

Glucose oxidase influence on bread's quality

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Abstract

The producers' attention is channeled towards ensuring the high and constant quality of the bread production. Cereals and almost all their derivatives lie at the basis of human alimentation (Banu, 2000). The bread and the bread industry products belong to the human alimentary behaviour throughout all the stages of his life. To satisfy the consumer's taste, the producers have approached an array of products. The various products range is obtained either by auxiliary variants or by altering the value of the operational parameters. All the choices adopted are related to the classic traditional technology. Bread is a fundamental food made with dough's baking, cooked steam and roasting dough. It is made using wheat flour, yeast, salt, water (in the most simple way). The classic technology of bread fabrication is based on the biological proprieties of the wheat and the technological characteristics of the flour. For improving the flaws of the bread, the dough is enriched with biogenic substances, reducing or oxidizing substances, or substances for increasing the dough acidity. Making these additions efficient is done by adding the multienzymatic systems (α -amilase, lipases, xilanase, lipoxigenase, glucose-oxidase, transglutaminase, proteolytic enzymes, etc).

Keywords: bread, dough, traditional technology, adding, glucose-oxidase, improve, increasing, enriched.

1. Introduction

The classic technology has suffered alterations when it comes to preparing the dough. There are substances which are added in very small quantities as compared to the raw material and substances which are added in larger quantities and which are considered to be auxiliary materials.

Enzymes are used in the bread manufacture, from different sources, as enzymatic products for standardizing the flours and conditioning the dough. The exogenous enzymes come from vegetal tissues (seeds, germinal cereals) and microorganisms (bacteria, yeasts and moulds) (Banu, 2000).

The glucose-oxidase is a flavic aerobic enzyme, which catalyses the reaction of oxidizing glucose at gluconic acid, forming H_2O_2 (oxygenated water) which is the most

efficient catalyst of the pentosans oxidized coating of wheat flour. The oxygenated water produced by glucoxidase acts on the SH groups, oxidizing them. The influence of the addition of glucose-oxidase on the bread volume is positive. The ameliorations of the bread characteristics are evident when is used a flour of lower quality. For optimizing the activity of glucoxidase, it is added glucose in the dough. In the bread manufacture the glucose-oxidase added to the dough comes from microbial sources, especially moulds.

2. Materials and methods

In our tests we had used a glucose-oxidase from SC ENZYMES & DERIVATES SA named Belpan Gox 10000, a yellowish powder. It is a glucose oxydase obtained

from a selected strain of *Aspergillus niger* and it catalyses the oxidation of glucose to gluconolactone converted to gluconic acid with the concomitant production of hydrogen peroxide.

Belpan Gox 10000 is quickly active at the mixing phase when there is abundant available oxygen. Glucose present in the flour is transformed in gluconic acid and hydrogen peroxide which oxidizes SH-groups to form S-S bridges in the gluten framework which is reinforced. The result is stronger, more elastic dough with a good stability to mechanical shock, better oven-spring and larger bread volume.

The production of hydrogen peroxide can also affect the coupling between pentosans and pentosans-gluten through linkages of ferulic acid radicals which increase the water binding capacity of the dough. As a result, a dryer dough is obtained.

Using Chopin mixolab we have made tests with a sample of flour type 650 (table no. 1), bakery yeast (*Saccharomyces cerevisiae*) compressed with max. 9% umidity, alimentary salt and water.

Using this ingredients we have made tests with Mixolab using different enzymatic units, breeder from 0 to 250000 units and we measure in different points: C₁ (used to determine absorption), C₂ (measures the weakening of the protein based on the mechanical work and the temperature), C₃ (measures starch gelatinization), C₄ (measures the stability of the hot-formed gel), C₅ (measures starch retrogradation during the cooling period).

We also measured the stability (min:s) and curve between points C₃ and C₂ and also between points C₃ and C₄

Table 1. Flour's parameters

Parameter	Unit	Value	STAS
Humidity	%	13.95	SR ISO 712:1999
Ashes	%	0.65	STAS 90-88
Acidity	grade	2.2	STAS 90-88
Humid gluten	%	24.2	SR ISO 7495:1998
Deformation of clammy gluten	mm	5	STAS 90-88
Falling number	sec	274	SR ISO 3093:1997

3. Results and Discussions

Glucose oxidase is an enzyme which catalyses oxidation of the glucose into gluconic acid. This oxidation appears to bring about a succession of reactions leading to oxidation of the proteins. The disulfide bonds thus formed strengthen the gluten network and increase the dough's resistance to kneading.

The addition of glucose oxidase therefore enables dough machinability to be improved (increased elasticity and hold during kneading, reduced adhesion during production, increased tolerance when placed in oven, etc.).

After our determinations, we have obtained following dates who are presented afterwards in graphic:

Table 2. Mixolab's results

Enzymatic units	0	50000	100000	150000	200000	250000	300000
WA (%)	56.6	56.6	56.6	56.6	56.6	56.6	56.6
C1 (Nm)	1.11	1.10	1.08	1.11	1.12	1.12	1.11
C2 (Nm)	0.46	0.50	0.52	0.54	0.56	0.57	0.58
C3 (Nm)	1.80	1.81	1.82	1.85	1.90	1.92	1.96
C4 (Nm)	1.67	1.74	1.75	1.76	1.81	1.83	1.88
C5 (Nm)	2.15	2.11	2.12	2.15	2.21	2.28	2.4
C3-C2 (Nm)	1.34	1.31	1.30	1.31	1.34	1.35	1.36
C3-C4 (Nm)	0.13	0.05	0.07	0.09	0.09	0.09	0.08
Stability (min:s)	4:84	5:16	6:18	7:14	8:28	9:52	10:84

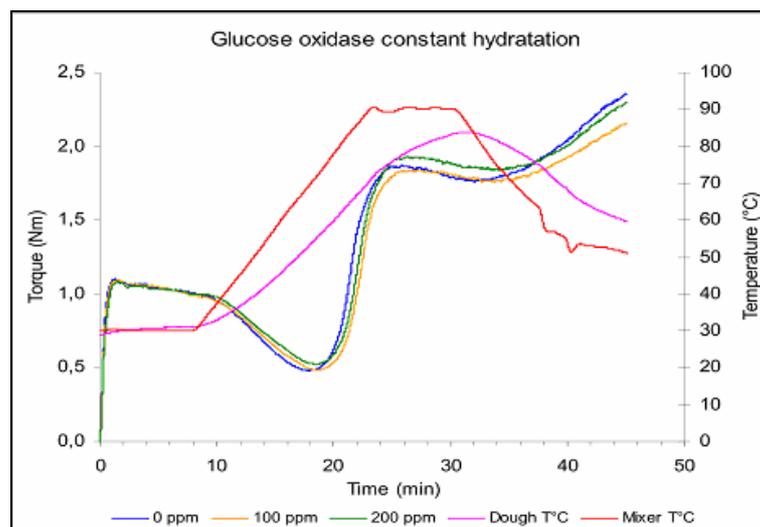


Figure 1. Mixolab's curves

In the Mixolab, this effect is characterized by:

- a slightly increase in C2 and stability, proof of the strengthening of the protein network.
- constant C3-C2, C3-C4 differences, showing that the glucose oxidase has little effect in the starch phase.

- improvement of the strength of the dough;
- improvement of the crispiness of the crust and the shape of the bread;
- improvement the core's fiber;
- increasing bread's volume;
- increasing dough's resistance and elasticity.

4. Conclusions

The advantage of using belpan Gox 10000 for bread making are:

- ascorbic acid or chemical oxidants could be reduced or replaced;
- improvement of machinability by the dry dough effect;

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