BAKERY YEAST *SACCHAROMYCES CEREVISIAE* MANUFACTURING BASED ON GOOD MANUFACTURING PRACTICE AND FOOD SAFETY PRINCIPLES

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Abstract
The quality and safety of the finished product -bakery yeast-(Saccharomyces cerevisiae) are two main aspects which must be complished in technological process of the bakery yeast manufacturing.
By implementation of the HACCP's rules which is an efficient system regarding food safety applied in food industry it can assure the identification, the assesment and the control of the potential risks in a yeast production unit.
Based mostly on preventing of the possible escapes which might represent some risks for consumers health, the system is used for establishing of the critical control points (CCP) in technological process in terms of each production unit equipment.
The paperwork had in view two main directions.
In the first stage experimental studies were made regarding microbiological control on each technological production stage, establishing hygiene and determining of contaminants from different sources (raw and auxiliar material, pure laboratory culture, production and storage chambers, machines and technological pipes, technological water and air, package materials, personnel).
In the second stage, HACCP plan was made in order to control the technological process regarding the contamination risks.
Based on GMP and GHP, could be identificated the main risks associated with technological process of the bakery yeast manufacturing, with establishment of the critical limits, control measures and monitoring methodes, as well as the establishment of a complete hygiene program for all technological process stages of bakey yeast manufacturing..
The aim of this study was to establish HACCP's stages within of the manufacturing process of compressed bakery yeast and to show the essential role of the food safety system implementation respecting the requires of SR EN ISO 22000.

Keywords: bakery yeast, food safety, HACCP principles, critical control points (CCP)

1. INTRODUCTION

Data regarding bakery yeast production exclusively used for bakery products manufacturing are since last decade of XIX century [1]. In the beginning, brewery yeast was manufactured using cereals mass as a substrate, later the substrate was changed with sugarcane molasses in United States of America and sugarbeet molasses in Europe, because it was the cheapest raw material. This transformation was made possible by Louis Pasteur's fundamental studies between 1857-1863 when he has revealed the microbiological fermentation origin and he explained yeast anaerobic mechanism.
The main purpose of bakery yeast technology it is representative by obtaining of the maximum amount of superior quality yeast biomass, which is adapted to produce the sugars fermentation in dough with minimal consum of nutritive media and utilities [2]. It is followed the achievement of the optimal multiplications of budding cells, using periodically renewable starters, maintaining the prescribed conditions of development and taking into account the physiological stage, the amount of initial yeast and all of limitative factors.
Bakery yeast industry in our country has faced with an ample development: both by the existent factories modernization, by improving of the intensive and extensive indicators of machines using and by setting up new production capacities.
Of world compressed yeast production about 88% it is used in bakery industry and the rest is used in proteic isolates, vitamins (complex B vitamins) or enzymes (invertase, dehidrogenase, enzymes from enzimatic complex) obtaining, that in different countries

the medium yeast consume is 1,4-2,5 kg/inhabitant/year. The aim of this study was to establish HACCP's stages within of the manufacturing process of compressed bakery yeast and to show the essential role of the food safety system implementation respecting the requires of SR EN ISO 22000.

2. METHODS

For HACCP's stages establishing with the view of its principles implememtation in compressed bakery yeast manufacturing 2 directions must be taken:achievement of microbiological control on manufacturing stages and establishing of potential risks that corespond to each techonological stages. Once that biological, chemical and physical risks are identified the method by which these risks can contaminate the product or the process using brainstorming technique and Ishikawa cause effect diagram was analysed [3].

3. RESULTS AND DISCUSSIONS

Bakery yeast can be manufactured by different technological processes: discontinuos, semicontinuos and continuos with diluted and concentrated leaven[4].
All the existent technological schemes are based on continuous accumulation of biomass. The basic stages of compressed bakery yeast technological manufacturing process are presented in *figure 1*.
Saccharomyces cerevisiae can be obtained on industrial scale by multiplication in several stages, in strong aerobic conditions, in an appropriate nutritive medium, with optim content of carbon, nitrogen, phosphorus, mineral salts and biostimulating substances, temperatures between 30-35 ^{o}C, acid pH and lack of microorganism contamination.
The clasic technological process applied for the quality bakery yeast obtaining is the discontinuos process, with diluted leaven, in 5 steps of multiplication [5].
The clasic process with diluted leaven it is realized in tanks with aeration and cooling system and compared with concentrated leavens has the disadvantage of a lower productivity with almost 20%, but the infection danger it is reduced.
Multiplication process with concentrated leavens it is based on dynamic air systems using, while diluted leavens process it is based on static air systems. Water, steam, electrical energy, nutritive salts, fat acids, sulphuric acid etc. consum is higher than in the case of concentrated leaven using.
In order to realise an optim bakery yeast manufacturing technological process, for the increasing, multiplication and maintaining assurinf of the vital functions must be realised an interconectivity between intrinsec factors (culture media composition, speed alimentation with substrate, pH and rH media) and extrinsec factors (temperature, respiration coefficient, aeration speed, specific increasing speed).
In order to establish the hygiene grade and to detect the contaminants that can provide from different sources: raw and auxiliar material, pure laboratory culture, production and storing rooms, machines and technological pipes, techonological water and air, packaging material, personnel it is neccesary to make microbiologic control on all technonological stages.
During bakery yeast manufacturing in the same time with cells multiplication that belongs to pure culture, in different stages of technological process cand be developed others microorganisms, which increase the contamination level of final product and determine reducing technological quality and preservation of compressed yeast.
For the preventing of the multiplication of contaminated microorganisms it is necessary a rigurous microbiological control on all production stages by the studying of the hygiene grade and the detecting of the contaminants that might have different sources such as: yeast culture that is inoculated in the beginning, molasses as raw material, auxiliar substances (increasing factors, mineral salts) air and soil microbiote, cleaning of the machines and working spaces, personnel hygiene and last but not least respecting of the good practices rules of production.

