THE INFLUENCE OF GLUTEN PROTEINS DISTRIBUTION ON PANIFICATION WHEAT QUALITY

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Abstract

By using multivariate statistical methods an overview was obtained of the influence it has gulten protein distribution in those which do not form gluten network on the rheological properties of dough and bread qualities. By correlating determinations performed on the properties of gluten tests sedimentation and testing rheological properties of dough tests baking experimental dough on a small scale has revealed that within each variety a higher content of proteins that do not make network gluten has an influence on rheological capacity, which is much weaker in this case in comparing with those that have a higher gluten content protein. Proteins that do not form gluten network are likely to have different surface properties than the gluten.

Key words: proteins, proteins distribution, *rheological properties*

INTRODUCTION

Composition and structure of proteins are the main factors that determine the properties of wheat bread (Antes, Wieser, 2001). Many approaches have been tried to evaluate wheat proteins and to understand their role in obtaining the bread (Belton, 2005).

MATERIAL AND METHOD

The material used was native wheat bread of different species Alex (G1), Partizanka (G2), Romulus (G3), Bustard (G4). The selected material has been regarded as the most representative for obtaining the flour bread in north-western Romania.

Protein content was determined according to EN ISO 20483/2007. For the determination of the protein substances have been working with the Kjeldahl method, decomposing the organic substances in the warm nitrogen at d = 1.84 of sulfuric acid in the presence of a catalyst, with their conversion into ammonium sulphate. It is hot decomposed in the presence of sodium hydroxide, ammonia and the distillate is fixed in an acidic solution and titrate the excess acid with a base in the presence of an indicator.

Protein content (Fig.1) depending on the species of wheat were: G1 14.33% 14.28% G2, G3 and G4 14.93% 12.74%.

The amount of wet gluten was determined according to ISO 21415-2 SR / 2007. To determine the wet gluten is separated the proteic gluten in the form

of gluten by washing with sodium chloride solution prepared in the sample dough and drying of gluten obtained. The amount of wet gluten to species of wheat (Fig2.) Were: 26.2 G1, G2 27.8, G3 G4 27.6 and 22.3.
Sedimentation index Zeleny test according to SR ISO-5529 / 2007. For determination of the sedimentation Zeleny-test was prepared a suspension in a solution of lactic acid in the presence of bromophenol blue in the test sample, obtained from wheat by milling and sifting under defined conditions.

After stirring periods and the rest set it was determined the amount of sediment resulting from the sedimentation of the particles of flour. Sedimentation index values for each sample of wheat were as follows (Figure 3) G1 50ml, 40ml G2, G3 and G4 52ml 38ml.

Determination of rheological characteristics of dough using Chopin alveograph was made according to standard ISO 5530-4 / 2005. Alveographic method is based on the tensile strength of a dough sheet of air under pressure, which inflates the form of a growing bubble rupture. Chopin Alveograph is used to determine certain rheological properties, in particular the maximum pressure P, swelling index G, the average abscissa at breaking L and the strain energy in W. The values after determining the rheological characteristic features of each type of flour were as follows:
W * 10-4J energy for 68 G1, G2 94 G3 and G4 110 107, maximum steam pressure (P) mm, 96 G1, G2 85 G3 G4 95 and 88, Extensibility (L) 15 mm G1, G2 27, G3 and G4 29 30 Total P / L G1 6.46, 3.12 G2, G3 and G4 3.34 2.94.

Determination of rheological properties of dough using JTL Janz device

In order to achieve the bread samples was used a well established procedure for the preparation of the dough. A basic recipe was used in the bread based on the weight of the flour: 450 g flour, 56% water, 1.6% yeast 2% salt. It has been used a device for the preparation and baking of the bread type BM 2000 Alaska, a device which performs the entire process for the preparation of bread. The duration of fermentation was 0, 30, 60, 90, 120 150, and 180 minutes. During the fermentation, were taken samples every 30 minutes.

