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RESEARCHES CONCERNING THE INFLUENCE OF SOME COMMERCIAL ENZYMATIC PREPARATS OVER THE QUALITY OF FROZEN SHEET DOUGH

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Abstract

For the obtainment of frozen pastry dough choosing ingredients is very important. In the manufacturing recipe of frozen sheet dough we experimented with an addition of two commercial enzymatic preparats. The finished products were sensorial analyzed regarding aspect, texture and friability.
Keywords: *frozen pastry dough, enzymatic preparats*

Introduction

The frozen pastry products' market has seen a development over the last few years, proposing the use of half-finished pastry products. Recipes and special procedures were developed for the manufacturing and processing of frozen sheet dough and great improvements were made in the development of frosting and defrosting equipment (Kulp, 1995; Neyreneuf, 1991). At the obtainment of pastry dough the entire technological process of sheet dough manufacturing suffers changes in order to make an optimum product. In this case it is sought that, after baking, the dough to detach itself in many overlapping sheets (Bordei, 2004). The obtainment of frozen pastry dough is a difficult technological process, for which the correct choice of ingredients consists an important factor for the quality of finished products. The correct choices of ingredients are extremely important for counterattacking the negative effects of storage in frozen state and defrost of pastry products (Grandvoinnet, 1997). In frozen dough, the activity of enzymes changes because of the following: the mobility of molecules decreases; the reaction speed decreases, as it depends on temperature; enzymes' proteic part denaturation; new bonds between the enzyme and the substrate; water activity decrease (Inoue, 1992). This paper shows own researches concerning the influence of the addition of some commercial enzymatic preparats over the quality of frozen sheet dough.

Experimental

The researches were made in the milling-bakery company S.C. Pambac S.A. Bacau on a technological line of obtaining sheet dough for pastry. The raw materials and the manufacturing recipe used in the experiments were: flour 480-1 kg; margarine-35%; salt-1.6%; water-57%; vinegar- 0.6%. For improving the quality of frozen sheet dough, an addition of two commercial enzymatic preparats was experimented with. For determining the dough's rheological characteristics, we used the Chopin alveograph and the Brabender farinograph.

AMG 800 BG (amyloglucosidase), from the firm Novo Nordisk, Denmark, is a fungal glucoamilase used in bakery (with an activity of 800 AGU/g). AMG is obtained through submerged fermentation of genetically unmodified *Aspergillus niger*. The enzyme hydrolyses the bonds α-1.4 and α-1.6 from amylases and amylopectin. AMG can also be used in the case of frozen dough. AMG is inactivated during the baking process.

Lipopan FBG from Novo Nordisk, Denmark is a purified lipolytic enzyme obtained from *Fusarium oxysporum* produced through the submerged fermentation of the genetically modified microorganism *Aspergillus oryzae*. Lipopan FBG has an inherent activity on phospholipids, glycolipids and triglycerides. Lipopan FBG (with an activity of 25 KLU/g) improves the manufacturing characteristic of dough and its stability, the quality of bakery products, obtaining products with a softer, whiter core, with more uniformity and increased volume. Lipopan acts on flour's lipids and works really well combined with other bakery enzymes, not having a negative effect over emulsifiants. In the recipes that contain special ingredients, like fats (butter) or other fats and oils that are composed of fat saturated acids sensible to lipase. Lipopan FBG may lead to unpleasant smells. Lipopan F BG is completely inactivated during baking.

Unlike classic technology, the obtained sheet dough was frozen at a temperature of -30°C for 30 minutes, and then stored in that state at a temperature of -18°C over periods varied between 10 days, 20 and 30 days.

At the end of each storage period the samples were defrosted slowly: defrosting time 35-45 minutes; defrosting temperature 28-30°C. For quality verification of frozen sheet dough the pastry

products were baked at the end in a rotational type oven. The baking was made following these technological parameters: baking time 12-13 minutes; baking temperature 210-220°C. The pastry products obtained were analyzed from an organoleptical point of view (aspects, texture and friability). Members of the tasting committee were instructed concerning the criteria for grading the samples, so that every product was appreciated with grades from 0 to 10 as following: between 0 and 2.5 unsatisfactory, between 2.5 and 5 insufficient, between 5 and 7 acceptable, between 7 and 9 good, between 9 and 10 very good.

