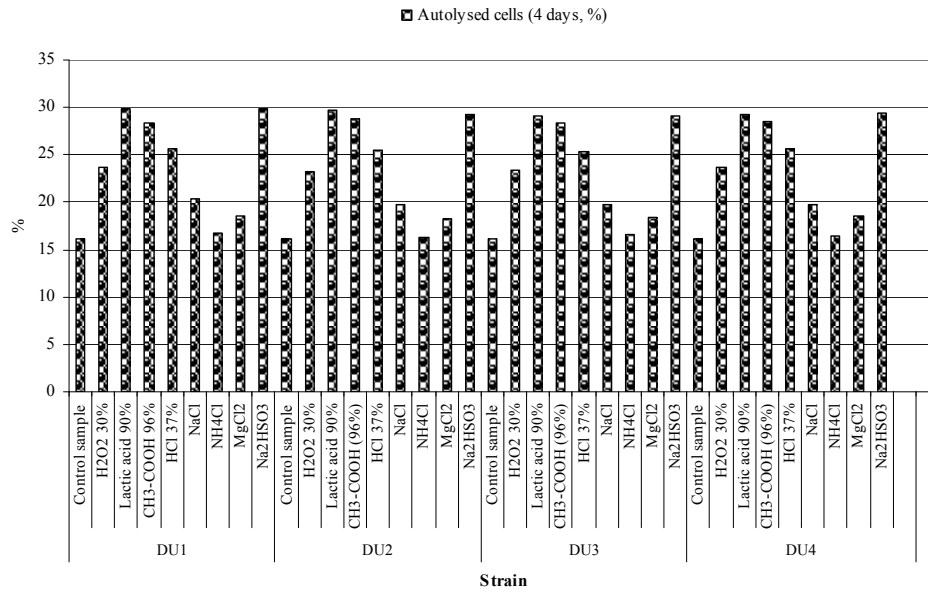


Fig.2. The evolution of the autolysis process of the selected yeast strains (DU1, DU2, DU3, DU4) under the influence of different chemical compounds, at 22°C, for 4 days.

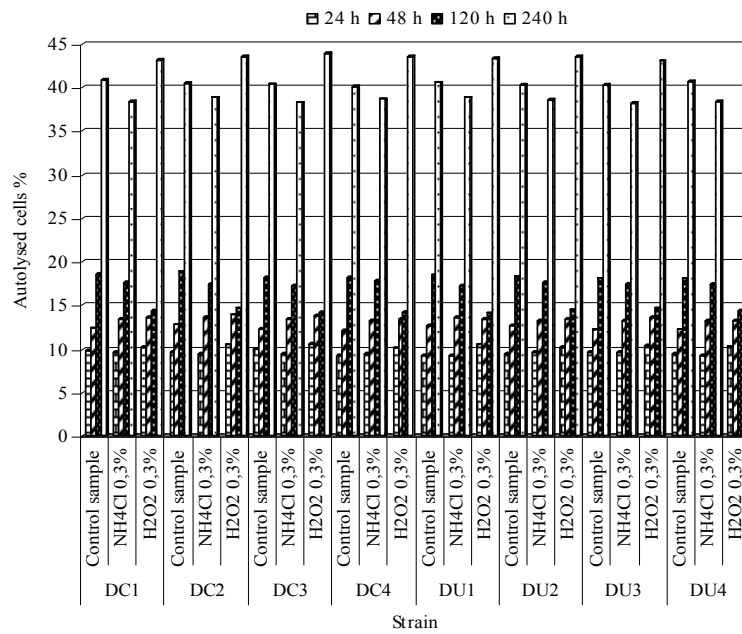


Fig.3. The evolution of starter cultures of baker's yeast strains DC1, DC2, DC3, DC4, DU1, DU2, DU3, DU4 in the presence of ammonium chloride and perhydrol

We obtained optimum results regarding the improvement of preservation qualities of yeast, by combination of chemical compounds addition and use of refrigerating temperatures. Thus, by addition of perhydrol and ammonium chloride the fermentative capacity of yeast increased with 10-20% compared to the control sample. The result is explained by the intracellular modifications of the yeast cells in the sense of adaptation to the stress conditions (Godon, 1998, Jamieson, 1995). Concluding, an improved preservation quality of yeast was obtained by addition of specific chemical compounds, as shown in figure 3.

Conclusions

The greater number of autolysed yeast cells was obtained in case of addition of 90% lactic acid at pH 3, 0,2% sodium bisulphite and acetic acid at pH 3. The lowest number of autolysed yeast cells was obtained with 0,1% ammonium chloride, perhydrol and 0,1% magnesium chloride.

The autolysis process of yeast cells is influenced by concentration of the compounds and the type of yeast strain.

Improvement of preservation properties was obtained by combined action of chemical compound and refrigerated temperature. By addition of 0,3% perhydrol at 6°C the fermentative power of yeasts increased with 10 – 20% compared to the control sample.

The baker's yeast studied under the influence of physico-chemical stress conditions presented an improved preservation period of time.

The results of combined addition of chemical compounds (perhydrol and ammonium chloride) and refrigerated temperatures showed an increase of the fermentative power with 15%.

The duration of viability and vitality of the yeast cultures was considerably prolonged by addition of perhydrol and ammonium chloride which proved to have a positive influence of yeast cells.

References

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