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# Influence of proteolytic and amylolytic activity on the formation of doughs used in bakery and pastry

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***Abstract***

The experimental research aimed at the expertise of T480, T550, T650, T780, T1100, T1200 flours by determining the proteolytic index, the falling index and the maltose index. Through the experiment, the formation of the doughs and the quality of the flour were verified, determining their extensibility L (81-114 mm), the maximum resistance of the dough to stretching (P = 64-98 mm), the extensibility index (G = 19-23.8 mm) , as well as the deformation (W=167-207 mm). The final result was the ratio of dough extensibility to deformation, which ranged from 0.56(56%) for T480 flour to 0.94(94%) for T650 flour used in pan bread dough. The porosity and volume characteristics of the bread assortments recorded values that are in line with the quality standards, sometimes the porosity exceeded 80%, implicitly also the volume, which means the addition of leavening agents in maximum limits outside the rules established by GMP [8,9,10].

***Keywords:*** optimization of dough quality

## 1.Introduction

Modern baking involves the development of information about the raw and auxiliary materials used in the manufacture of bread. Practicing new methods of control for raw and auxiliary materials in order to obtain bakery products of higher quality brought to the improvement of the structural properties of the dough and the core of the bread. This also gave birth to the modern concepts of making nutritious bakery products. Thus, the types of flour manufactured in Romania T480, T550, T650, T800-900, T 1250-1750 with an ash content of 0.48% to 2.2% (2) were used to obtain bakery doughs that have been alveo graphically tested, according to the proteolytic activity, the degradation of the starch content, the extensibility/deformation ratio that can generate recommendations and for the use of flours according to the behaviour of the dough (3).

The quality of the dough and bakery products will be influenced by the ratio between the resistance and the extensibility of the dough. Then the coding index can optimize the use of different types of flour in different doughs and assortments. The maltose index tells us the colour of the dough and the colour of the baked core [5,6,7].

The assessment of dough and product quality through texture analysis are essential tools for bread product development and manufacture. This chapter describes the terms used in texture analysis of the intermediate product (dough) and the final baked product. It considers the principles connected with the measurement of the rheological properties of dough and their practical relevance. For the final baked product the texture of the crust and the crumb structure along with freshness, volume, and appearance are all important criteria by which the product quality is judged. Some of the tests and instruments used for these tasks are described. Potential trends for instrumentation and measurement techniques are discussed [11,12,13].

Protein, flour, and dough quality of purple- and blue-colored wheats need to be evaluated for their potential in making bread products. It is important to breed black-, purple-, and blue-colored wheats as bread wheat in the future. It is valuable to investigate chemical transformations of phenolic acids and anthocyanins during baking.

Although very little is known about adverse reactions to black-, purple-, and blue-colored wheats and their food products, known adverse reactions to wheat include allergies and celiac disease. Different clinical forms of wheat allergy include baker's

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asthma, atopic eczema/dermatitis syndrome, urticaria, and wheat-dependent, exercise-induced anaphylaxis [4].

## 2. Material and methods

Determination of the titratable acidity was made on the principle of neutralizing the total acidity of the sample to be analysed, by titration with NaOH 0.1 n, in the presence of phenolphthalein, until the pale pink turn. The results were calculated according to the formula A= 3.35xV/V1. (V is the volume of NaOH 0.1n taken in the experiment, and V1 is the volume of the sample to be analysed). The soluble dry substance was determined refractometrically at the optimal temperature, recording variable values from 10% to 17% soluble dry substance, experimentally validated values [1].

## Results and discussions

The proteolytic activity of the studied flours indicates an increasing swelling index from 5-6% in T480, T550, T650 flour to 20% in the case of T780 flour, as well as a maximum proteolytic activity of 25-35% in flours with more a lot of dark flour bran T1100 and T1200 (figure 1).