Using a perforator ring (20 mm diameter) were obtained samples with a height of about 20 mm. Given that the low levels of deformation baking dough could be considered as having a elastic behavior by determining using Young's modulus, and using a machine compression JTL Janz, samples dough are compressed uniaxial between parallel plates lubricating 6 mm / min. In order to study some of the viscoelastic properties of the dough, the same apparatus was used to test for the stress relieving. In this sense, the model, placed between two parallel plates, the upper plate downwardly moving at a constant speed of 6 mm.s-1. When reached

approximately 0.5 pressing the downward movement of the upper plate was stopped and variation in time of compressive force was recorded.

Quality rating crumb In parallel with the bottom of the bread were cut 3 slices on average approximately 3 cm and placed, the cylindrical samples were prepared by a ring perforator avoiding the bread crust. All slices were cut from a loaf after 2 hours of rest at room temperature. Samples having a diameter of 20 mm and their height is adjusted to 15-25 mm. For the determination of core density was weighed to an accuracy of 0.00 g. The tests were carried out by compressing and relaxing as described above (W. Li, Dobraszezyk, Schofield, 2003).

RESULTS AND DISCUSSION

Grains taken coming from different species are distinguished by their quality of what is on assignment differently to the two types of protein, the gluten and the gluten network which does not form (Clyde Don, Wim J. Lichtendonk Johan J. Plijter, Ton van Vliet, Rob J. Hamer, 2005).

In terms of protein content, three of the four samples of wheat (G1, G2, G3) have a high protein content, over 13% (from 13.25 to 13.44%), and one of the samples (G4) has a small content (10.6%). The amount of wet gluten formed has a variation similar to the protein content, varying between 30 and 28.5% for the first three samples and 23.7% for the flour F4.

Quality flours expressed Zeleny sedimentation index, which classifies substances flours after the quantity and quality of protein is very good for grain G1şi G3 and G2 and G4 is good for panification.

Following the farinograph curves appearance and parameters, it is found that all samples of wheat had a little development time, between 1.5min for G2 for 2 minutes for the other samples. The stability of the dough, however, is quite good, it ranging from 4 minutes for G1 to 6 minutes for G4. From the softening point of view G1 has the highest softening (90 UF), curve farinograph having therefore a different look from the other grains, grain G2 and G3 were lowest softening (65 UF) and G4 somewhat higher (80 UF), it tends to present two peaks, the second but less pronounced. Alveographic analysis show that grains taken at experiments form doughs having a resistance value slightly below the optimum P (75-80mm) and a very low extensibility L that varies between 46-74 mm above the optimum of 130-150 mm, which make and report form P / L is well above the normal value for bakery 1.09 to 1.58 to 0.55-0.75.

The figures below show pie charts of various parameters flours.

