Proteases in bread. it’s influence on bread’s quality

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Abstract

Bread is the most common and traditional foods around the world. But bread actually has close links with enzymes. For years, enzymes have been used in bread making. Due to the changes in the baking industry and the ever-increasing demand for more natural products, enzymes have gained real importance in bread-making. A process for obtaining a bread having a shelf-life of at least fifteen days, the process involves adding to the dough or to a dough ingredient a complex enzyme mixture, said complex enzyme mixture, comprising a maltogenic amylase, at least one other amylase, a phospholipase and protease, in an amount sufficient to provide a bread having a shelf-life of at least 15 days. Proteases are used to solve many problems in certain baking applications. Like all other living material, the cells in cereal grains used for flour contain enzymes. The most important enzymes in flour are proteases and amylases. However, the quantities of these enzymes are not always ideal for baking purposes and supplementary enzymes often need to be added.

Keywords: proteases, influence, bread, quality, solve problems

1. Introduction

A protease is any enzyme that conducts proteolysis, that is, begins protein catabolism by hydrolysis of the peptide bonds that link amino acids together in the polypeptide chain.

Protease is responsible for digesting proteins in your food, which is probably one of the most difficult substances to metabolize. Because of this, protease is considered to be one of the most important enzymes that we have. If the digestive process is incomplete, undigested protein can wind up in your circulatory system, as well as in other parts of your body.

Proteases are enzymes which break down proteins by breaking peptide bonds. By breaking the peptide bonds, protease weakens the gluten network, which therefore causes a reduction in resistance to kneading. Proteases are used in biscuit making to reduce the tenacity of the dough. They enable dough machinability, extensibility, viscosity and development time to be adapted in a more or less controlled manner.

2. Materials and methods

In our tests we used a protease from SC ENZYMES & DERIVATES SA named Belpan BI, a standardized, a yellowish powder with moisture 5-8% and bulk density 500-600g/L. This product is made by Aspergillus oryzae, has an pH 6-9 and an optimum temperature of 25-30°C. Belpan BI improves the dough consistency, doughs are more relaxed with better spreading and reduced shrinking. This results in an improved machinability. Using Belpan BI, the baked product has a better tenderness, higher volume and improved overall sensory properties.

We have made our tests using Chopin Mixolab.

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The Mixolab senses in real time the torque (in Nm) produced by the dough between the two blades. Once the dough is formed, the device measures its behaviour as a function of time, mixing development and temperature. The test is based on preparing a constant hydrated dough mass in order to obtain a target consistency during the first test phase. In the “Chopin+” protocol the dough mass weighs 75 grams and the target consistency is 1.1 Nm (+/- 0.07 Nm).

We have made tests in constant hydration with a sample of flour type 680 (table no. 1), bakery yeast (*Saccharomyces cerevisiae*) compressed with max. 9% humidity, alimentary salt and water.

Using this ingredients we have made tests with Mixolab using different enzymatic units, breeder from 0.5 grams (20000 enzymatic units) to 3 grams (120000 enzymatic 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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value</th>
<th>STAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humidity</td>
<td>%</td>
<td>14.2</td>
<td>SR ISO 712:1999</td>
</tr>
<tr>
<td>Ashes</td>
<td>%</td>
<td>0.55</td>
<td>STAS 90-88</td>
</tr>
<tr>
<td>Acidity</td>
<td>grade</td>
<td>2.4</td>
<td>STAS 90-88</td>
</tr>
<tr>
<td>Humid gluten</td>
<td>%</td>
<td>23.1</td>
<td>SR ISO 7495:1998</td>
</tr>
<tr>
<td>Deformation of clammy gluten</td>
<td>mm</td>
<td>6</td>
<td>STAS 90-88</td>
</tr>
<tr>
<td>Falling number</td>
<td>sec</td>
<td>290</td>
<td>SR ISO 3093:1997</td>
</tr>
</tbody>
</table>

### 3. Results and Discussions

We all know that when we add proteases, the dough’s consistency is lower and the gluten’s network became slender and extensible. There is a linear connection between consistency decrease and enzyme quantity.

In the Mixolab, this effect is characterized by:

- reduced viscosity when hot (C3) which may be linked to a change in water distribution. The C3-C4 difference does not change, showing unchanged diastatic activity.
- reduced C5-C4 difference, showing less pronounced gelling (retrogradation) of the starch.

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

Because rheological properties are changed, the dough’s extensibility is growing and, once with this, is growing the capacity to retain the flatulences. As a sequel of all this, we can observe that the volume and the porosity are increase.

In C₃-C₄ we observed that the diastazic activity is the same, are not registered any changes.

We also observed that protein network are falling (in C₂). Stability in lower, strated at 5:40 till 4:30. Interesting is the fact that between consistency decrease and enzyme quantity is a linear connection.

References


A. Baltsavias, etc, 1997, *Rheological properties of short doughs at small deformation*, Journal of Cereal Science 26