

**THE INFLUENCE OF ASOCIATED SUPPLEMENT OF ALFA
AMYLASE AND XYLANASE ON THE RHEOLOGY OF
DOUGH CONCERNING ITS CONSTITOGRAPHICAL
PARAMETERS**

**INFLUENȚA ADAOSULUI ASOCIAT DE ALFA AMILAZA ȘI
XILANAZA ASUPRA REOLOGIEI ALUATULUI PRIVIND
PARAMETRI CONSISTOGRAFICI**

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In this paper we determined the influence of associated supplement of alfa amylase and xylanase on the rheology of dough concerning its constitographical parameters : maximum pressure (Pr max), (mb) and the absorbed water (Wa), %. The analysis on the consistograph were conducted for constant hydration at the consistency of 500 UF. Determinations were made on 4 types of flour and optimal dosages were found for each enzyme, after which we prepared the optimal dosage of the enzymes in the compound for flour F1 and F2 : P1-840000 U. SKB/100 kg flour +8100 U. FXU /100 kg flour, P2-840000 U. SKB/100 kg flour+16200 U. FXU, /100 kg flour , P3-840000 U. SKB/100 kg flour+24300 U. FXU/100 kg flour , and for F3 and F4 thus: P1-280000 U. SKB/100 kg flour +8100 U. FXU /100 kg flour, P2-280000 U. SKB/100 kg flour+16200 U. FXU/100 kg flour, P3-280000 U. SKB/100 kg flour+24300 U. FXU/100 kg flour. Fungous α -amylase and xylanase were used in these concentrations to establish which one is more appropriate to be added in flour to obtain superior quality of bread: finer texture of the crumb, prolongation of the freshness of the bread, improvind the colour and flavour, improving the slicing ability.

Keywords : α -amylase, xylanase, constituating parameters.

Introduction

Bread is a basic food obtained by baking, steaming or roasting dough. The dough consists of wheat flour, yeast, which is then let to grow, after which it is baked in the oven (Turhan, 2002; Uri, 2006). Because of the high gluten level which confers the dough a sponge-like, elastic consistence, wheat is the most commonly used cereal for bread, but other cereals such as rye, corn or oat, can be

used in combination with wheat flour. The minimal ingredients are flour and a yeasting agent such as yeast (Uthayakumaran, 2002; Dan, 2001; Vardakou, 2004).

In the prospect of diversifying the pastry products, new sortiments appeared on the romanian market, which, although not traditional, have established themselves through nutritive quality and high level of digestibility. Among these is the bread with supplement of α -amylase and xylanase.

In the present paper we determined the influence of associated supplement of α -amylase and xylanase on the rheology of dough concerning its constitographical parameters : maximum pressure (Pr max), (mb) and absorbed water (Wa), %. The analysis on the Chopin consistograph were made for constant hydration of 500 UF. Determinations were made on 4 types of flour and optimal dosages were found for each enzyme, after which we prepared the optimal dosage of the enzymes in the compund for flour F1 and F2 : P1-840000 U.SKB/100 kg flour +8100 U.FXU /100 kg flour, P2-840000 U.SKB/100 kg flour+16200 U.FXU, /100 kg flour , P3-840000 U.SKB/100 kg flour+24300 U.FXU/100 kg flour , and for F3 and F4 thus: P1-280000 U.SKB/100 kg flour + 8100 U.FXU /100 kg flour, P2-280000U.SKB/100 kg flour + 16200 U.FXU/100 kg flour, P3-280000 U.SKB/100 kg flour + 24300 U.FXU/100 kg flour.

Materials and Methods

We used 4 types of flour as witness samples, with the following features:

Table 1

Flour features

Feature	F1	F2	F3	F4
Humidity, %	14.60	13.77	14.08	14.42
Ashes, %	0.64	0.48	0.55	0.38
Protein level, %	13.25	13.44	13.37	10.60
Moist gluten, %	27.5	28.5	27.6	24.85
Deformation of the moist gluten, mm	13	5.5	4.5	5
Sedimentation index - Zeleny, ml	48	37	44	36
Gluten index, %	56.54	78.51	71.92	75.04
Maltose index, mg/10g	290.18	253.36	253.45	280.16
Acidity, %	2.5	2.6	2.4	2.3
-Drop index	451	394	296	270
-Energy $W \cdot 10^{-4} J$	104	185	108	223
-Maximum pressure (P), mm	72	81	69	101
-Extensibility index, (G)	15	19.1	15.8	18
-Extensibility (L), mm	46	74	50	65
-P/L ratio	1.58	1.09	1.39	1.55
-Elasticity index (Ie), %	27.4	44.6	30.7	48

Yeast – Pakmaya (commerce). **Salt** – extrafine grocery salt (commerce). **Water** – drinking water from the network. **Enzyme : Clarase G Plus** – a fungaous compound of α -amylase, extracted from *Aspergillus oryzae* with a minimal enzymatic activity of 140.000 U. SKB/g (Verma.,1999). **Belpan XILA L** – a fungaous standardized xylanase of microorganical origin. obtained by immersed fermentation of an *Aspergillus* strain. The enzyme contains pentosanase. endo- and exo-xylanase, hemicelullase, which promote the hydrolisis of pentosanes turning the insoluble pentosans into soluble ones, thus increasing the elasticity module of the dough with an enzimatical activity of 2700 FXU/g FXU – fungal xylanase units (Voicu, 1997).