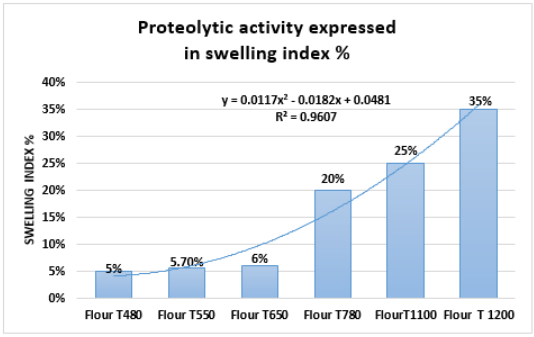


***Figure 1.*** Proteolytic activity expressed by the swelling index

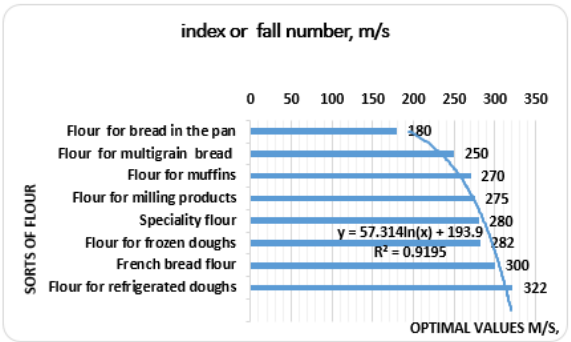


***Figure 2.*** The falling index of the obtained doughs for different types of bread

The experimental results obtained vary according to a polynomial curve with a very high level of confidence. $R^2$=0.9607.

The fall index has optimal values ranging from 180 m/s for the dough obtained for bread in the pan, to 322 m/s for the refrigerated dough. Average values between 250-300 m/s fall index were found for multigrain bread dough 250 m/s, cake dough -270 m/s, specialty dough -280 m/s, frozen dough -282 m/s s, the dough for French bread. (figure 2) The dynamics of the falling index optimizes the quality of the obtained doughs to manufacture bread assortments with improved porosity and larger volume. The level of confidence of the experimental results is maximal and provides security for obtaining bakery products of the best quality.

From figure 3 it can be seen that the percentage of starch varies from 5.7% to 10% depending on the type of dough, respectively the type of bakery product. The varied range of bakery and pastry products shows us variations with a confidence level above 50%.

The maltose index varies from the flour for muffins and pretzels, at the minimum level to the mix of wheat and rye flour for bread. (figure 4) The confidence level obtained is 0.9978, which means very good results with a very high probability of occurrence.

The largest deformation was recorded in the T480 flour -207 mm, and the smallest in the T1200 multigrain flour of 167 mm. The extensibility index a recorded values from 19 to 23.8 and a directly proportional extensibility from 62 to 89 mm. Thus, by describing the extensibility and deformation indices, it was possible to measure the maximum stretching resistance of the dough P , with maximum values for T650 flour, average values for T1200 flour. (figure 5).

The highest elasticity/deformation ratio was obtained for T650 flour used in the manufacture of bread, cakes, pretzels, 0.92-0.94, average values were recorded for flour used to obtain frozen dough 0.86, for flour used in pastry -0.7, and the lowest values were obtained for T1200 multi-cereal flour and T480 flour – 0.56 used in the manufacture of cozonac, specialties. (figure 6)

