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Development of new types of bread fortified with partially fermented oat wholegrain flour with high betaglucan content

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Enrichment of wheat products with substances exhibiting health preventive effects on the human organism through addition of grains with high content of dietary fibre, betaglucans, vitamins, antioxidants and other bioactive compounds is often limited by their undesirable technological properties^(1,2). The innovation trend in the food industry is leading to the use of uncommon crops like wholegrain oat flour⁽³⁾, which nutritional composition and optimal addition into the bread recipe regarding qualitative, technology and nutritional parameters are described in the current work.

The analysis of nutritional components consisted of the determination of proteins, fat, starch, saccharides, ash, total dietary fibre (Total Dietary Fiber Kit; Merck, Germany), total betaglucans (Megazyme Assay Kit, Ireland) and energetic value of seven oat varieties. The oat flour with the superior composition selected for experiment consisted of 1.0% of proteins; 9.3% of fat, 30.1% of starch, 55.8% of saccharides, 4.9% of ash, 26.4% of dietary fibre; 8.9% of betaglucans and 391kcal/100 g of dry weight (made in triplicates, RSD below 2.5%). The impact of oat flour addition on the rheology of the dough was analysed using Farinograph, Extensograph, Amylograph (Brabender, Germany) and Mixolab analyser (Chopin Technologies, France). The bread samples were prepared according to the standard recipe (Adivit Ltd, Slovak Republic) with various replacements of wheat flour by wholegrain oat flour (WOF) up to 50%. As the most acceptable variation according to sensory evaluation (shape, dimensions, taste) the 30% addition of WOF was revealed. To improve the sensory properties, shelf life and health beneficial effect, the WOF was partially fermented with *Lactobacillus plantarum* (Stuvital Ltd., Slovak Republic). In the following step, oat flour in the recipe (30%) was partially replaced by fermented WOF from 5 to 50%. Qualitative aspects such as specific volume, shape, dimensions (width, length, and height), textural properties such as firmness (using TA.XT Plus Texture Analyser, UK), shelf life (a_w , moisture, texture) and nutritional composition of breads with various addition of partially fermented WOF were compared. The bread with 50% of fermented WOF revealed unacceptable sensory profile (extensive, uncharacteristic sourness) and significantly lower betaglucan content (2%, RSD: 0.2%, $P < 0.05$) compared to the bread with non-fermented WOF addition. No statistically significant differences ($P < 0.05$) were found in ash, protein and fat content of the final bread samples.

According to the betaglucan content (3.7%, RSD: 0.2%), sensory evaluation and other above mentioned results, the bread with 15% of fermented WOF was chosen as a most suitable sample with regard to the technology and health beneficial aspects.

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