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BIOTECHNOLOGICAL POTENTIAL OF
FERMENTATION YEASTS OF THE GENUS
SACCHAROMYCES

SUMMARY OF PhD THESIS

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INTRODUCTION

Yeasts are, in terms of quality and economic the most important group of microorganisms that are used in production and marketing. Although technologies based on yeast continue to be used mainly in industries related to food and beverage products, there are various reasons for the initiation of new technologies.

The theme of this paper is inscribed in the current study that concerns the biological and technological properties of yeasts used in production and technological processes that ensure high quality products, and how they can be controlled and conducted their metabolic activity.

Making industrial biotechnologies to obtain enzymatic preparations for extension of practical use have turned his attention of specialists focused on the identification of the microorganism capable of producing enzymes with catalytic properties as appropriate for the purpose for which it was obtained. With the help of enzymes produced by microorganisms it can speed up biochemical processes and improve production processes to improve food quality.

1. CHARACTERIZATION OF MORPHOLOGICAL, PHYSIOLOGICAL AND BIOCHEMICAL OF FERMENTATIVE YEASTS STRAINS

1.1. HYPOTHESIS AND OBJECTIVES OF THE STUDY

The theme of this paper is part of the current study concerning the biological and technological properties of yeast used in the production and technological processes that ensure high quality products, and how it can be controlled and directed their metabolic activity.
In order to achieve were established the following objectives:

a) the isolation and selection of: 3 strains of beer yeast (Saccharomyces carlsbergensis); 3 strains of bakery yeast (Saccharomyces cerevisiae); 3 strains of wine yeast (Saccharomyces ellipsoideus);
b) establishment the morphological and physiological particularities of strains of yeasts isolated
c) knowledge of the biochemical composition of the fermentation yeast strains isolated
d) preparing a collection of industrial yeasts with superior production qualities, useful specialists.

1.2. RESULTS AND DISCUSSIONS

As a result of the analyses carried out yeasts Saccharomyces carlsbergensis formed colonies with a diameter between 2-4 mm on the MMA. Examined under the microscope the cells exhibited a spherical or oval shape, being singular or arranged in pairs.

Yeasts Saccharomyces cerevisiae observed under the microscope (native prepared) have an ellipsoid shape, white-gray. S. cerevisiae cells fall into three groups: the first group sizes are placed cells with dimensions 4,5 – 10,5 x 7-21 mm, those in the second group have size 2,5 –7×4,5 – 11 – 18,5 μm, and the last group, covers cells with the smallest dimensions, 3,5-8 × 5 (11.5) – 17,5 mm.

Physical characteristics of the cells depend on how and when of the division of nutritional substances held by cell. SCF 204, SCA 205, SCTS 206, SCHP309 and SET 102 have the dimensions between 4 and 7,58 μm and due to a smaller area, have a lower yield.

The new strains of yeast have been seeded in culture medium of liquid malt mash at a temperature of 22 °C for 3 days. Technological properties of yeasts have been studied from the point of fermentative test, in additional contact with maltose content of 5%, 10% and 15%.
It can be seen that the fermentation yeasts varies depending on the amount of maltose content added, but also during fermentation. It can be seen that the greater amount of CO₂ that was recorded after the addition the content of 15% by adding maltose after a period of 72 hours.

High values indicate that after 72 hours with the addition of 15% maltose content, yeasts increase their shelf life by superior, with a fermentative capacity of 45-55% higher compared with the blank.

Compared with the blank, yeast strains with the addition of 5% maltose content registered a higher fermentative activity, as the yeast Saccharomyces ellipsoideus versus the other two types of yeast.

Thus conclude that the addition of carbohydrate, respectively maltose content, promote positive capacity of the fermentation yeasts.

Under conditions of aerobiose sugars are assimilated to carbon dioxide and water, and thus a large amount of energy required for rapid growth and multiplication. The data obtained shows that the addition of sugar inhibits easy fermentative activity due to the quantity of sugar in excess which cannot be fully assimilated by yeast. Sugar content as a percentage of 5% constitutes an added moderated which results in differences of about 20-30% between the work of the blank and the fermentative of the sample.

Unlike Saccharomyces ellipsoideus and Saccharomyces carlsbergensis, Saccharomyces cerevisiae as a result of the addition of sugar and maintained at a temperature of 27 °C recorded higher values, demonstrating a high fermentation capacity.

To highlight the effect of fermentative yeasts on preservation activity has added glycerol in a proportion of 1%, 2% and 3%. Glycerol added the biggest concentration after 3 days produced a significant growing to the fermentative capacity of the yeasts. This is due to partial or total period of the lag that occurs in the production of CO₂, needed the biosynthesis of glycerol. Analysis of types of yeast studied, Saccharomyces cerevisiae shows the highest increase of fermentative capacity, and in
this yeast sample with added 3% glycerol, glycerol register the maximum value recorded, respectively 19,459 g CO2/g for s.u. and SCHDO 308.