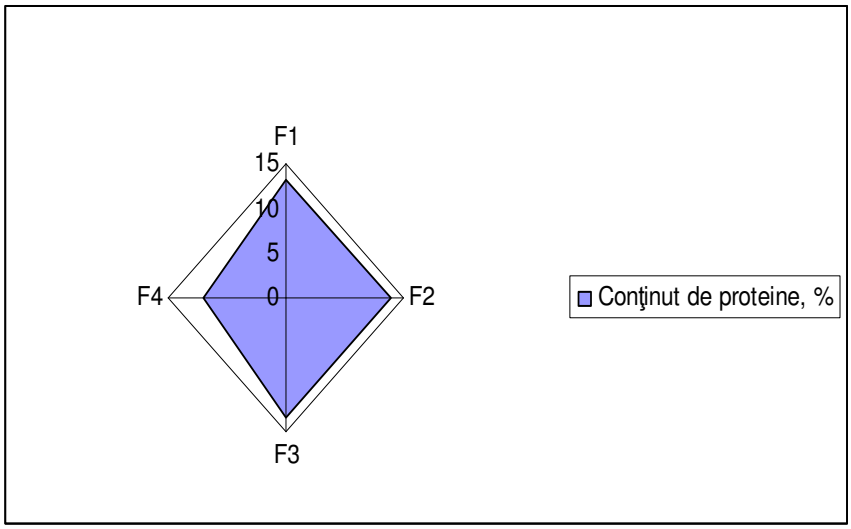

Fig. 1. The pie chart on the grain protein content G1-G4

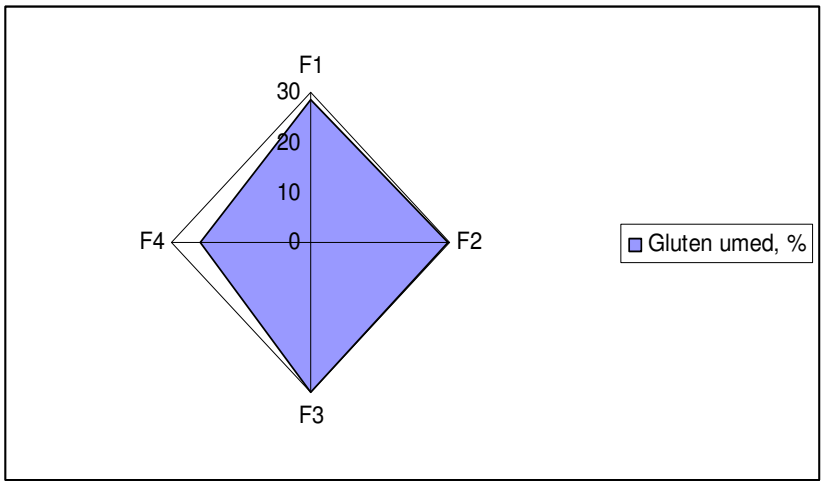

Fig.2. The pie chart on the grains wet gluten content G1-G4

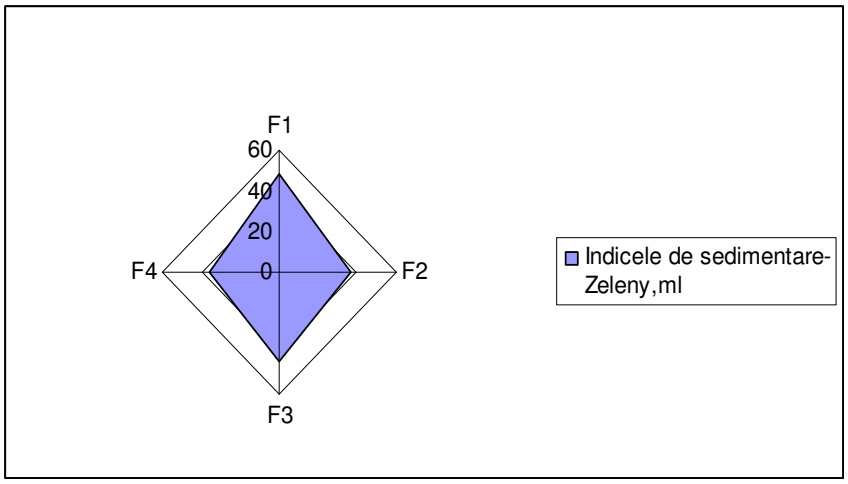

Fig. 3. The pie chart on the grain sedimentation index G1-G4

CONCLUSIONS

This study included a wide range of analyzes for wheat, using grain crops spread in the north-west of the country. Following interpretation of the data analyzes have concluded that not only the total amount of protein count for quality wheat but also their distribution in terms of gluten proteins from those that do not form gluten network. The latter visible influence rheological properties of dough made from these grains. As can be seen in the variety of the wheat G4 Dropia amount of protein is the lowest compared to other species yet rheological properties showed that at this species occured the best dough development. One can only conclude that protein content does not reflect the precise quality wheat, but their distribution is the factor that determines its rheological properties.

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