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EFFECT OF ENZYMES CONCENTRATIONS ON THE RATE OF WHEAT BREAD WASTES HYDROLYSIS PROCESS

M.N.G. Ibrahim & F. El-Youssef
St. Petersburg national research University of information technologies, mechanics and optics, Saint Ptersburg

Supervisor – assistant professor N.V. Barakova
St. Petersburg national research University of information technologies, mechanics and optics, Saint Petersburg.

The importance of bread recycling appeared with the annual increment in the wheat bread wastes. The recycling of bread wastes can be used for the production of beneficial secondary products as bioethanol, microbiological nutrient media, bio-lactic acid and aroma production [1, 2]. The main step in bread recycling is bread nutrient hydrolysis using enzymes to produce bread hydrolysate. The bread starch hydrolysis is divided into two steps, a) liquefaction using α-amylase and xylanase enzymes to produce dextrin, some maltose and glucose, b) saccharofication using glucoamylase enzyme to produce glucose [3]. Many factors can influence on the bread hydrolysis process and the quality of bread hydrolysate. These factors are temperature of hydrolysis, pH of hydrolysate media, viscosity of hydrolysate, time of hydrolysis, quantity of substrate and enzymes concentration. The enzymes concentrations especially in the liquefaction step have critical effect on bread hydrolysis process [4, 5] The principal of our research is to study the effect of different enzymes concentrations on period of time of hydrolysis process and concentration of total dry matter in the hydrolysate media.

The hydrolysis process was studied using wheat bread wastes (Moskovski loaf bread) stored for 4 and 6 days at room temperature. The fine bread particles were prepared by grinding the bread and it's sieving through a 2 mm screen. The hydrolysate mixture was prepared with hydro-moduls ratio 1:3 (bread: water) using water at temperature 50 °C. The hydrolysate was prepared using two types of enzymes, a) bacterial thermostable α-amylase enzyme with two different concentrations 2.5 and 5 units/ 1 g bread, b) yeast xylanase enzyme with two different concentrations 1 and 2 units/ 1 g bread. The mode of bread hydrolysis was at temperature 80 °C with addition of bread particles with 4 times fractionation and 10 min between each fraction.

The duration time of bread hydrolysis after 4 days storage using 2.5 units of α-amylase and 1 unit of xylanase was 4.5 h, furthermore it was 2.5 h using 5 units of α-amylase and 2 units of xylanase. As well, the duration time of bread hydrolysis after 6 days storage using 2.5 units of α-amylase and 1 unit of xylanase was 5.5 h, moreover it was 3.5 h using 5 units of α-amylase and 2 units of xylanase. The analysis of total dry matter was 21 % and 21.5 % in bread hydrolysate stored 4 days prepared with different concentrations of α-amylase and xylanase (2.5 & 1 units) and (5 & 2 units). In addition, the evaluation of total dry matter was 21.8 % and 22.4 % in bread hydrolysate stored 6 days prepared with different concentrations of α-amylase and xylanase (2.5 & 1 units) and (5 & 2 units).

Our data shows the significant effect of increasing the enzymes concentrations, as they can increase the rate of bread hydrolysis, consequently lead to shortening in the duration time of the hydrolysis process by 2 hours in each type of bread hydrolysate till reach the peak of dry matter concentration. In addition, duplication the enzymes concentrations aid to increase the total dry matter concentration in the range of 0.55 % in the hydrolysate media in each type of bread.

As conclusion, investigation the effect of enzymes concentrations on bread hydrolysis process verify their significant influence for shortening the duration time of hydrolysis process and increasing the total dry matter in the hydrolysate media.

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