

Development of High Nutritious Value Added Bread from Composite Flour

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Introduction

Bread is a popular bakery product across the whole cross profile of the society, where all consumers like to consume bread alike, regardless of the level of income, education and other demographic characteristics (Lohano et al., 2010). Conventionally, flours used in bread making are made from cereals, mainly wheat (Nnabuk et al., 2012). Wheat is a foreign origin commodity and substantial amount of foreign exchange is required to import this food item, which is a real burden to the national coffers. Due to the drop in production of wheat internationally the future pricing of this product will be very uncertain and increasing prices will be forecasted (Piyasena et al., 1996). The government of Sri Lanka is also discouraging the consumption of wheat based products by mainly reducing the wheat flour usage by 20% and mixing with flour obtained from various other sources could be used in order to save the massive amount of foreign exchange (Piyasena et al., 1996).

In recent years, the demand to use novel sources as substitute for the wheat flour has increased to provide the consumers requirements. Replacement of wheat flour by other kinds of flour in bread making is economically important in Sri Lanka. There is a growing interest in using composite flour for bread making owing to some economic, social, and health reasons (Adeyemi and Idowu, 1990). The composite flours used were either binary or ternary mixtures of flours from some other starchy crops with or without wheat flour. Previous studies have given successful evidences for the substitution of 10 % cassava flour to wheat flour as the composite flour mixture for bread making process (Adeyemi and Idowu, 1990; Dhingra and Jood, 2004). Therefore, this study was focused to develop a high nutritious bread by partially substituting wheat flour with composite flour mixtures made out of *Caryotaurens* (Kithul) and *Xanthosoma sagittifolium* (Kiriala) flour.

Methodology

This study was designed to assess the quality of bread produced with composite flour obtained from wheat, *X. sagittifolium* and *C. urens*. Matured *X. sagittifolium* tubers and *C. urens* flour were obtained as raw materials and *X. sagittifolium* tubers were further processed to obtain the flour. Six blends were prepared by homogeneously mixing wheat, *X. sagittifolium* and *C. urens* flour according to the percentage proportions, 100:0:0 (A), 50:50:0 (B), 50:0:50 (C), 50:40:10 (D), 50:30:20 (E), 50:20:30 (F), 50:10:40 (G) respectively. The dough mixtures with different blends were kept in a mold for 90 minutes at room temperature followed by baking in a pre-heated oven at 250°C for 30 minutes.

Physical parameters such as loaf weight, loaf volume, specific volume and sensory attributes (i.e. crust and crumb color, taste, aroma, texture and overall acceptability) were evaluated by using 30 untrained panelists. Sensory data were statistically analyzed using Friedman Test with the confidence level of 95% using MINITAB 15. Proximate analysis and cost analysis were investigated for the selected bread sample in order to evaluate the nutritional quality and the total cost. Further, microbiological analysis (bacterial count, yeast and mold count) and shelf life analysis were performed for the selected best sample under the refrigerated condition and room temperature conditions separately.

Results and Discussion

According to the results of the sensory evaluation test (Figure 1), Sample 'G' (10% *X. sagittifolium* flour and 40% *C. urens* flour) was the best sample out of the six different composite breads except the control with respect to the crust and crumb color ($p=0.000$), taste ($p=0.000$), aroma ($p=0.000$) and overall acceptability ($p=0.000$). However, sample 'A' which was made out of 100% wheat flour showed the best sensory characteristics.

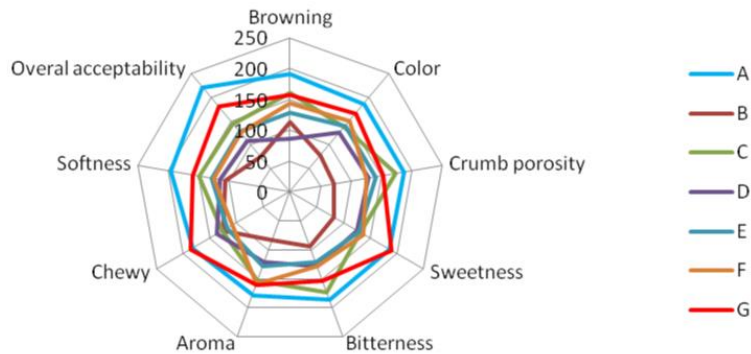
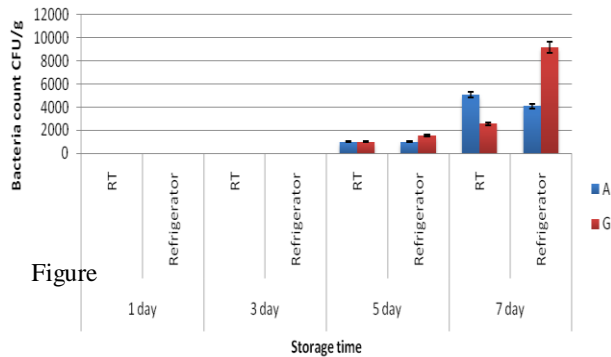


Figure 1. Sensory values based on sum of ranks

Further, loaf specific volume ($1.50 \text{ cm}^3/\text{g}$) for sample 'G' was approximately resemble to the loaf specific volume of the bread made out of 100% wheat flour. According to the proximate analysis (Table 1), selected bread sample 'G' showed high nutrient content with respect to the ash, fiber and carbohydrates than that of the normal wheat flour bread.

Table 1. Proximate analysis for the best composite flour bread

Parameter	Selected bread (sample G) g/100g	Control sample (100% wheat flour) g/100g
Moisture	25.75	30.64
Ash	2.72	1.56
Crude protein	7.79	10.27
Crude fat	3.80	4.23
Crude fiber	2.54	1.48
Carbohydrate	67.68	54.64



Figure

Figure 2a. Microbiological analysis for the bread sample ‘G’ and the bread sample made out of 100% wheat flour at different storage times and different storage conditions. Figure 2a- Bacterial count at different storage times and different storage conditions.

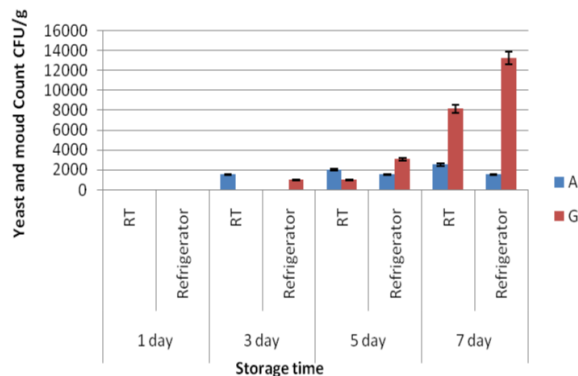


Figure 2b. Yeast and mould count at different storage times and different storage conditions. Vertical bars show standard errors.

According to the Figure 2a and Figure 2b, bacterial and yeast mold count were not observed for the selected sample ‘G’ until the fifth day of the storage at room temperature even without adding any preservatives. Therefore, the shelf life of the selected bread can be further extended by improving the processing conditions or adding permitted preservatives.

Conclusions

Wheat based composite flours containing *X. sagittifolium* and *C. urens* show a potential for the production of bread by replacing 50% wheat flour with all the sensory acceptable qualities. The bread sample with 40% *C. urens* flour and 10% *X. sagittifolium* flour can be considered as the best sample with all the sensory and nutritional qualities.

References

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