

29. Changes in the structural and mechanical properties of bakery products with the addition of buckwheat bran

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Introduction. Bakery products are widely consumed by all segments of the population. Sugar substitutes, including fructose, are often used to replace sugar in products for patients with diabetes. However, it significantly affects the technological process, in particular the structural and mechanical properties of dough semi-finished products and finished products [1]. To increase the nutritional value of products and improve quality, it is advisable to add bran, particularly buckwheat.

Materials and methods. Buckwheat bran TM ‘Agroselprom’ was used in the research. Bran was added to the dough in the amount of 7.3 and 14.6% by weight of flour (based on the body's supply with 20, 30 and 40% of the daily requirement for dietary fiber taking into account the consumption of 277 g of bread/day - the daily norm in Ukraine). The water-absorbing capacity of bran was determined by centrifugation, the size of bran – by laboratory sieving. Structural and mechanical properties of dough were characterized by a farinograph (TM ‘Brabender’, Sweden) and an alveograph (TM ‘Chopin’, France). The control sample was sample of dough with fructose without bran.

Results. Studies of the properties of the used bran showed that the content of dietary fiber was 42.1%. The water absorption capacity of buckwheat bran exceeded the water absorption capacity of flour by 5.62 times, which was due to the higher content of shell particles. Buckwheat bran particles were much larger than flour's. The weighted average particle size was 0.53 mm.

According to the farinograph, the water absorption capacity of the dough depending on the dosage of bran increased by 10.6-21.2% compared to the control, which can be explained by the high hydration capacity of non-gluten bran proteins. The duration of dough formation increased, which was explained by the fact that the particles of additives in their fractional composition were much larger, so it took more time compared to the control sample for their swelling and the formation of a homogeneous dough system. The stability of the dough decreased with increasing dosage of buckwheat bran by 62-75%, elasticity – by 16-37% due to the restructuring of the dough structure under the action of kneading organs and hydrolytic processes.

The obtained data correlated with the results of the analysis of alveograms. Thus, the elasticity of the dough according to the alveograph increased by 27.1-85.7% compared to the control sample, the extensibility decreased by 2.0-22.6%. The work of deformation also decreased by 5.1-10.7%.

Conclusions. Thus, the addition of buckwheat bran significantly affected the structural and mechanical properties of dough semi-finished products due to their properties. With increasing dosage of the studied additives, the stability of the dough decreased and its dilution increased, which was a consequence of the increase in liquid phase in the dough with additives and disaggregation of biopolymers of the dough components under the action of hydrolytic enzymes.

References

1. Drobot V., Mischko N., Bondarenko Y., Teslia O. (2012). Fruktoza – perspektyvnyi tsukrozaminnyk v tekhnolohii diabetychnykh khlibobulochnykh vyrobiv, *Zernovi produkty i kombikormy*, 4, 24-27.