Results and Discussions

The influence of amyloglucosidase addition. In the manufacturing recipe, amyloglucosidase has been added in three distinct quantities: 10g/100 kg, 20g/100 kg and 30g/100 kg, compared to lour quantity. After dosing according to flour, the mixture was then mixed and homogenized. After the obtainment of a homogenized mixture, it was analyzed in the testing laboratory. In order to make the alveograph analysis we used 250 g from the homogenized mixture and 300g for the farinograph analysis. The results obtained are shown in tables 1 and 2.

Table 1. The influence of amyloglucosidase addition over rheological properties of raw material flour

Amyloglucosidase addition (g/100 kg flour)	Alveogram characteristics			
	P (mm)	L (mm)	W (10^{-4}J)	P/L
10	91	76	239	1.20
20	96	76	247	1.26
30	92	79	248	116

The alveogram shows the following characteristics: height, P, measured in mm corresponding to dough bubble's maximum pressure and is interpreted as deformation resistance or as dough stability; width, L, in mm is interpreted as dough extensibility; deformation energy, W, in cm, is strongly tied to flour power, flour hydration capacity. Dough deformation action is calculated in 10^{-4}J.

From the alveograph, an improvement of energy absorbed by the dough and a slight increase of its extensibility is observed. These

influences are partly due too the fact that besides its amylolitic activity the preparat also has a generally somewhat low proteolitic activity.

Table 2. The influence of amyloglucosidase addition over technological properties of raw material flour

Amyloglucosidase addition (g/100 kg flour)	Farinogramme characteristics					
	Absorption capacity (%)	Development (min.)	Stability (min.)	Elasticity (U.B.)	Softening (U.B.)	Power
10	57.0	1.30	2.30	120	90	46
20	57.2	1.30	2.00	130	100	45
30	57.4	1.15	2.30	130	100	44

At the farinograph, through the enlargement of amyloglucosidase quantity, a decrease of flour's power is observed. Amyloglucosidase addition does not influence hydration capacity. In the case of stability and elasticity an increase of amyloglucosidase quantity has an insignificant effect on farinogram's indicators. The samples obtained from sheet dough with amyloglucosidase addition were analyzed from an organoleptical point of view in the testing laboratory of S.C. Pambac S.A.

Figure 1 shows the influence of amyloglucosidase over organoleptical properties: through amyloglucosidase addition from 10g/100 kg of flour to 20g/100 kg flour, the value of the results obtained has an increasing tendency, afterwards, by increasing the quantity to 30g/100 kg flour the valued slightly drop.

The influence of lipases addition. In the manufacturing recipe, lipase was added in three distinct quantities: 1g/100 kg of flour; 2g/100 kgflour and 4g/100 kg flour. After dosing according to flour, the mixture was stirred and homogenized. After the obtainment of a homogenized mixture, it was analyzed in the testing laboratory. The results obtained are shown in tables 3 and 4.

From the analysis made in the alveograph an increase of deformation energy (W) and extensibility (L) can be observed. This can be explained through a mechanism, which according to the lipase acts in the dough: through the hydrolysis of flour's lipids in the presence of lipases monoglycerides and free fat acids are formed. The monoglycerides act as surfactants and the free polyunsaturated fat acids, in the presence of endogenous lipases and oxygen introduced

through kneading, oxidize into hydro-peroxides, process coupled with dough's oxidation reaction, SH group's oxidations, with a positive influence on dough's rheological properties.

