THE EFFECT OF THE MALT FLOUR ON THE RHEOLOGICAL PROPERIES OF THE DOUGH AND THE BREAD QUALITY

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Abstract

The paper studies the effect of the malt flour on the rheological properties of the dough from farinograhic and extensographic point of view. The technological effects of the malt flour on the bread quality were estimated with backing tests. Adding malt flour there were obtained dough with superior rheological properties and finite products with improved quality features (porosity, the core elasticity, the taste and the aroma of the bread, the colour intensification of the shell and the bread freshness last more).
Keywords: *α-amylase, amylolitic enzymes, malt flour.*

Introduction

The wheat flours contain normally enough β-amylase in order to convert the long chains of amylose into maltose but they have a natural deficit of α-amylase(Bordei D., 2005). Those situation appears especially at the flour varieties proceeded from glassy cereals or from grains tilled and harvested in condition of dryness; they contains no α-amylase.

Also, the white flours contains less α-amylase than the ones with great extraction and, as consequence, they have a smaller capacity of forming sugars. The bread obtained from those flours has a small volume, the shell has a light colour, the core is brittle and the aroma is weak.

Those hypodyastasic flours are usually named "strong on fire" and could be corrected by adding of exogenous amylases(Giurcă V.,2002).

The amylolitic enzymes fulfils various functions into the bakery technology, from the first phases as catalysts of the starch decomposition to maltose - the main factor in the gases production, in the conditioning of the core, the taste, the colour of the shell, the aroma and volume of the bread and also during the other technological phases they acts on the jellified starch by the backing heat. They also have an important role in the prolongation of the bread's freshness.

The increase of the amylolisis from the dough, in order to ensure the necessary amount of glucides able to ferment can be fulfilled by adding of amylolitic products (malt flour, diamalt) or fungous products(Stoica A.2002).

The malt flour is often used by the millers in order to ameliorate the α-amylase content of the wheat flour, but it is also found as ingredient in some bread specialities.

The malt flour is obtained from wheat or barley after germination, moderate dried and grinded to the flour granulation.

Except the active α-amylase, the malt flour also contains active proteases and β-amylase; therefore it can be used only with the wheat flours what can support a proteolytic degradation.

Experimental

For determinations there were used a wheat flour, 650 type, obtained from in 2006 harvested wheat. The used malt flour is Belpan malt supplied by Enzymes&Derivates Romania.

The flour quality was analyzed according to the methodology from the Romanian Standards: STAS 90-88, STAS 6124-73, STAS 6283-83 and SR ISO 3093:1997.

The physical and chemical properties were appreciate as follow: ashes content 0.65%, humidity 14.2%, wet gluten content 26, gluten deformation index 2 mm, collapse index 438s.

The rheological behaviour of the dough was determinate with the Brabender farinograph according to the Romanian Standard SR ISO 5530-1:1998 and the extensograph device.

The bread quality characteristics were determinate by the backing tests (STAS 91-83 ref.).

Starting from the chosen flour for analysis there were used different doses of Belpan malt, as follow:

- M- witness sample without malt flour;
- P_1- sample with 50g Belpan malt /100 kg flour;
- P_2- sample with 100g Belpan malt /100 kg flour;
- P_3- sample with 150g Belpan malt /100 kg flour;
- P_4- sample with 200g Belpan malt /100 kg flour;
- P_5- sample with 250g Belpan malt /100 kg flour;

Results and Discussion

The influence of the malt flour onto collapse index is shown in the table 1.

Table 1: The influence of the malt flour onto collapse index

Sample	M	P1	P2	P3	P4	P5
$l_{def.}$,mm	2	3.5	5	6	7.5	8
l_{cad},s	438	350	285	256	200	150

On the basis of practical experiments, it was establish that in order to optimize the collapse index there is necessary a dose of 100-150g malt flour/100 kg flour.

The rheological behaviour of the dough was estimated with the Brabeneder farinograph as shown in table 2.

Table 2: Pharinographic indexes

Sample/added amount	M	P_1	P_2	P_3	P_4	P_5
Hydration capacity%	58.6	57.7	57.2	57.1	56.9	56.4
Development, min	3.17	3.10	3.49	3.16	2.50	2.17
Stability, min	4.35	4.15	3.91	3.76	3.68	3.31
Soaking, U.B.	126	130	137	140	157	170
Power	48	48	48	46	42	38

On the basis of farinographic data, there was establish that by adding Belpan malt there were obtained dough varieties with superior rheological properties comparative to the witness.

