

## **The use of beetroot-based functional additives in breadmaking technology with increase health-promoting value**

### **Summary:**

Cereal products, including bread, is one of the easiest ways to provide the human body with nutrients, primarily energy ingredients - carbohydrates, and also a certain amount of protein, minerals or vitamins (including from group B, A and E) . In order to increase the range of bread available on the market and to improve the nutritional value of this type of food, e.g. diversification as to the technology of their production or enrichment of the raw material composition of the bread. The above-mentioned premises were the reason for choosing beetroot as an addition to the development of a new type of functional bread, which was the material in this research work.

The main objective of the study was to determine the effect of the addition of beetroot root in the form of juice, pomace or powder in the recipe on the technological and health-promoting properties of wheat, wheat-rye and wheat-oat bread. Moreover, the aim of the research was to indicate how the share of this vegetable and in what form positively affects the organoleptic qualities of the tested breads.

Wheat flour type 650 and mixtures of this flour with rye flour type 720 and oat flour in a 4:1 ratio were used for baking bread. Juice, pomace and beet root powder of the Czerwona Kula variety were produced on a laboratory scale. The samples tested for each type of bread included the three beetroot additives at four percentage levels in the enriched bread recipe. The tests of raw materials included analyzes of the content of biologically active ingredients in the juice, pomace and beetroot powder and detailed tests of the baking quality of flours/mixtures used for baking. A detailed analysis also covered semi-finished products, i.e. control doughs and doughs with beetroot additions. These were farinographic, extensographic, amylographic and fermentographic analysis and a laboratory baking test. The content of betalain and the antioxidant potential in the tested bread were also determined. The obtained breads were subjected to organoleptic and consumer evaluation, as well as to the analysis of the basic chemical composition.

The research carried out as part of this doctoral thesis confirmed the usefulness of the tested functional additives based on beetroot in the technology of baking bread with an increased pro-health value.