Biotechnological properties of yeasts have been investigated from the viewpoint of fermentative capacity of nine strains of yeast in contact with exogenous trehaloses added in content of 5 and 10%. It was used as a culture medium in which malt must have been introduced by 2 ml of inoculum, samples are fermented for six days at 22°C. The quantity of CO2 was measured periodically, while pursuing the development of fermentației in default conditions.

Following analyzes of selected yeast strains with temperature have revealed that favorable temperature fermentation activity is the 25°C, the most valuable being SCHP strain 309.

Fermentation activity of yeast was analyzed according to the addition of vitamins in malt wort medium. Concentration and type of vitamins influences the fermentative activity of yeasts, such addition of vitamin B1 for the most efficient yeast strain was SCHDO 308, with a total release of CO2 from 3.426 g/100 ml. SET-102 strain of the highest fermentative activity in culture medium enriched with vitamin B6.

From the figure below shows that the average moisture within the three types of yeast as follows: - for Saccharomyces carlsbergensis water percentage is between 65-68% - for Saccharomyces cerevisiae 64-66% - for Saccharomyces ellipsoideus 67-69%.

Mean dry matter, within the three types of such yeast: Saccharomyces carlsbergensis average value determined for dry matter is between 32-35%, for Saccharomyces cerevisiae 34-36 %, for Saccharomyces ellipsoideus 31-33%.

The average percentage of crude protein for this strain of yeast taken range from: the average value determined for Saccharomyces carlsbergensis crude protein is between 50 - 54%; for Saccharomyces cerevisiae 40-50%; for Saccharomyces ellipsoideus is 60%.

Yeast Saccharomyces carlsbergensis, Saccharomyces cerevisiae and Saccharomyces ellipsoideus are able to drive so that the properties of alcoholic
fermentation biotechnology dominant strains were selected: SCF 204-marked B1, B3 SCTS 206-marked, marked SCHCCBM 307-P1, P3 SCHP 309-noted , SEMCCBM 101-102-SET marked V1 and V3 noted to obtain high quality wine products.

The yeast autolysates increased fermentative activity, of which the most valuable evidence is P1B1V1, a direct proportion of the three selected yeast strains.

The amount of accumulated biomass was recorded by yeast autolysated, V1 is the most valuable strain.

2. RESEARCH ON OPTIMIZATION OF THE ENZYMATIC ACTIVITY OF FERMENTATIVE YEAST STRAINS

2.1. HYPOTHESIS AND OBJECTIVES OF THE STUDY

Requirement of food as healthy and safe, growing concern for human health, her relationship with the structure and quality of food and micronutrients of associating food with beneficial effects on human health caused its completion.

Study objectives were:

- identification and establishment of culture medium for the cultivation of the 9 strains of yeast of the genus Saccharomyces;
- improving the culture medium with growth factors;
- Invertase activity determination of the 9 strains of yeast according to the addition of culture medium;
- determine invertase activity of yeast strains of the 9 depending on the temperature of incubation
- Maltase activity determination of the 9 strains of yeast according to the addition of culture medium;
- Phosphatase activity determination of the 9 strains of yeast according to the addition of culture medium.
2.2. RESULTS AND DISCUSSIONS

The yeasts of the genus *Saccharomyces*, the potential to synthesize invertase is dependent on the composition of culture medium. The best results were obtained when the yeast strain grown on medium enriched with complex malt mash of vitamins + (CH$_3$COO)$_2$Zn. In conditions of complex addition of vitamins and (CH$_3$COO) 2Zn in malt wort, Strain of yeast selected from this criterion is SCA 205, that is Saccharomyces carlsbergensis isolated from Albacher company from Sebeș.

If the baking yeast strains of the strongest growth invertase activity was recorded for SCHP strain 309, isolated from Saccharomyces cerevisiae from Pakmaya company.

Influence of different additives in the culture medium malt wort, the potential strains of yeast invertase of wine can be explained by their different degree of absorption: The largest increase was recorded by strain 103 SEJ 3.55 times the control sample, a strain isolated from valuable features wine center Jidvei.

The optimal enzyme activity is obtained at an incubation temperature of 32 ° C. The largest amount of invertase obtained by comparing the 9 strains of yeast grown on medium malt wort was recorded for SCHCCBM strain 307.

The results obtained certifies that the strains grown on malt wort culture medium enriched with vitamin complex and vitamin complex + (CH$_3$COO)$_2$Zn have the highest maltase activity.

Between the strains of *Saccharomyces carlsbergensis* brewer's yeast cultivated on malt wort culture medium enriched with vitamin complex + (CH$_3$COO)$_2$Zn, the highest maltase activity showed a SCTS strain 206 (352 μmol maltase / g yeast) isolate from Trei Stejari company in Sibiu, 1.05 times more than the SCA 205 (334 μmol maltase / g yeast).