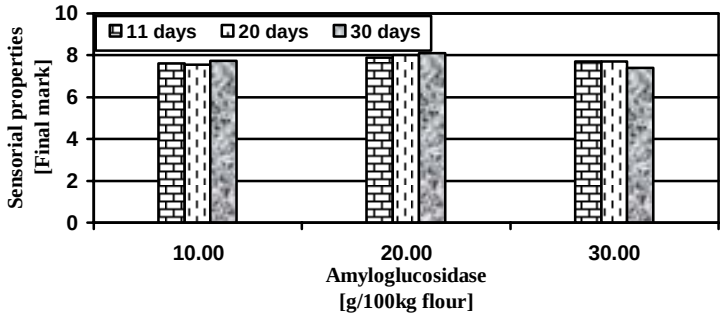

Figure 1. The influence of amyloglucosidase over the finished products quality

Table 3. The influence of lipase addition over rheological properties

Lipase addition (g/100 kgflour)	Alveogram characteristics			
	P (mm)	L (mm)	W (10^{-4}J)	P/L
1.0	92	69	225	1.33
2.0	96	78	247	1.23
4.0	92	79	243	1.16

Table 4. The influence of lipase addition over technological properties of raw material flour

Lipase addition (g/100kg flour)	Farinogramme characteristics					
	Absorption capacity (%)	Development (min.)	Stability (min.)	Elasticity (U.B.)	Softening (U.B.)	Power
1.0	56.6	1.30	4.15	125	70	50
2.0	56.5	1.30	4.00	125	60	52
4.0	56.5	1.30	5.30	120	60	53

The analysis made at the farinograph show that the addition of lipases leads to an improvement of dough's stability and its power. Lipase addition had no influence over dough's development elasticityand hydration capacity.

The samples obtained from sheet dough with a lipases addition were analyzed from an organoleptical point of view in the testing laboratory of S.C. Pambac S.A. Figure 2 shows a graphic

representation of the influence of lipases addition over the samples' organoleptical properties. Lipases addition has a negative influence over organoleptical properties, enlarging the quantity from 1g of lipases/100kg of flour to 4 g lipases/100kg flour lead to a decrease of 13.6% of the obtained results. Storage duration of frozen sheet dough has an insignificant influence over the finished product's organoleptical properties.

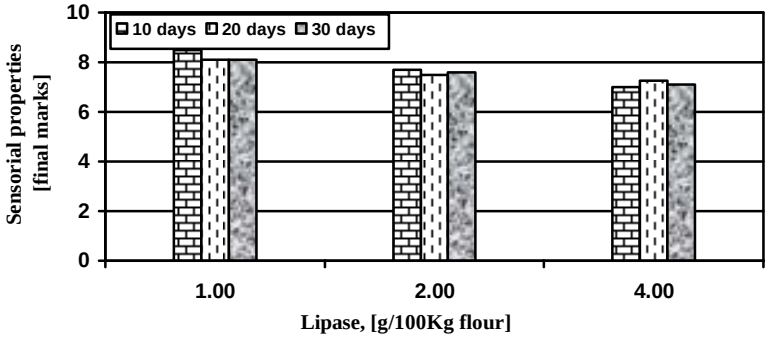

Figure 2. The influence of lipase over the finished products quality

Conclusions

The useing of lipolitic enzymes is not recommended in the manufacturing recipe of sheet dough in more than 1g lipase to 100 kg of flour. The use of amyloglucosidase has a positive influence over pastry products' organoleptical qualities, the optimum dose being 20g amyloglucosidase to 100kg flour. Prolonging the storage period of sheet dough from 10 days to 20 or 30 days has an insignificant effect over the finished products' aspect, texture and friability.

References

Bordei, D. (2004). *Tehnologia moderna a panificatiei*. Editura AGIR, Bucuresti

Grandvoinnet, P., Pratx, B. (1997). *Les ingredients des pates*. Farines et mixes, Paris

Inoue, Y., Bushuk, W. (1992). Studies on frozen dought. Flour quality requirements for bread production from frozen dought, *Cereal Chemistry*, 69, 423-428

Kulp, K., *et al*. (1995). *Frozen & Refrigerated Dough and Batters*. American Association of Cereal Chemists, Inc. St. Paul, Minnesota, USA

Neyreneuf, O., Van der Plaat, J.B. (1991). Preparation of frozen dough with improved stability, *Cereal Chemistry*, 68, 60-65