INFLUENCE OF XANTHAN GUM ON THE STRUCTURE OF DOUGH AND QUALITY OF BREAD MADE FROM SPROUTED WHEAT GRAIN

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Regular consumption of whole wheat bread is recommended by dietary guidance as a rich source of many essential nutrients for reducing the risk of chronic diseases such as diabetes, obesity, cardiovascular diseases, and others. According to the latest research, whole wheat bread made from sprouted (germinated) wheat grains is especially valuable since bioactivation improves the nutritional profile of grain. The accumulation of B vitamins, vitamin C, β-carotene, tocopherols, and phenolic compounds are stimulated, and the content of antioxidants increases during grain germination. At the same time, due to the action of proteolytic and amylolytic enzymes, the quality of gluten decreases, and starch is partially hydrolyzed, which leads to a deterioration in the baking properties of wheat grain. Bread made from sprouted grain often has a small volume, dense crumb, which needs to be regulated with the use of baking improvers.

To improve the structure of the dough oxidizing agents, emulsifiers are usually used. Another effective way to form the necessary viscoplastic and elastic characteristics of the dough is the use of hydrocolloids, such as microbial polysaccharide xanthan produced by the bacteria *Xanthomonas campestris*. Ability to bind water and interact with protein and starch has led to its widespread usage in regulating the consistency of many food systems. Numerous research results have proven the structure-forming role of xanthan gum in white wheat dough, gluten-free and protein-free dough. Xanthan gum changes the rheological properties of dough from whole wheat flour, increases bread volume, and reduces bread hardness.

The objective of this research is to evaluate the influence of xanthan gum on dough structure and quality indicators of bread made from sprouted wheat grain. The effect of xanthan gum on the rheological properties of the dough (spread of the dough ball, strength of adhesion, elasticity, resilience, and viscosity), the structural-mechanical (degree of penetration), and the physical-chemical (specific volume and moisture) properties of bread was determined.

At the first stage, wheat grains were germinated. The washed wheat grain was soaked in water (hydraulic ratio 1,0:1,5) at a temperature of

20±2°C for 18 hours, then germinated (t= 20±2°C, W= 90±5%) for 24 hours until sprouts appeared (1…2 mm). Sprouted wheat grain (W = 44,0%) was washed with water to remove the contamination products and ground on a laboratory grinder using a matrix with a hole diameter of 2…3 mm.

To evaluate the rheological properties of the dough (W=47%), a model samples were prepared without yeast using xanthan gum in the amount of 0,1…0,4% by the weight of grain. An experimental samples of dough for assessing the quality of bread were prepared in the same way, but with the addition of yeast (3% by weight of the grain). The dough was fermented for 90 min, divided, shaped, and left to proof at 38±1°C for 35±5 min. The bread was baked at 200±10°C for 30±5 min. All baked bread samples were cooled for 3 hours. A control samples were prepared without the use of xanthan gum.

It was determined that the addition of 0,1…0,4% xanthan gum improves rheological properties of the dough from sprouted wheat grain. The obtained results shown that the spread rate of samples with xanthan decreased by 6,0…14,3%, its adhesion strength reduced by 10,1…21,4%. On the one hand, this is due to its high water absorption and water retention capacity. On the other hand, anionic polysaccharide xanthan gum forms complexes with flour hydrocolloids, which also helps to reduce adhesive strength of the dough. It should be noted that the modulus of elasticity of the dough with the addition of 0,1…0,3% xanthan gum increases by 15,9…49,3%. Increasing the amount of xanthan gum in the dough to 0,4% reduces the improving effect, but the elastic properties of this sample remain higher than in the control. The plastic viscosity of sprouted wheat grain dough with the addition of xanthan gum also increases through the experiments. This tendency of xanthan influence on the rheological properties of sprouted wheat grain dough was also observed during the analysis of structural-mechanical and physical-chemical properties of bread. The introduction of 0,1…0,3% xanthan gum contributes to an increase in the degree of breadcrumbs penetration by 11,3…28,3%, which is caused by improving the elastic characteristics of the dough. The degree of penetration of the bread sample with the addition of 0,4% xanthan decreases slightly but remains higher than the control. It was established that the specific volume of bread increases in the presence of xanthan. The presented data shown that the largest specific volume was in bread with the addition of 0,1…0,3% xanthan gum. The moisture-absorbing and moisture-retaining abilities of xanthan have a positive effect on the moisture content of bread.

Thus, the addition of 0,1…0,4% xanthan gum improves the rheological properties of dough, structural-mechanical and physical-chemical properties of bread from sprouted wheat grain. The usage of 0,3% xanthan gum is advisable to obtain bread with the best quality indicators.