

DEVELOPMENT OF THE METHODS OF HYDROLYSIS IN BREAD REFUSE RECYCLING

Fatmah Al Yousif, Monika Ibrahim, Ph. D. Nadezhda V. Barakova,
 ITMO University, 9, Lomonosov str., St. Petersburg, 191002, Russia,
barakova@corp.ifmo.ru

Estonian University of Life Science, Frierich Reinhold Kreutzwaldi, 51014 Tartu, Estonia



Introduction

Bread is the main source for many population worldwide. However, when the production is more the customer need it will be problematic due to throwing these solid substrates into landfill and harm environment and people health, but the major stride of bread recycling is the hydrolyzation of nutrients compounds of bread utilizing chemical and enzymatic methods.

There are many factors play role in the bread hydrolyzation such as suberates, enzyme and water ratio, temperature and PH. They must be optimized for gaining the desirable yield such as fermentable glucose, amine nitrogen and phosphate. Bread molecules can be employed as a raw material to be hydrolyzed and obtain a new added-value bioproduct. There are two main stages in the hydrolyzation procedure, one is liquefication where alpha- xylanase enzymes are employed to produce dextrin, some maltose and glucose, in this stage will be our experiment and second is saccharification where glucoamylase enzyme employed to produce glucose.

Material and methods

Bread and enzyme of amylase and xylanase are employed. There are 3 main steps, one is grinding bread into very tiny molecules and sieving 2 mm, second is mixture water, enzyme and the third is the hydrolyzation process. Measurement the viscosity with the range of 30-90 degree.

Result

Topic 1: Determination the effect of shelf-life of wheat bread in plastic bags on moisture and grinding degree

The storage time of the loaf, days.	Indicators			
	Moisture, %	Pass through a sieve = 1 mm	All others = 1 mm	All others = 2 mm
2	32.9	22.7 ± 0.5	68.8 ± 0.5	8.5 ± 0.5
4	34.5	53.2 ± 1.5	41.2 ± 1.5	5.5 ± 1.5
6	35.0	58.0 ± 1	39.1 ± 1	3.96 ± 1

Table 1 : Physico-chemical indicators of bread crumbs obtained via grinding the loaf "Moscow" threaded grade 1 in sliced.

Topic 2: Explore the change in rheological properties of batch mode from returnable wheat with different shelf-life in plastic bags

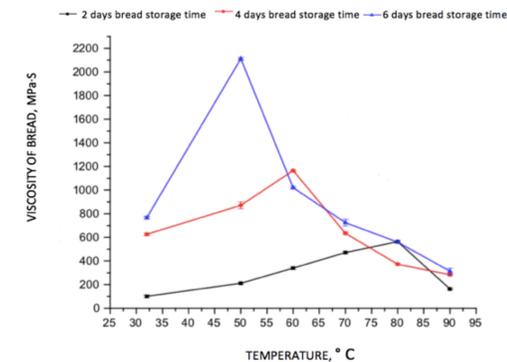


Figure 1 : The viscosity of bread (MP·a) and temperature (°C), The dependence of viscosity of batches made from a loaf with different self-life reserved in a plastic bag.

Topic 3: To study the effect of temperature on the accumulation of dry substance in hydrolysate of returnable wheat bread

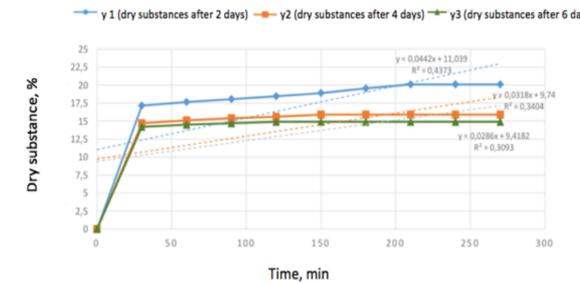


Figure 2 : Dynamics of dry substances residue in hydrolysates at different temperatures of mixing in function of time. In a hydrolysate of a batch prepared from medium grinding of 2 days storage, the blue line corresponds to y1(solid substrates stored for 2 days), the orange line corresponds to y2(solid substances stored for 4 days), and y3 corresponds to(solids substances stored for 6 days).

Topic 4: studying the effect of temperature on the accumulation of dry substance in hydrolysate of returnable wheat bread

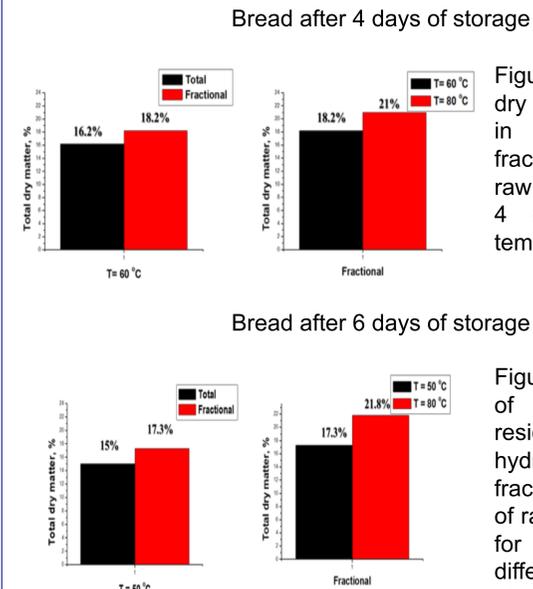


Figure 3 : Dynamics of dry substances residue in hydrolysates during fractional introduction of raw materials stored for 4 days and different temperatures of mixing.

Figure 4 : Dynamics of dry substances residue in hydrolysates during fractional introduction of raw materials stored for 6 days and different temperatures of mixing.

Topic 5: To explore the effect of enzyme preparation on the accumulation of dry substances returned from hydrolyzed wheat bread

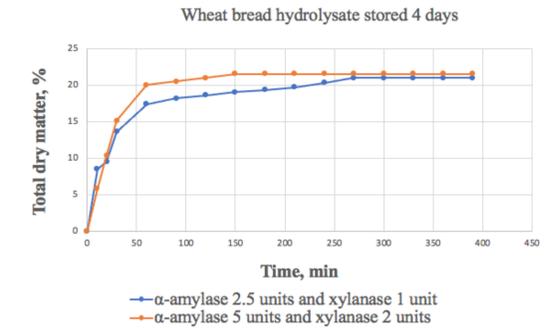


Figure 5 : The content of dry substances residue in hydrolysates or return loves stored in bag for 4 and 6 days, at the rate of application of 2.5 units of amylase and 1.0 units of xylanase power per 1g of the raw materials.

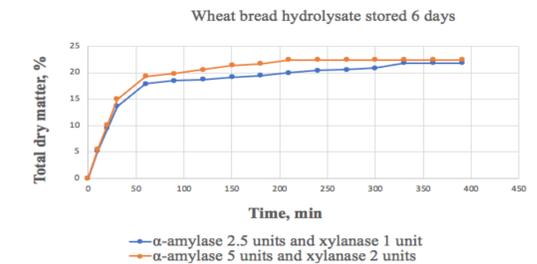


Figure 6 : The content of dry substances residue in hydrolysates or return loves stored in bag for 4 and 6 days, at the rate of application of 5 units of amylase and 2 units of xylanase power per 1g of the raw materials.

Conclusion

The resultant bread hydrolysate can be modified for the synthesis of secondary metabolites using different microorganisms and for glucose syrup production