УДК 664.64.

9. CONFORMATIONAL CHANGES IN DOUGH WITH PUMPKIN PROTEIN CONCENTRATE FOR WHEAT FLOUR BAKERY PRODUCTS

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In recent years, due to military aggression and the significant deterioration of the ecological situation in the world, food security has suffered a significant negative impact. The range of food products, in particular bakery products, is represented mostly by traditional types with a rather low nutritional and biological value. The solution to this problem can be the inclusion in the formulation of such products of sources of complete proteins, such as pumpkin protein concentrate, which, in combination with the lipid component, will be useful for people with diseases of the gastrointestinal tract, such as irritable bowel syndrome [1].

Conformational changes in the process of bread making with 3% sunflower lecithin and 5% pumpkin protein concentrate were studied by infrared spectroscopy. The control was a sample without pumpkin protein concentrate. The reflection spectra of wheat flour and pumpkin protein concentrate showed slight differences (Fig. 1). The spectrum of wheat flour had a higher reflection intensity. Samples of dough after fermentation had a lower reflectance along the entire length of the spectrum than raw materials and dough after kneading. This is explained by the course of conformational transformations of biopolymers during the fermentation process. At a wavelength of 2100 nm, the reflectance coefficient of the control sample of the dough after kneading was 0.34, and that of the sample with protein concentrate was 0.31. At the same time, after fermentation, the values were 0.24 and 0.25, respectively. The tendency of the change of the coefficient was not the same, which is explained by the different structure of the protein of the studied raw materials. This is mainly due to a change in the structure of gluten in the presence of pumpkin protein concentrate, as proteins of vegetable origin weaken its structure and prevent the formation of a branched framework.

The infrared spectra of the bread samples were compared to the corresponding dough samples after fermentation. A characteristic extremum characterizing the amino acid composition was observed at a wavelength of 2294 nm. Lower reflectance coefficients of bread samples compared to dough samples after fermentation are explained by the effect of high temperatures on the protein structure, in particular, its denaturation.

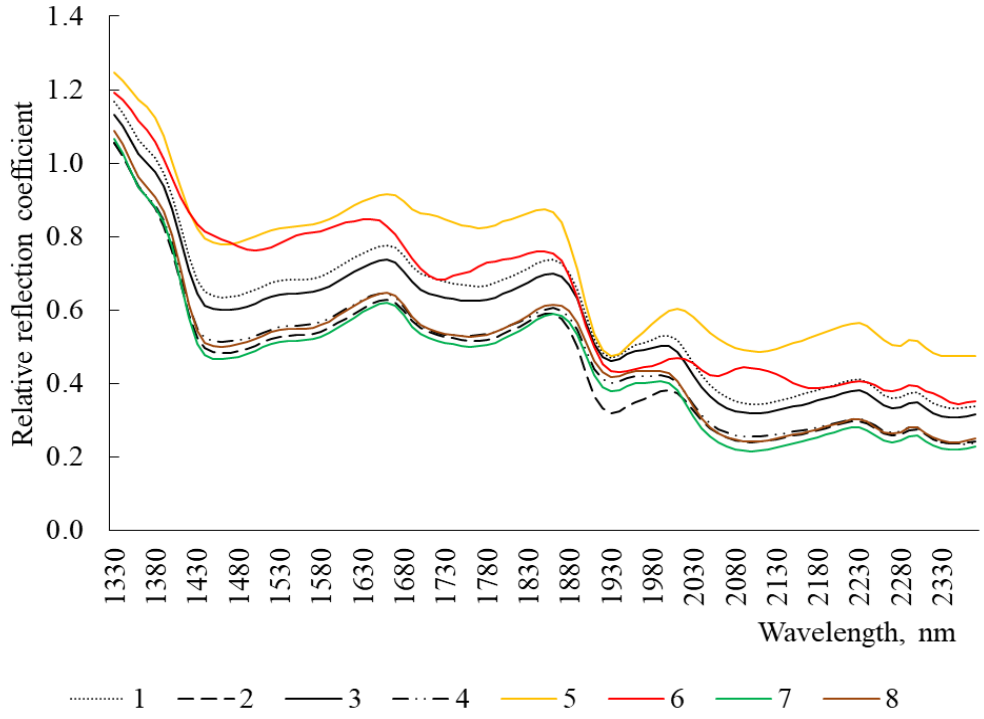

Fig. 1. Infrared reflection spectra of samples:

1, 2 – control sample of the dough after kneading and after 3.5 hours of fermentation; 3, 4 – dough sample with 10% pumpkin protein concentrate after kneading and after 3.5 hours of fermentation; 5 – wheat flour; 6 – pumpkin protein concentrate; 7, 8 – bread samples: control and with 10% pumpkin protein concentrate

Taking into account the mentioned transformations and the ability of pumpkin protein concentrate to significantly increase the biological value of bread, its use in the production technology of wheat bakery products is promising and relevant in order to give bread healthy properties.

References

1. Shevchenko A., Drobot V., Galenko O. (2022). Use of pumpkin seed flour in preparation of bakery products. Ukrainian Food Journal. Volume 11, Issue 1. pp. 90-101. DOI: 10.24263/2304-974X-2022-11-1-10