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# Using of germinated seeds and grains in the technology of functional biscuits

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Germination is a widely known method of increasing the nutritional value of seeds and grains. The development of functional foods with germinated raw materials each time requires an individual approach, in particular, a significant modernization of recipes, changes in the technological process of production, which will ensure the high biological value of the final product, its excellent organoleptic properties and microbiological safety.
The objective of this study was to evaluate the effect of adding powders of the germinated seeds on the functional and physical-chemical properties of dough and baked biscuits. The seeds of sunflower (*Helianthus annuus*), buckwheat (*Fagopyrum esculentum*) and white mustard (*Sinapis alba*) were cleaned, dehulled (buckwheat and sunflower), disinfected with 1% potassium hypochlorite for 5 min, watered by distilled water to neutral pH, steppend in distilled water for 4 h and germinated in dark for 48 hours at 18 º C. Seeds were kept moist by spraying them with distilled water. For obtaining the powders germinated seeds were dried at 60°C, milled and sieved. The powders and the biscuits were analyzed on total phenolic content by Folin-Ciocalteu calorimetric assay, $\alpha$-tocopherol content by HPLC, free radical scavenging activity by DPPH calorimetric assay, peroxides value by ferric thiocyanate method, total dietary fibre by AOAC method no. 985.29.
The experimental samples with the addition of germinated seed powders were developed by substituting the part of wheat flour by one type of powders or their mixes in different proportions. Organoleptic properties were chosen as the basic quality criterion in the design of functional product. It was shown that the optimal amount of germinated seed powders in recipes of traditional products depends on material type and varies from 8 % (for white mustard) to 40 % (for sunflower and blends of sunflower with buckwheat).This allowed to a significant increase in the nutritional value of the product compared to control without powders. In particular, in the samples with 40 % content of sunflower powder there was an increase in the content of $\alpha$-tocopherol by 112 %, phenolic compounds by 76 %, antioxidant activity increased by 95 %. The samples with 25 % content of buckwheat powder had higher the content of $\alpha$-tocopherol by 18 %, content of phenolic compounds by 126 %, antioxidant activity increased by 65 %. The samples with mix of the sunflower and buckwheat powders (30 % and 10 % respectively) had higher the content of $\alpha$-tocopherol by 101 %, phenolic compounds by 131 %, antioxidant activity increased by 129 %. Total dietary fiber in all samples of functional biscuits was higher than in the control, an increased ranged from 4 % to 16 %, which has led to a decrease in the calorie content. At the end of the recommended shelf life time (2 weeks), the content of fat peroxides in the functional biscuits samples was lower by 19-43 % than in the control.
Studies have shown that the use of supplements from germinated seeds allows not only increasing the nutritional value of traditional products, but also to gives them new flavoring shades. In high-fat foods recipes, the use of such supplements is an effective method for preventing fat oxidation due to the high content of antioxidants.