STUDIES UPON MALTASIC ACTIVITY OF THE BAKERY YEAST SACCHAROMYCES CEREVISIAE

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Abstract:
The maltose is the main disaccharide developed in the dough as a result of the action of α and β amylases from the flour. The hydrolyses of the maltose is achieved under the effect of the maltase, an enzyme produced by the bakery yeast Saccharomyces Cerevisiae.
In the work was tested a more accurate method of establishment of the maltase produced by the bakery yeast, a method of spectrophotometer establishment were instead of the maltose is using a pseudosubstratum, the disadvantages of the classical method being eliminated.
In the experiment was used yeast from four producing firms from inland and abroad. It was determined the maltasic activity in the compressed yeast at the four sorts during the warranty period and after their storage in favourable conditions for partial autolysis of the cells.
Keywords: maltase, yeast, amylase, maltose, dough.

Rezumat:
Maltoza este principalul glucid format în aluatul de pâine, sub acţiunea α şi β amilazelor din făină. Hidroliza maltozei se realizează sub acţiunea maltazei o enzimă produsă de drojdia de panificaţie Saccharomyces Cerevisiae.
În această lucrare s-a experimentat o metodă mai precisă de determinare a maltazei produse de drojdia de panificaţie, o metodă de determinare spectrofotometrică în care în loc de maltoză se foloseşte un pseudosubstrat fiind eliminate dezavantajele metodei clasice.
În experimentări s-a utilizat drojdie comprimată de la patru firme producătoare din ţară şi străinătate. S-a determinat activitatea maltazică în drojdia comprimată la cele patru sortimente în termenul de garanţie şi după păstrarea lor în condiţii în care a fost favorizată autoliza parţială a celulelor.

Résumé :
Le maltose est le principal glucide formé dans le levain, sous l'action de α et β amylases de la farine. L'hydrolyse du maltose est faite sous l'action de la maltase, une enzyme produite par la levure de pain Saccharomyces Cerevisiae.
Dans ce travail on a experimenté une méthode plus precise de déterminer la maltase produite par la levure de pain, une méthode de détermination spectrophotométrique où on utilise un substrat à la place de la maltase, les desavantages de la méthode classique étant éliminés.
Dans les experiments on a utilisé de la levure comprimée des quatre firmes productrices du pays et de l'étranger. On a déterminé l'activité de la maltase dans la levure comprimée aux quatre sortiments en terme de garantie et après leur maintenance dans des conditions favorables à l'autolyse partielle des cellules.
Mots clés: maltase, levure, amylase, maltose, levain.

Introduction

One of the most important biotechnological properties of the compressed yeast is the capability to making quick suitable for fermenting the maltose, the main disaccharide built up in the dough, as a result of action of α and β amylases from the flour.

The maltase (α glucosidase) from Saccharomyces cerevisiae is an adapting enzyme that is induced by the existent maltose in the medium. The maltose is carried in the inside of the cell by a maltaso-permeazis and after the coding by the genes from the cell genome of the α glucosidase, the maltose is hydrolyses in the inside of cell in two moles of glucose that is then metabolized (breathing or by alcoholic fermentation).

In the outside of the cell is glucose present, this exercise an effect of catabolical repression and the biosynthesis of the α-glucosidase is inhibited.

The knowledge of the conditions that are stimulating the biosynthesis is important for determining the activity of this enzyme yelled by different strains of the yeast Saccharomyces Cerevisiae.

So, in the case of using a cells suspension for determining the maltasic activity and as substratum maltose, by the temperature of 30°C takes place at the same time as the hydrolyses of the maltose a consumption of glucose, too, so that the determining of the quantity of glucose resulted by hydrolyses is not accurate.

Because the strains of the bakery yeast are different each other by their activity, we used in this work a method of Spectrophotometer establishment were instead of the maltose is using a pseudosubstratum , the disadvantages of the classical method being-eliminated.

We applied this method in order to determined the maltasic activity of the yeast from different sources, with various autolysis degree.

Materials and methods

I used in our study compressed yeast from four producing firms from inland and abroad.

The maltasic activity was determined in extracts by using as pseudosubstratum, para-nitrofenil-α-glucopiranozidol that is hydrolyses by α-glucosidase producing para-nytrofenil which reacts with D-erytrol resulting a yellow colour and their extinction was read at spectrophotometer UV-VIS at a wave length λ=400nm. An unit of activity is representing the quantity of enzyme that lends to the building-up of a 1μmol of para-nytrophenol per minute at 30°C and pH 6.8.

The dry substance of the yeast was determined in oven by the quick method with the drying of the sample handled in the mortar with sand within one hour at 130°C.

The physiological status of the yeasts from the mould was estimated at the same time with the counting of the cells from a gram of compressed yeast in the presence of blue methylene and natrium cytrate 2% with chamber Thoma.

The fermentation power was determined by the Ostrovski method.