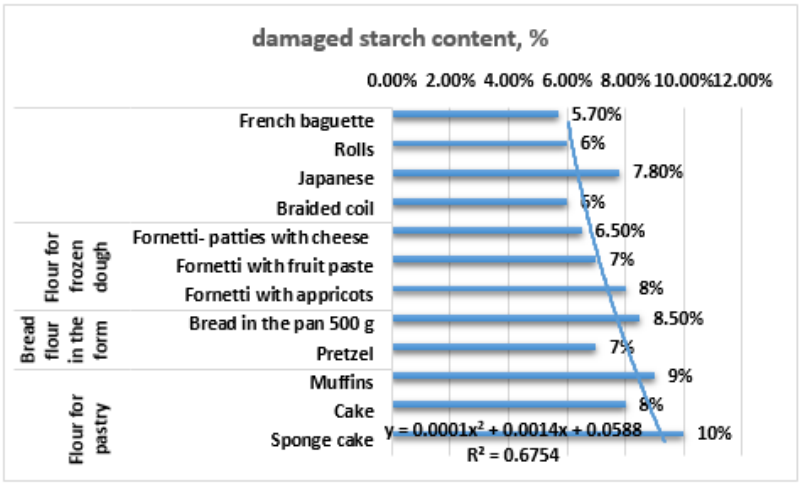


***Figure 3***. Evolution of damaged starch content

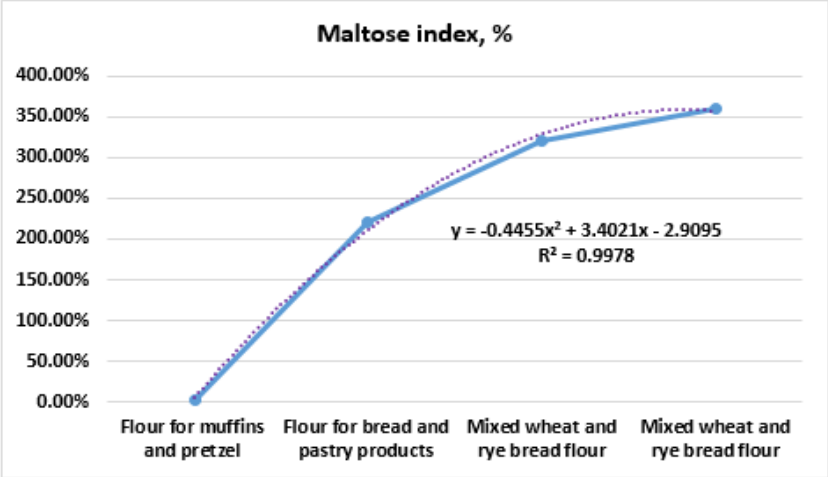


***Figure 4***. The dynamics of the maltose index in flour mixes for baking, pretzels or pastry products

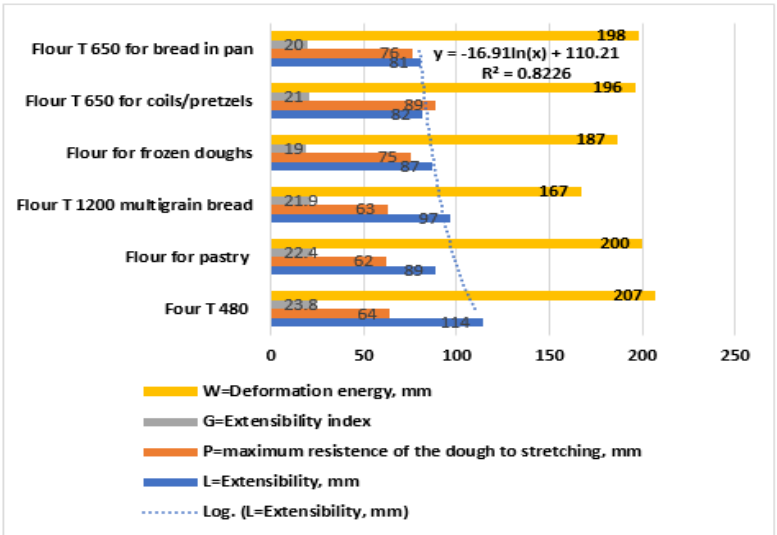


***Figure 5.*** Dynamics of the extensibility and deformation characteristics of the doughs according to the quality of the flour ( original figure)

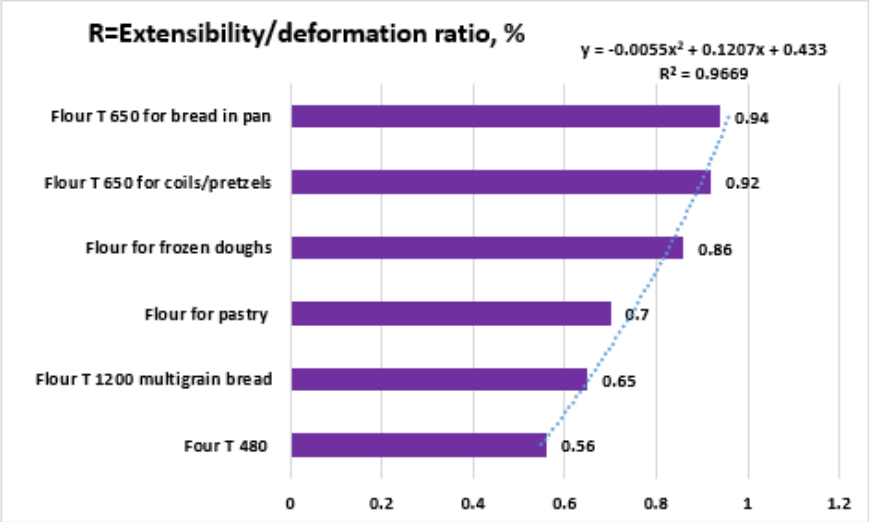


***Figure 6.*** Extensibility/deformation ratio for different flours and doughs(original figure)

## Conclusions

1.The quality of baking and pastry flours influences dough extensibility and deformation, resulting in baked goods with improved porosity or greater volume.

2. The maximum proteolytic activity of 25-35% was determined in flours with more bran dark flours T1100 and T1200. Consequently, this also influences the digestibility of bread, hence the recommendation to consume bread with bran before white bread.

3. The maltose index of the wheat and rye flour mix was studied to scientifically assess the use of this controversial mix. Of course, we can use this mix for bread, but it cannot be used successfully for other specialties or pastry products, because the dark color of the assortments cannot define the quality characteristics of these flour products.

**Compliance with Ethics Requirements.** Authors declare that they respect the journal's ethics requirements. Authors declare that they have no conflict of interest and all procedures involving human or animal subjects (if exist) respect the specific regulation and standards.

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