Then we measured the enzyme like this : we added 1 g enzyme to 99 g flour. mixed 20 minutes. The enzyme was weighed on a Sartorius electronical scale. The outer limits for using the enzymes were determined through tries for each one. obtaining the optimum dosage.

Enzyme dosage was necessary because the enzyme quantity for the determination was very small.

4 samples were prepared. one being the witness without the enzyme and 3 with following mixture dosages: for flour F1 and F2 : P1-840000 U. SKB/100 kg flour +8100 U. FXU /100 kg flour P2-840000 U. SKB/100 kg flour+16200 U. FXU. /100 kg flour P3-840000 U. SKB/100 kg flour+24300 U. FXU/100 kg flour and for F3 and F4 thus: P1-280000 U. SKB/100 kg flour + 8100 U. FXU /100 kg flour P2-280000 U. SKB/100 kg flour + 16200 U. FXU/100 kg flour P3-280000 U. SKB/100 kg flour + 24300 U. FXU/100 kg flour.

Dough obtaining process: we obtained the dough through direct process (Dobraszczyk ,2003). Following this basic recipe: 675 g flour, 13.5 g yeast, 13.5 g salt 365 g water. The yeast was mixed with 50 ml water, the salt was dissolved in 50 ml water, the enzyme was added in various proportions, according to the recipes flour quantity.

Operational program: slow kneating 12 minutes in a laboratory mixer; fast kneating 4 minutes, fermentation 20 minutes; 25-30 °C re-kneating 20 s; manual distribution – 1000 g; manual rounding; pre-yeasting – 20 minutes (rest).

In order to appreciate the quality of the dough we determined the following parameters on the consistograph: maximum pressure (Pr max) and absorbed water (Wa). %.

Results and Discussion

The influence of associated supplement of α -amylase and xylanase on the maximul pressure of dough is presented in Table 2 and Figure 1.

Table 2

The influence of associated supplement of α -amylase and xylanase on the maximum pressure of dough

Flour sample	Maximum pressure (Pr max), (mb) at an associated supplement of α -amylase and xylanase of:			
	M	P1- 840000 U. SKB/100 kg flour +8100 U.FXU /100 kg flour	P2- 840000 U. SKB/100 kg flour +16200 U.FXU /100kg flour	P3- 840000 U. SKB/100 kg flour +24300 U.FXU /100kg flour
F1	2807	2412	2324	2514
F2	3045	2844	2244	2829
Flour sample	Maximum pressure (Pr max), (mb) at an associated supplement of α -amylase and xylanase of:			
	M	P1- 280000 U SKB/100 kg flour +8100 U. FXU /100 kg flour	P2- 280000 U. SKB/100 kg flour +16200 U. FXU /100 kg flour	P3- 280000 U. SKB/100 kg flour +24300 U. FXU /100 kg flour
F3	3072	2852	3060	2990
F4	3117	2949	2996	2984

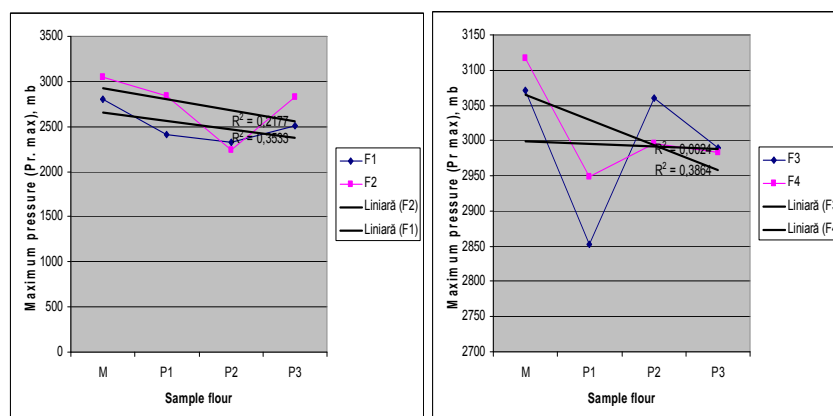


Figure 1. The influence of associated supplement of α -amylase and xylanase on the maximum pressure of the dough

The maximum pressure which gives us information about the firmness of the dough sample by treatment with a mixture of associated enzymes decreases in comparison with the maximum pressure of the witness sample for all the flours but in various percentages: thus for F1 the drop in comparison with the witness sample varies between 10 and 17%, the minimal drop being consistent with P3 and the maximum drop with P2. In the case of F2 there is a maximum pressure drop in

comparison with the witness sample the minimal drop being 7% for P1 and P3 and the maximum drop 26% for P2.

