STUDIES ON SELECTED DISTILLED YEAST STRAIN FOR UTILIZATION IN BREAD MAKING

By

SARAH EID AHMED SOLIMAN

B.Sc. Agric. Sci. (Food Technology), Benha University, 2011

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ABSTRACT

SARAH EID AHMED SOLIMAN. "Studies on Selected Distilled Yeast Strain for Utilization in Bread Making". Unpublished M.Sc. Thesis, Department of Food Science, Faculty of Agriculture, Ain Shams University, 2018

The most common food grade yeast is *Saccharomyces cerevisiae*, also known as baker's yeast, which is used worldwide for the production of bread and baking products, beer, wine, distillates and ethanol. Several factories in Egypt are devoted for the production of ethanol alcohol for industrial purposes using molasses through alcoholic fermentation processes. This fermentation is carried out by ethanol-tolerant strains of *Saccharomyces cerevisiae* i.e. similar to those strains employed in baker's yeast production.

The aim of this work was to improve the physiological and fermentation capacities of distilled yeast to simulate those properties of traditional baker's yeast to be used for baking purposes to fulfill the gap between local production baker's yeast and actual requirements of the local market.

Using some factors that can optimize the growth conditions resulted in a significant improvement of the physiological and fermentation capacities of the distilled yeast strains which can simulate or near to those properties of traditional baker's yeast. The proximate chemical composition, total viable count, fermenting power, gassing power and invertase enzyme activity of the obtained distilled yeast biomass were evaluated. The improved distilled yeast strain *S. cerevisiae* (F514) was compared to a baker's yeast strain *S. cerevisiae* (F707) as a reference and they were stored at 8°C and 30°C to follow up their contents of protein and trehalose as well as total viable cells and fermenting power. The *S. cerevisiae* (F514), *S. cerevisiae* (F707) and a mix of *S. cerevisiae* (F514) and commercial baker's yeast with 1:1 ratio were used as leavening agents in Pan and Balady breads production. The chemical composition, physical measurements (Loaf weight, volume and specific volume), sensory characteristics, freshness, texture properties and color of produced pan bread were investigated.

Regarding to the effect of washing treatment, it was noticed that washing for three times significantly increased protein content, decreased ash content and increased each of the fermenting and gassing power of the distilled yeast strain. Fortification by 4 g/l urea was the optimum concentration that increased protein and trehalose contents. The optimum source for phosphorous was 0.7 ml/l orthophosphoric acid that recorded the highest protein and trehalose contents and the lowest ash content. Fortification by zinc sulfate caused in significantly high protein and trehalose contents, a high invertase enzyme activity and high fermenting and gassing power. The optimum concentration of magnesium sulfate was 0.5 g/l that recorded the highest protein and trehalose contents and the highest fermenting and gassing power. The highest protein was noticed by using 0.02 g/l biotin, while the using of 0.015 g/l significantly recorded the highest trehalose content. The concentration of 0.02 g/l biotin recorded the highest fermenting power and 0.01 g/l recorded the highest gassing power. Not only dry matter, trehalose content, the fermenting power and the gassing power tended to be decreased at pH 5 and 5.5 but also, the ash content tended to be increased at the same pH values. It was also noticed the highest protein content at pH 4 followed by pH 5.5. The highest invertase activity was noticed at pH 5.5 and the lowest activity was at pH 4. The lowest protein content was noticed at 40 °C and temperatures of 36 °C and 40 °C increased ash content and decreased trehalose content. The fermenting power decreased gradually by raising of the temperature of incubation as well the gassing power and the invertase activity. Speeds of 100 and 200 rpm significantly recorded the highest dry matter content and the highest invertase enzyme activity, while the speed of 150 rpm recorded the highest protein content. The highest trehalose content was recorded at 200 rpm. It was noticed that raising the shaking speed resulted in higher fermenting power, while the speeds of 100 and 200 rpm recorded the highest gassing power with 10% glucose, shaking speed of 150 rpm has the highest gassing power with10% maltose and shaking speed of 100 and 150 rpm with 10% sucrose solution.

The results show that properties of the improved distilled yeast strain became near to those properties of the reference baker's yeast strain contents of dry matter, protein, fat, trehalose and ash contents as well the total viable count, the fermenting power, the gassing power and the activities of invertase and maltase enzymes.

Following up the effect of storage conditions on the protein and trehalose contents, the total viable count and the fermenting power of the two yeast strains showed that there are significant differences owing to storage temperature and the difference of the yeast strain. It was noticed that protein and trehalose contents, the total viable count and the fermenting power of the two tested strains decreased, but this decrease was higher when storage was at 30 °C than it was at 8 °C. The improved distilled yeast strain was applied in pan and balady breads as well the reference baker's yeast strain and the improved distilled yeast strain and commercial baker's yeast with 1:1 ratio mix for comparison. The improved distilled yeast strain and commercial baker's yeast with 1:1 ratio mix showed the best quality criteria of pan bread among the other treatments. It recorded the highest volume and specific volume of the loaf, the highest score for the organoleptic properties, freshness, texture profile and the color attributes. Regarding Balady bread, the improved distilled yeast strain showed the highest volume and specific volume of the loaf, the reference baker's yeast strain had the highest score for the organoleptic properties followed by the improved distilled yeast strain and the improved distilled yeast strain and commercial baker's yeast with 1:1 ratio mix recorded the best color attributes.

Key words: Fermentation, Ethanol production, By-product, Distilled yeast, Baker’s yeast, Molasses, Biomass, Bread making.

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