UDC: 631.16:664.71-11:633.111

TECHNOLOGICAL EVALUATION OF EXPORTS OF POWDER FROM GRAIN WHEAT SPLETS DEPENDING FROM WATERPROOF TREATMENT

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Actuality. Currently, spelt grain is gaining popularity and is a valuable raw material for flour and cereal mills. Under the conditions of the reorganization of the Ukrainian economy and its European vector of development, the priority task of leading domestic experts is to adapt the raw materials and products of its processing to the requirements of the western market.

The technological properties of spelt and traditional wheat grain used in the industry are different. This determines the relevance of the additional study of spelt grain processing for flour and its optimization.

Spelt has features that favorably differ from the characteristics of traditional wheat. In particular, it can be a valuable resource in the development of safe wheat varieties for patients with celiac disease.

Spelt grain products can be part of a protein-restricted diet which improves the metabolic human health.

The goal of the investigation is to substantiate and establish the optimal modes of spelt grain processing for flour.

The materials and methods for investigation. The object of studies is spelt grain of Zoria Ukraine variety.

The studies were in three replications that were randomized in time. The coefficient of data variation in replications ranged from 1.2 to 8.3% which corresponded to a small variation and made it possible to use average values. Optimization of the flour production process was carried out using the correlation and regression analysis.

The results and discussion. The descriptive statistics showed that the water and heat treatment statistically significantly influenced both the overall flour yield and parameters of its output after the first and second systems. The average arithmetic (5.75%, 31.62 and 83.38%) and median (51.35%, 31.80 and 82.9%) values were similar in all cases which were explained by the possibility of correct data sharing. Water and heat treatment caused the greatest impact on the output after the first grinding system, since the difference between the minimum and maximum values was the highest (8.5%). However, the smallest water and heat treatment affected the flour output after the second grinding system.

More clearly, the relationship between WTO parameters and the flour output can be described by cell charts.

It was established that the increase in humidity and the irrigation duration reduced the average flour yield after the second grinding system. The trends in the change in total flour output and its yield after the first grinding system were similar. An increase in humidity up to 15.0% resulted in an increase in the flour yield but at the humidity content of 16.0% and above the flour yield decreased. Such regularities are explained by the fact that the water and heat treatment contributed to decreasing interaction forces of starch granules of the flour endosperm.

It is obvious that after increasing in humidity content up to 15.0%, the smallest number of intermediate products (whole meal and dunsts) was formed and the flour output in the first system was the largest. The increase in humidity to 16.0-17.0% caused an increase in the number of intermediate products that gave an increase in the flour yield in the second system. Studies show that the process of cereal formation in small productivity enterprises using two milling systems and traditional flour mills differs significantly. As a result of the regression analysis, there was a significantly high correlation ($r = 0.68-0.72$) between the flour output and water and heat treatment. The interaction force was significant, since coefficients of the multiple determination were 0.45-0.53 that predetermined the feasibility of their subsequent modeling.

With a probability of 95% it can be argued that the softening duration influenced the flour output. At the same time confidence in the humidity effect on the flour output after the second system was 85%.

In almost all cases, the dependencies between processing parameters and the flour yield were high, since beta coefficients by module were greater than 0.5.

Grain humidity had higher degree of influence on the total flour output compared with the softening duration but in combination these two parameters significantly influenced the process of flour producing. Therefore, for determining the optimal mode, after checking the correct distribution of the remnants of function 5 the response surface was constructed.

The maximum yield of flour can be obtained as a result of humidifying spelt grain to the humidity level of 15.0 ± 0.2% followed by its softening for 30-35 hours.

Conclusions. As a result of the study of the process on making flour from spelt grain, there is a high correlation between parameters of water and heat treatment and the output of products. The gradient of grain humidification has the greatest influence on the flour output. The softening duration is less but significantly influences the flour output. The recommended mode of flour production on low-productivity mills using two grinding systems is to humidify grain to the moisture content of 15 ± 0.2%. After that, grain should be softened for 2-5 hours. It is recommended to increase the softening duration up to 20-30 hours to increase the flour yield by 1-3%. However, the economic efficiency of using a long-term softening should be set individually for each enterprise.