Best phosphatase activity was recorded by all three yeast strains selected in malt wort culture medium enriched with complex vitamins + (CH$_3$COO)$_2$Zn. The highest value recorded was 19.11 μmole phosphatase / g yeast by SEMCCBM 101, an increase of 1.53 times higher than the sample.
3. STUDY ON THE INFLUENCE OF THE ADDITION OF YEAST IN FEED PHEASANT ON THE PROCESS OF INCREASING WEIGHT

3.1. HYPOTHESIS AND OBJECTIVES OF THE STUDY

Knowing the physiological role of yeast and their necessity, the study's hypothesis is: "Feeding stimulating and high quality feed in the necessary quantities of various physiological pheasant, is indispensable to obtain high yields, a good health and reproduction of high index of diversifying feed ration with added different bread yeast and wine. Study objectives are developed in line with modern techniques of analysis and aim: "the analysis of physico-chemical implications of pheasants given hay and outstanding results in their weight gain. "Determination of crude protein, crude fat, lysine, methionine and yeast of fodder given the three categories of feeding pheasants. "Registration weight gain in the three categories of pheasants consider: pheasant chicks, pheasants for growth and maintenance.

3.2. RESULTS AND DISCUSSION

Nutritional value of feed is given by their ability to meet the body energy and substances with plastic and bio-stimulator, the way they affect the health and animal production.

Monitoring weight gain was realise on a group of 10 young pheasants for 14 days. The largest increase recorded in the addition of yeast in feed ration showed a lot of pheasant chicks were feed with bread yeast. Thus, day 14, chickens fed with bread yeast increased with an average weight of 440 grams compared to the control group, which grew by 384 grams.

As pheasant chicks, influence of the addition of yeast to feed of pheasants for growth has been positive. Favorable outcome classified using bread yeast in pheasants ration classified first, the maximum weight (weight average) is the 1281 grams, from 1084 grams recorded in the control group.
The rate of weight gain pheasants for maintenance, according to the addition of yeast, is oscillating. Lot of pheasants receiving yeast showed a maximum, with the other additions, by day 9. Different absorption of yeast used, the 10-day feeding was a decisive, placing beer yeast first, against bread yeast. However, average weight recorded in the 14 days had a value of 898 grams for pheasants fed with bread yeast, from 818 grams to pheasants fed with beer yeast.

4. GENERAL CONCLUSIONS AND RECOMMENDATIONS

Summarizing the results of this study, the morphological, biochemical and physiological three selected yeast strains isolated from industrial yeasts can conclude:

4.1. It was found that the strains SCF 204, SCA 205, SCTS 206, SCHP309 and SET 102 have the dimensions between 4 and 7,58 µm and due to a smaller area, have a lower productivity.

4.2. Values recorded indicate that after 72 hours with the addition of 15% of maltose yeast increase their shelf life by superior, showing fermentative capacity of 45-55% higher than the sample. By the sample, yeast strains with the addition of 5% maltose showed a higher fermentative activity.

4.3. Unlike *Saccharomyces ellipsoideus* and *Saccharomyces carlsbergensis*, *Saccharomyces cerevisiae* by the addition of sugar and maintained at a temperature of 27 ° C showed higher values, showing a higher fermentation capacity.

4.4. *Saccharomyces cerevisiae* increase the largest fermentation capacity, and in this yeast sample containing 3% glycerol records the maximum, repectively 19,459 g CO₂ / g dry substance for SCHDO 308.

4.5. Plasmolizatele with sucrose and salt obtained from yeast of beer, bread and wine is characterized by a chemical composition that we particularly recommended food and serve as food for some condimentar extract, which gives them their characteristic taste pleasant, like mushrooms.

4.6. Environmental enrichment methods of culture with various growth factors showed positive results, the enzymatic activity of yeasts increasing significantly.
4.7. Research has shown that culture medium composition significantly influences the activity of invertase, maltase and phosphatase, best culture medium is malt mash with vitamin complex and (CH₃COO)₂Zn.

4.8. Action stress exerted on the inoculum can improve production efficiency invertase, maltase, and that phosphatase enzyme activity.

4.9. The addition of yeast in feed ration positively influence weight gain of pheasants. The most complete and beneficial for growth and development of the three categories of pheasant (pheasant chicks, pheasants for growth and for maintenance) was a feed ration with added yeast, followed by the addition of beer yeast.

4.10. Knowing the nutritional value of feedingstuffs are one of the basic issues in the study and practice of feeding the animals. The food is considered to be organic or inorganic matters which may be ingested by their metabolites animal without harming their health or production. Thus, enriched with bakery yeast provides the best animal nutrients needed for vital functions and in order to achieve the planned works.
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