EFFECT OF MILLING AND SIEVING ON SOME QUALITY PARAMETERS OF WHEAT FLOUR

UTICAJ MLEVENJA I PROSEJAVANJA NA KVALITET PŠENIČNOG BRAŠNA

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SUMMARY

Wheat is one of the most important cereals in the world and the bread made of its flour belongs to the everyday life of human mankind. The Hungarian standard relating to the laboratory production of wheat flour (MSZ 6367-9-1989) does not mention the type of laboratory mill used for milling, and it only builds up some general criteria, such as: the laboratory mill should be provided with four differently nicked barrels, a sieve with appropriate hole sizes, and also with the separated collections of the pilot flour and the bran. Our study was started at this point and the answers for the following questions were aimed to be found: do the flour patterns studied and produced with different grinding and sieving techniques, widely used in laboratory mills of the same wheat pattern show any alterations after the impact of the formula production as regards chemical constitutions (protein content, wet gluten content). Various flours and whole grains of the wheat patterns sieved with different particle sizes were studied in this experiment. The results our research confirm that the quality of wheat flour can be modified by different methods of pattern production.

Key words: mills, sieving, particle sizes

INTRODUCTION

Wheat is one of the most important cereals in the world and the bread made of its flour belongs to the everyday life of human mankind. The Hungarian standard relating to the laboratory preparation of wheat flour (MSZ 6367/9-1989) does not mention the type of laboratory mill used for milling, and it only requires some general criteria, such as: the laboratory mill should be provided with four differently nicked barrels, a sieve with appropriate hole sizes, and also with the separated collections of the pilot flour and the bran. Our study was started at this point and the answers for the following questions were aimed to be found: do the flour samples studied and produced with different milling and sieving techniques, widely used in laboratory mills of the same wheat pattern show any alterations after the impact of the formula production as regards chemical composition (protein content, wet gluten content). Various flours of the wheat patterns sieved with different particle sizes were studied in this experiment. The results our research confirm that the quality of wheat flour can be modified by different methods of samples preparation.

We use different methods and system of them to determine the quality of crops products just like wheat (Bichonski, 2004), because we cannot identify the quality of crops with only a single feature, since there is no 'absolute quality' (Győri and Győrine, 1998).

Flour millers produce mainly for bakers, whose principal requirement is for a flour of consistent quality; maintaining uniformity of flour quality was described by Scott (1951) at the miller’s ‘golden rule’. Particle size distribution of flour is an important quality parameter to be considered in the design, adjustment and operation of the mill (Tóth A., 2006). It relates to the flour’s purity, water absorption capacity, rate of hydration and related mechanical damages during the mill (Posner E and Hibbs A., 1997).

MATERIAL AND METHOD

Analyses were made in the accredited laboratory of the University of Debrecen, Agricultural Center, Institute of Food Science, Quality Assurance and Microbiology. Hajdú Gabona Ltd Company provided us with 50 kg homogeneous wheat flour, which was the base for this research about milling and sieving. We used a FQC 109 laboratory mill and 4 different sieve sizes: 250-200 µm; 200-160 µm; 160-125 µm; <125 µm and the control flour which was not sieved. The test specimen runs between finely grooved steel rolls which rotate with different speeds and in opposite direction. The milling product is separated by a sieve. We used Thyr 2 vibration sieve machine to separate the particle sizes. To study the differences the following measurements were performed: ash content, protein content, wet gluten content, gluten index and gluten expansiveness. Similar relations were examined by Vida et al. (1996) and Markovics (2002). Measurements was repeated 3 times. Tests were made in accordance to MSZ-ISO-standard illustrated in Table 1. For describe was used the statistical relations: mean and standard deviation.

RESULTS AND DISCUSSION

At first we studied the distribution of particle sizes in 100 g wheat flour after sieving (Fig. 1).

The highest was the ratio of particles in the range 200-160 µm, which amounted to 34 g/100 g whereas the smallest part
were particles less than 125 µm (12%). The distribution of particle sizes was homogenous. The proportion of largest particles, 250-200 µm in size, was 31% from the whole pattern.

The ash content of flour patterns is presented in Table 2, from which it can be observed that the ash content of the fraction with the largest particles significantly differed from all others (P<0,05). The ash content of the control was the same as that of the 160-125 µm fraction.

Table 2. The change of ash content
Tabela 2. Promena sadržaja pepela

<table>
<thead>
<tr>
<th>Ash content/Sadržaj pepela (%)</th>
<th>Mean/Srednja vrednost</th>
<th>Stand. dev./Stand. devijacija</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control/Kontrola</td>
<td>0.4663</td>
<td>0.011</td>
</tr>
<tr>
<td>250-200 µm</td>
<td>0.4132</td>
<td>0.023</td>
</tr>
<tr>
<td>200-160 µm</td>
<td>0.4794</td>
<td>0.0198</td>
</tr>
<tr>
<td>160-125 µm</td>
<td>0.4665</td>
<td>0.0115</td>
</tr>
<tr>
<td>125 alatti µm</td>
<td>0.4930</td>
<td>0.01182</td>
</tr>
</tbody>
</table>

After determining the protein content, it was observed that its content increased as the particle size decreased (Figure 2). The deviation between groups is similar. The wet gluten content increased with a decrease in particle size (Figure 3).

The deviation of different particle sizes is significant. Studying gluten index (Figure 4), 160-125 µm fraction showed different properties to all other fractions. The deviations were very different. The 160-125 µm fraction showed the biggest deviation in this parameter similarly to the wet gluten content. The falling number was the highest in the fraction of largest particle which means that the falling number increased with an increase of particle size (Figure 5). The difference between the particle sizes was not so significant. The smallest fraction <125 µm had the highest deviation. In all cases the differences can be explained by the flour-bran ratio, and in some of the cases the higher germ content of the fractions also played a role in the differences among fractions with various particle sizes.
CONCLUSION

The results from our research confirm that the quality of wheat flour is affected by the different particle sizes of pattern production. To find the answer on the differences we took microscopical pictures about flour fraction with different particle sizes. In all cases the differences can be explained by the flour-bran ratio, and in some of the cases the higher germ content of the fractions also played a role in the differences among fractions with various particle sizes. These showed that the particle size has a significant effect on the protein characteristic of the wheat flour studied in this study and on technological indexes such as falling number.

LITERATURE


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