

10. Summary

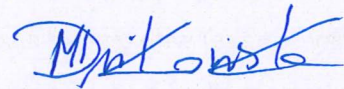
The aim of this study was to develop gluten-free sourdough formula and gluten-free bread recipe (composition and ratio in the mixtures of hydrocolloid) and also to determine the optimal amount of enrichment raw materials (chia seeds at a level equal 10 % of gluten free flour, teff flour at a level equal 12% of gluten free flour, as provided by the gluten free recipe.) Another object of the study was to develop optimal technology conditions for part-baked gluten-free bread (baken in yeast and sourdough technology).

Obtained gluten-free breads, their quality and nutritional values were assessed, i.g. bread yield, baking loss, bread volume and crumb texture profile (on the day of baking and during 3-day storage) with texture analyzer TA.XT Plus. An organoleptic analysis was performed using a point method by a 15-person panel, with proven sensory sensitivity. The active and potential acidity was determined in sourdough and gluten-free sourdough technology breads by HPLC/UV method. AOAC methods were used to determine the contents of protein, fat, dietary fiber, ash and minerals: Ca, Mg, P, K, Fe, Mn, Cu, Zn. The lipid profile was performed using on HPLC method. Also, glycemic index was determined by *in vitro* method.

In the organoleptic evaluation, regardless of the fermentation method and baking technology used, all gluten-free breads qualified for the first quality class, but slightly more points (especially for the taste and smell) were obtained by breads with 12 % of teff flour, despite their smallest volume. Independently from batter fermentation method (sourdough or non-sourdough breads), the amount of enrichment raw materials (10 % chia or 12 % teff addition) decreased specific bread volume. Part-baked technology affected the increase of bread yield and the reduction of baking loss. Nutritionally, 10 % chia seeds or 12% teff flour addition significantly increased the content of nutrients i.g. protein, fat (including alpha - linolenic acid) mineral compounds in the form of ash and dietary fiber – especially the insoluble fiber fraction (independently from batter fermentation method and baking technology). At the same time, it also reduced starch amount. These differences were especially pronounced in gluten-free breads enriched with 10% of chia seeds. 12% teff flour addition increased the amount of MUFA acids but 10% of chia addition increased the amount of PUFA acids (including alpha – linolenic acid 18:3 n-3). According to the regulation of the European Union (EU 1924/2006), gluten-free bread enriched with 10 % of chia seeds (regardless of the fermentation method and baking technology) can be treated as a product which is a source of omega-3 fatty acid while all of the assessed gluten-free breads can be treated as a source of dietary fiber. Based on the glycemic

index determined by the *in vitro* method (expressed as an index of starch digestion) part-baked sourdough gluten-free breads enriched with 10% of chia seeds can be classified as a product with a low glycemic index. Traditionally baked sourdough gluten-free bread belongs to the group of products with an average glycemic index. The other gluten-free bread had a high glycemic index (GI over 80).

Due to the nutritional value, glycemic index (GI), crumb texture profile during the 3-day storage and high quality of the organoleptic analysis, sourdough gluten-free bread enriched with 10 % chia seeds, baked both in traditional and part-baked technology, can be especially recommended for industrial use.

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