Results and disscusion

1. Determining of the maltasic activity in the compressed yeast of good quality

The samples for analysis have a fermentation power between 9-21 minutes, being proper in yeast of good quality, confirmed by the reduced number of autolysis cells (table 1).

Accounting to determining of cells characteristic to the type of the yeast and the conditions of cultivation is varying the number of the cells in a gram of compressed yeast.

The sorts of yeast analyzed contain on the average between $1.5\text{-}3.5*10^{10}$ cells per gram of yeast from the mould and have a percent of autolysis cells between 5-10%, suitable for the yeast used in bakery.

Table1. The characteristics of the fresh compresses yeast

Nr.	Compressed yeast	u %	s.u. g %	Nr. cells g^{-1}	Autolysis cells %	Maltasic activity U.A.g^{-1}s.u.	
1.	L.esaffre-France	65,4	34,6	$2,2*10^{10}$	7,2	235,1	9,5min
2.	Ferminan-Italia	70,4	29,6	$3,5*10^{10}$	9,2	119,8	21,27 min
3	Budafor-Hungary	67,7	32,3	$2,4*10^{10}$	10,0	243,5	11,21 min
4	Pakmaya-Romania (Paşcani)	70,4	29,6	$1,5*10^{10}$	5,3	277,3	14,25 min

From the enzymatic point of view the samples are different in the maltasic activity, with close values for the samples 1, 3, 4 and reduced for the yeast Fermipan that has also a lower fermentative capacity.

2. Maltasic activity of the compressed yeast after storing in favourables conditions for partial autolysis of the cells.

To establish to what extent is the maltase an enzyme resistant to the action of the intracellular proteases we determinate the maltasic activity in extracts obtain by the same yeast samples stored during 3 days at 28°C and 17 days at refrigerator (20 days after the validity term).

The samples 1 and 3 doesn't present aspect modifications, the yeast 2 and 4 are presenting a more high degree of autolysis, more evident at the yeast 4 (were is observing a liquefying of the mould) and colour darkening.

By the determining of the same parameters, the values from the table 2 were obtained.

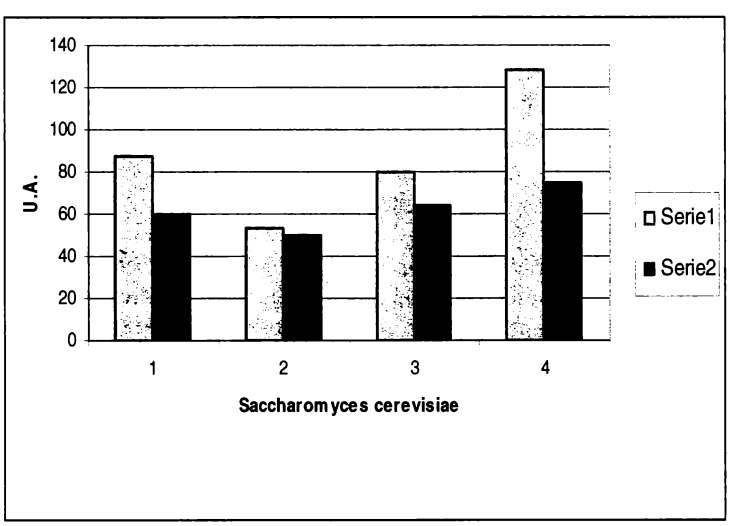
Table2. Modifications of the quality of the compressed yeast by storing after the validity term (20 days).

Nr.	Compressed yeast	u %	s.u. g %	Nr. cells g^{-1}	Autolysis cells %	Maltasic activity U.A. g^{-1}s.u.
1	L.esaffre-France	57,4	42,6	$7,5*10^{10}$	10,4	504,3
2	Ferminan-Italia	65,6	34,4	$3,9*10^{10}$	9,2	289,9
3	Budafor-Hungary	65,1	34,9	$3,12*10^{10}$	10	197,8
4	Pakmaya-Romania (Pașcani)	62,2	37,8	$2,5*10^{10}$	47	304,5

During the storing takes place an evaporation of the free water and a growing of the member of the cells/gram. The percent of the autolysis cells reached values of 47% from the total number by sample 4 where a softening of the mould was observed, too.

From the point of view of the enzymatic activity expressed in A.U./g s.u. comparatively with fresh yeast it is observing a growing of about two times for the samples 1 and 2 and a decreasing or near values for the samples 3 and 4.

In the diagram 1 is representing comparatively the maltasic activity expressed in A.U. per 10^{10} cells, in order to have a more accurate valuation criterion.



1-fresh yeast
2-stale yeast

Diagrame 1.
Comparative maltasic activity expressed in A.U. per 10^{10} for fresh and stale yeast

Conclusions

- It was tested a more accurate method for determination the maltase produced by the bakery yeast.
- The enzymatic activity is dependent on the yeast stain and the physiological status of the cells.
- Through the autolysis the intracellular maltase becomes free more easy in extract and is strong to the proteolysis.

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