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SPECIFIC FEATURES OF FORMING OF DOUGH STRUCTURE WITH ADDITION OF DERIVED PRODUCTS OF OAT AND MAIZE GERMS (ОСОБЛИВОСТІ ФОРМУВАННЯ СТРУКТУРИ ТІСТА З ДОДАВАННЯМ ПОБІЧНИХ ПРОДУКТІВ ПЕРЕРОБКИ ЗАРОДКІВ ВІВСА ТА КУКУРУДЗИ)

As is commonly known, the use of various additives to increase the nutritional and biological value of bakery products leads to a change in the dough structural and mechanical properties. It depends especially on the specific nature of chemical composition of the additives and the functional and technological properties. The results of studies of the structural and mechanical properties of dough with additives are the required factors that make it possible to monitor and affect the main qualitative characteristics of finished products, such as porosity, dimensional stability, volume yield.

Fine extraction cakes of oat germs as well as fine maize germs oil cakes manufactured by domestic enterprises and that were not previously used in the technology of bakery products, were selected as an enrichment additive for manufacturing of bakery products.

It was established that a specific feature of the chemical composition of extraction cake and oil cake is the availability of 14,4% and 12,7% of protein, 34,1% and 23,6% of starch, 40,0% and 43,0% of dietary fiber, 10,0 and 6,0 mg of phenolic compounds per 100 g, 1890 and 1390 mg of tanning substances per 100 g, 7,0 and 23,6 mg of tocopherol per 100 g, respectively. The determination of the functional and technological properties of extraction cake and oil cake showed that their moisture absorbing capacity is by 1,6 and 1,7 times higher than in the high-grade wheat flour. The experimental studies have shown that the value of water retaining capacity of extraction cake and oil cake is 146 and 135%. In our opinion, the higher rates of moisture absorbing and water retaining capacities of the additives being studied indicate the necessity to increase the dough humidity during kneading to ensure its optimal texture and formation of the necessary structural and mechanical properties in the finished products.

The proteolytic activity of the additives is slightly lower than in flour (25,0 mg of nitrogen per 100 g on average) and is 16,0 and 23,0 mg of nitrogen

per 100 g on average. The total activity of amylolytic enzymes of extraction cake of oat germs and maize germs oil cake is 8,0 and 4,1 mg of starch per year on average, as well as α-amylase activity is 3,7 and 2,8 mg of starch per year on average, respectively.

The samples being studied with the addition of extraction cake and oil cake in an amount of 10–20% by mass of flour were used in order to determine the structural and mechanical properties of dough with the additives being studied. The dough made from high-grade wheat flour was selected as a control sample. The elastic properties of the samples being studied and control ones of the dough were studied using Brabender farinograph and the change in their viscosity after 20 and 120 minutes of its autolysis using a rotational viscometer at a speed of $\gamma=1$ c^{-1} was also studied. The dough adhesion strength after fermentation for three hours was also determined. The experimental data were processed statistically by means of Student-Fischer test at a reliability level of 0.95.

Decoding the dough farinogram curves showed that the moisture absorbing capacity of the dough when adding 10% of additives does not change significantly. The addition of 15–20% of extraction cake to the dough increases this indicator by 10,1–14,3%, and addition of oil cake – by 7,8–11,1%, which shall be taken into account when calculating the amount of water required for kneading of dough. The dough development time for samples with extraction cake and oil cake increases by 1,0–1,5 and 1,0–2,0 minutes, the resistance index decreases by 1,4–1,6 and 1,4–2,1 times, and the degree of dough rarefaction increases by 2,0–2,4 and 2,8–3,2 times in comparison with the control sample. The increase in moisture absorbing capacity and the dough development time can be due to the availability of a significant amount of non-starch polysaccharides in the additives being studied, which have high hydrophilic nature due to the availability of carboxyl and hydroxyl groups in their composition and compete with flour biopolymers, which may be a prerequisite for increasing the dough moisture basis. In our opinion, a decrease in the dough resistance index as well as an increase in its dilution rate can be explained by a decrease in the amount of gluten proteins in the system, as well as by a decrease in the degree of their swelling due to significant competition in dietary fiber moisture absorption capacity.

Therefore, the addition of extraction cake of oat germs and maize germs oil cake into the dough in the amount of 10–25% of the mass of wheat flour leads to an increase in its moisture absorbing capacity, development time and viscosity, and, at the same time, to a decrease in resistance and an increase in dilution. The obtained data shall be taken into account during bread technology development with the additives being studied.