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Evaluation of flour prepared from Gahala (*Colocasia esculenta*), Innala (*Plectranthus rotundifolius*), and Kiriala (*Xanthosomasagittifolium*) in bread making

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Due to the cost, high demand, and geographical scarcity of wheat flour, there have been attempts to find a suitable replacement, especially in tropical areas including Sri Lanka. Sole replacement by foreign flours has not shown positive results. The use of composite flour has given comparatively better results. Gahala, Innala, and Kiriala, which grow in Sri Lanka, are potential flour and bread making sources. However, there have not been enough studies performed locally on this regard. Thus, the focus of this study is to check out the suitability of these yam flours for incorporation with wheat flour, in terms of bread making. The study consisted of flour preparation, a proximate analysis and analysis of rheological properties, preparation of bread, and evaluation of bread with the relevant yam flours sensory wise, and by bread scoring. Blend levels from yam flours used for composite flour were 10%, 20%, and 30%. As the controller 100% wheat flour was used. Flour preparation was done by drying the yams and grinding them. A.O.A.C. approved methods were used for determining the proximate composition. Rheological properties for the various blend levels were evaluated by Farinogram and Extensogram analysis. Bread was prepared according to the A.A.C.C.I 10-10.03 method and was evaluated for sensory properties and bread score. According to the results obtained, carbohydrate amounts were $82.36 \pm 2.82\%$, $81.94 \pm 2.59\%$, and $81.29 \pm 2.68\%$ for Gahala, Innala, and Kiriala flour respectively. Protein levels were $1.80 \pm 0.03\%$, $1.44 \pm 0.04\%$, and $1.27 \pm 0.03\%$; fat levels $1.92 \pm 0.07\%$, $2.04 \pm 0.01\%$, and $2.32 \pm 0.02\%$; moisture levels $10.42 \pm 0.16\%$, $11.02 \pm 0.18\%$, and $11.43 \pm 0.15\%$; ash levels were $1.75 \pm 0.09\%$, $2.03 \pm 0.06\%$, and $1.89 \pm 0.06\%$; crude fiber was $1.75 \pm 0.20\%$, $1.56 \pm 0.20\%$, and $1.79 \pm 0.17\%$, for Gahala, Innala, and Kiriala, respectively. Farinogram analysis revealed that 10% incorporation of Gahala flour results in 67% of water absorption, 6 minutes of dough development time, 2 minutes of arrival time and 23.5 minutes of stability. As for Innala the respective values were 60%, 7.5 minutes, 1 minute, and 20 minutes. Extensogram revealed 121.7 mm of Extensibility, 518 BU of resistance to extension, 617.7 BU of maximum ration, and 4.3 of ration number for 10% Gahala dough whereas the values were 112.7, 514.6, 620, and 4.6 for 10% Innala dough. The developed breads showed that with the incorporation of yam flour there was a decline in the rise of bread. Each bread type had characteristic odors of their yam. According to the sensory analysis the breads corresponding to 10% blend level were comparable in overall acceptability with normal wheat bread. Both 20% and 30% blend levels resulted in significantly different breads compared to the control. These sensory results are true for both Gahala flour and Innala flour incorporated breads. Thus, it was concluded that 10% was the most suitable blend level among selected composite flours, when considering the sensory evaluation & bread scoring, for bread making with Gahala and Innala flour incorporation. Further studies are suggested to obtain improved breads.

Keywords: Bread; composite flour; Gahala, Innala, Kiriala