Abstract

In the light of higher consumption and a larger demand for processed food such as bread due to rising global population, the present study emphasizes on optimization of the level of incorporation of functional ingredients in yeast leavened bread as well as evaluates the quality characteristics of the developed bread. The selected inputs in the shape of raw materials were cleaned, weighed and soaked, after which the excess water was drained and the soaked millet grains and legumes were dried. The pomegranate bagasse was washed with hot water and dried. Besides, the finger millet was germinated and then dried to arrest the germination. All the dried raw materials were milled to obtain fine flour packed in LDPE and stored in air tight container for the development of functional ingredient incorporated breads which were formulated and evaluated for their physical, nutritional, functional and shelf life characteristics. The optimization study results revealed that the optimal crust thickness and maximal sensory attributes could be obtained from fat (10%), yeast (3%) amount in the bread recipe baked at 175ºC. The incorporation of each of multigrain flour, malted finger millet flour, red kidney bean flour and maize flour with carrot juice up to a level of 20% w/w and pomegranate bagasse incorporated at 15% w/l in yeast leavened bread showed optimal specific volume from the response surface methodology optimization results and maximal sensory scores from the descriptive sensory analysis. The quality analysis results suggest that different incorporated level of functional ingredient in the bread recipe adopted, influenced the nutrient content and the physical characteristics of the final product in general. While as the processing methods namely soaking and germination in the study showed a significant difference \( p<0.05 \) in nutritional and physical properties as well. There existed a significant difference \( p<0.05 \) in the nutritional and functional characteristics between the multigrains, legume flour, pomegranate bagasse and the control (100% wheat flour). The incorporation of individual functional ingredient flour to the formulation, significantly \( p<0.05 \) increased proteins, fat, fiber and ash content when compared to the control sample. These functional ingredients contributed to enhancement of the mineral content of the developed bread but allowed deleterious effect on the physical properties such as specific volume, crust thickness and percentage weight loss of the developed bread. Interestingly it was observed that the bread crumb had higher mineral content values than the bread crust in all the
developed breads and control. In the developed bread scanning electron micrographs disruption in the continuity of protein matrix could be seen which may be a reason for the result of low physical characteristic such as specific volume. The investigation of staling process caused water migration from the crumb to the crust and water properties changed of the developed breads. However certain aspects like the digestibility and bio-availability of the functional ingredient incorporated breads. Successful utilization of millets, legumes and pomegranate bagasse with added functionality in bakery food sector will definitely open up new scope to the food industries.