It is noticed a decreasing of the water absorption capacity due to the increase of the hydrolyzed starch by the amylases from the malt flour (the degraded starch has a greater capacity of water absorption comparative with the un-degraded one).

With the increase of the malt flour amount, the dough development time and the stability and power of the flour decrease and the soaking of the dough increases as consequence of the proteolytic activity induced by the malt flour, therefore by the gluten hydrolysis - the main wheat protein.

The rheological behaviour of the dough, fulfilled with the extensograph is shown in table 3.

Table 3: Extensographical values

Sample	Fermentation time (min)	Resistance (UB)	Extensibility (mm)	Energy
M	45	203	168	51
	90	126	166	25
	135	97	160	20
P_1	45	192	167	49
	90	140	149	28
	135	116	150	21
P_2	45	137	164	34
	90	98	143	23
	135	85	140	16
P_3	45	131	167	31
	90	96	145	18
	135	71	122	11
P_4	45	122	149	27
	90	79	131	6
	135	74	123	11
P_5	45	116	153	26
	90	74	131	18
	135	-	-	-

The extesographical data indicate that all the established parameters on fermentation periods reduces by decreasing of the collapse index, accountable as consequence of the increasing of the proteolytic activity from the dough, therefore the gluten hydrolysis induced by the added malt flour. The decreasing of the consumed energy (little surface between the curve and the abscissa) that point out the dough's strength is the most obvious index from the extensographic analysis.

By the gradual decrease of the collapse index the dough's strength is reducing that cannot support anymore long fermentation periods. For the sample 5 by a collapse index of 150 the fermentation time curve for a fermentation time of 135 min was no more designed due to the excessive soaking of the dough.

Therefore we can conclude that the ameliorated samples with malt flour (it reduces the collapse index) must have a smaller fermentation time.

The technological effects of the analysed samples were appreciated according to the backing tests (table 4).

Table 4: Quality indexes for bread resulted by experimented

Indicator/Sample	M	P_1	P_2	P_3	P_4	P_5
Nominal massă, g	300	302	301	302	301	304
Porosity, %	78	82	86	86	80	82
Elasticity, %	82	86	98	96	88	78
Volum variation, cm^3/100 g product.	287	346	386	382	320	280

According to the results offered in table 4, we can see that an optimum of the finite product characteristics (porosity, elasticity, aspect of the section, etc.) is obtained for an amount of 100-150g malt flour/100 kg flour. The volume variation of the improved samples is shown in figure 1. Big doses of malt flour conducted to the reduction of elasticity and the increasing of the stickiness of the dough's core. The preservation of the bread's freshness increases with the increasing of the added malt flour.

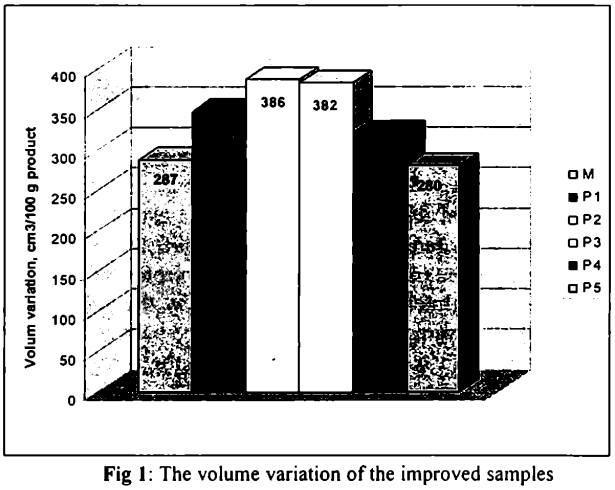

Fig 1: The volume variation of the improved samples

Conclusion

The results indicate that by adding of malt flour the rheological and technological properties are superior for an amount of 100-150g malt flour/100 kg flour.

A too big quantity of malt flour increases excessively of the dough's soaking and a worsening of the bread's characteristics (an excessive colouring of the resulted bread, small volume, etc.).

References

Bordei D., 2005, *Tehnologia modernă a panificaţiei*, Ed. AGIR, Bucureşti

Giurcă V., Giurea A.M., 2002, Factorii care influenţează proprietăţile de panificaţie ale grâului, Ed. Agir

Stoica A., Banu C., 2002, Aditivi chimici şi biochimici utilizaţi în panificaţie, Ed. Bibliotecha, Târgovişte

***1999- 2002. Colecţie de standarde pentru industria de morărit şi panificaţie: SR ISO 5530-1 ; 5530-2 ; SR ISO 5530-4