In the case of F3 the maximum pressure drops with a maximum percentage of 7% for P1 0.4% for P2 and 3% for P3 for F4 the percentage of the maximum pressure drop in comparison with the witness sample is: 7% for P1 and 4% for P2 and P3.

For all these four flour types the maximum pressure drops as a result of the synergic action of the two associated enzymes, which produce a slight liquefaction of the dough.

The influence of the associated supplement of α -amylase and xylanase on the water quantity absorbed by the flour is presented in Table 3 and Figure 2.

Table 3

The influence of the associated supplement of α -amylase and xylanase on the water quantity absorbed by the flour

Flour sample	Absorbed water (W _a),%			
	At an associated supplement of α -amylase and xylanase:			
	M	P1- 840000 U. SKB/100 kg flour +8100 U.FXU /100 kg flour	P2-840000 U. SKB/100 kg flour +16200U.FXU /100 kg flour	P3-840000 U. SKB/100 kg flour +24300U.FXU /100 kg flour
F1	56.4	54.6	54.2	55.1
F2	57.4	56.6	53.9	56.5
	M	P1-280000 U. SKB/100 kg flour +8100 U. FXU /100 kg flour	P2-280000 U. SKB/100 kg flour +16200U. FXU /100 kg flour	P3-280000 U. SKB/100 kg flour +24300 U. FXU /100 kg flour
F3	57.6	56.6	57.5	57.2
F4	57.8	57.0	57.2	57.2

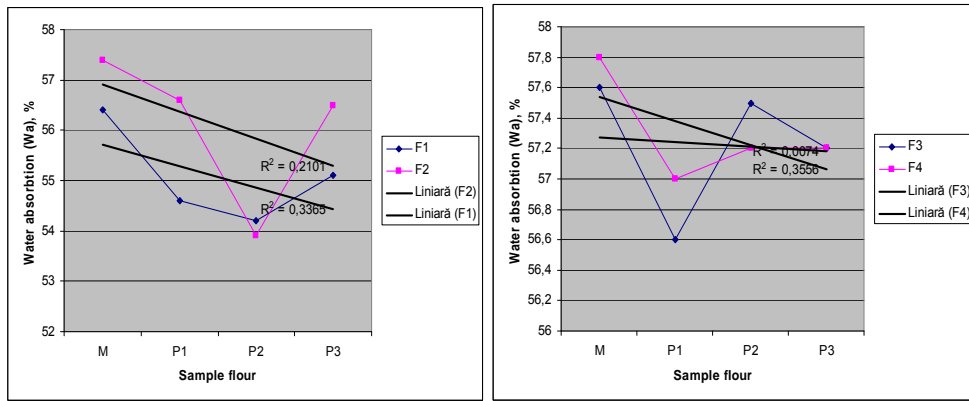


Figure 2. Influence of associated supplement of α -amylase and xylanase on the quantity of water absorbed by the flour

From the experimental data obtained we can observe a decrease of the water quantity absorbed by the flour for all the studied flours in comparison with the water absorbed by the witness sample in the following percentages: for F1 the decrease of the water absorbed is 2% for P3, 3% for P1 and 4% for P2. For F2 the decrease of the absorbed water in comparison with the witness sample is 1% for P1, 2% for P3 and 6% for P2.

For F3 if in case of P1 the decrease of the absorbed water percentage in comparison with the water absorbed by the witness sample is 3% for P2 it is 0.08% and P3 1%.

For F4 the decrease of the absorbed water percentage in comparison with the water absorbed by the witness sample is constant (1%) for all the samples (P1, P2, P3).

Conclusions

For all the four flours the maximum pressure drops as a result of the synergic action of the two associated enzymes which produce a slight liquefaction of the dough. The experimental data shows a decrease of the quantity of water absorbed by the flour for all studied flours in comparison with the water absorbed by the witness sample in different percentages: for F1 the decrease of absorbed water is between 2% for P3, 3% for P1 and 4% for P2. For F2 the decrease of the water absorbed in comparison with the witness sample is 1% for P1, 2% for P3 and 6% for P2. For F3 the decrease of absorbed water is 3% for P1, 0.08% for P2 and 1% for P3. For F4, the decrease of the percentage of absorbed water in comparison with the water absorbed by the witness sample is constant (1%) for all samples.

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