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Development of alternative flour-based sandwich snack with mushroom filling

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Alternative flours are gaining a higher interest in the bakery industry, since they can be used to offset the negatives of traditional wheat flour and to improve the nutritional value of the bakery products. Composite mixtures of flours obtained from fruits, vegetables, nuts, grains and pulses have been introduced to improve the nutritional profile of snack foods. This trend has substituted wheat flour with the composite flour mixtures of locally available abundant raw materials to rebalance the nutrient profile while preserving the acceptability of the health concerned consumers. Jackfruit (*Artocarpus heterophyllus*), pumpkin (*Cucurbita maxima*) and banana (*Musa acuminata*) are commonly grown crops in Sri Lanka. High productivity, high conversion ratio and possibility of growing in marginal agricultural lands of these crops offer an added advantage for processing. Managing the surplus and value addition are possible solutions to utilize these crops effectively while minimizing the postharvest losses. The objective of this study was to develop a snack using jackfruit, pumpkin and green banana flours and to evaluate its sensory, nutritional and functional properties. Wheat flour and flours from above three crops were mixed in different ratios; wheat flour:jackfruit flour 70:30, 75:25 and 80:20, wheat flour:pumpkin flour 75:25, 80:20 and 85:15, wheat flour:green banana flour 70:30, 75:25 and 80:20. Different mushroom fillings were formulated by changing the proportion of oyster mushrooms and other ingredients. Sensory assessment was conducted to select the best filling formula. The proximate composition of the novel snack was determined following the standard AOAC methods. Methanolic extract of the snack was analyzed for the total phenolic content (TPC), total flavonoid content (TFC) and ferrous reducing antioxidant power (FRAP). The predicted glycemic index (PGI) was determined by starch *in vitro* digestion method. Substitution level of 30% jackfruit, 15% pumpkin and 25% green banana flour layers with the selected mushroom filling offered the acceptable color and textural attributes in the novel snack to impress the consumers. The crude protein, crude fat, total dietary fiber, and total ash of novel snack on dry weight basis were 10.31±0.16%, 6.18±0.01%, 8.16±0.01% and 2.75±0.01% respectively. Its moisture content was 30.77±0.03%. Newly formulated snack exhibited a high antioxidant potential comparatively to the typical wheat-based bakery products (GI ≥ 70 on the glucose scale). The TPC, TFC and FRAP values of the novel snack on dry weight basis were 0.31±0.04 mg of gallic acid equivalent per gram, 0.112±0.008 mg of quercetin equivalents per gram and 0.06±0.01 mg of Trolox equivalents per gram respectively. The novel snack exhibited an intermediate GI value of 68, which was a lower value compared to wheat based snacks. Substitution of flours of jackfruit, pumpkin and banana for wheat flour provides opportunities for developing healthier snacks while allowing the consumers to explore new textures, flavors and aromas.

Keywords: Composite flour, Healthy snacks, Postharvest losses, Value addition

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