The pressed yeast, biomass of cells from *Saccharomyces cerevisiae* specie, superior fermentative yeast, made from live cells, produces sugars in fermentation dough with ethanol production, carbon dioxide which represents dough raising agent and secondary products.

In the same time with yeast, depending on purity level of biomass lactic bateria, micrococci, proteolitic bacteria and other contaminated yeast species are introduced.

It is appreciated that 1g of pressed yeast contains almost 10^{10} cells ($7,9x10^9$-$20,2x10^9$) therefore a dough that is prepared using the method without spongea and containing 60% water, 1,5% salt and 2% pressed yeast it will have almost $12x10^7$ cells g -1 and $100x10^7$ bacteria.

The flour contains about 10 g germs/g in which the majority are bacteria and compressed yeast also contains lactic bacteria (10^8 - 10^{10}/g), micrococci, proteolitic bacterias and other yeast species.

According to the norms in force biomass of the compressed yeast must have microbiological characteristics represented in *Table 1*.

Biomass of pressed yeast can contain foreign microorganisms, therefore the number of bacteria from commercial samples of yeast is 10^4-10^9/g yeast and belong to the heterofermentative lactic bacteria (Leuconostoc genus) or to the homofermentative lactic bacteria (Lactobacillus genus), rarely may be found Acetobacter aerogenus. In active dry yeast may be found the same species, but more less because of drying process. May be found sporulated bacteria (Bacillus subtilis) maximum number of spores is limitated at 200/g of dry yeast.

Bakery yeast may be also contaminated with wild yeast C. Krusei, C. mycoderma, C. Tropicalis, C. Utilis, Rhodotorula mucilaginosa or with fungi Oidium lactis, Monilia, Fusarium which are developed on the surfaces of yeast stored in cold places.

Identified risks: contamination with substances that have an inhibitory effect on the yeast physiological activity (taking delivers of raw material), contamination with atypical yeasts molds and bacteria, nitrate presence (on molasses preparing and yeast pure culture multiplication or on manufacturing stages). Contamination with atypical yeasts, molds, bacteria, physical risks (at filtration-pressing, moulding-packaging and storing) can lead at of the establishing critical control points that must be monitorised depending on the specific of each manufacturing unit. Also, taking into account the characteristics from table 1 it can be the established critical limits that must be monitorised within the technological process.

It is indicated that the number of critical control points not to be more than three, otherwise the system must be reprojected.

4. CONCLUSIONS

For preventing of the contaminated microorganisms multiplication it is necessary a rigurous microbiological control on all production stages by assesment of all contamination possibilities.

By correct assesment of the possible risks which can affect the manufacturing process safety or even of the final products, HACCP system makes possible the prevention of contamination and reduces at an acceptable level the potetial risks of productive process or final product. Critical control points are established depending on the equipment of each production unit and also by the working condition, but not to be more than three in order to assure a good functioning.

Not respecting of the HACCP's principles in any of production process stages damages the entire system.

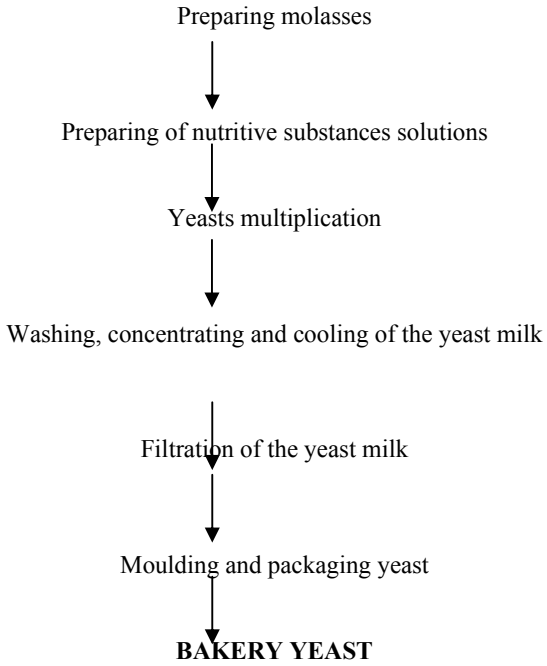

Figure 1 Compressed bakery yeast manufacturing technological stages

Table 1 Microbiological characteristics of compressed yeast

E. colli, UFC/g	<100
Coliform bacterias, UFC/g	<10000
Moulds, UFC/g	<100

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