ABSTRACT

Initiatives on tackling food insecurity among global emerging economies are being focused on enriching native staple foods with locally available nutritious underutilized crops. The objective of this study was to optimize protein content and dietary fibre in rice (*Oryza sativa*) flour using Sorghum (*Sorghum bicolor* L.) and Bamboo shoots (*Yushania alpine*). An extreme vertices design of mixture approach with 11 runs was employed in the study using MINITAB® software. The 11 blends from 11 generated runs and individual ingredient samples were analyzed for nutritional composition. Energy value and energy-to-protein ratio for the samples was calculated. Bamboo shoots flour (BSF) had the highest content for all proximate components except total carbohydrates on dry weight basis. Rice had the highest content of total carbohydrates at 77.71% and energy to protein ratio of 53.72 kcal/g. Sorghum had the highest mean total phenolic and condensed tannins of 45.512 (mg GAE/kg) and 2.512 (mg CE/g) while rice the least with 0.042 (mg GAE/kg) and 0.102 (mg CE/g), respectively. Fresh bamboo shoots had the highest level content of HCN of 117.81 mg/kg. Other dried ingredients had a mean HCN content of 2.313, 1.584 and 0.066 mg/kg for dried BSF, sorghum and rice respectively. Increasing the quantity of BSF and sorghum flour in the blends consequentially increased the protein content, dietary fibre and total minerals. Optimum blend was established to be 50:27:23 for rice, sorghum and BSF, respectively. This blend had 13.4% protein, 6.2% dietary fibre and 3.9% total minerals. Regression analysis showed that apart from dry matter, all other constituents were significantly predictable during optimization with $R^2 > 0.7530$. Cluster analysis showed that the nutritional components analyzed are in four main clusters. Cluster 1: Dry matter and protein digestibility, cluster 2: Carbohydrates, energy value and energy ratio, cluster 3: Protein, fibre and ash while cluster 4: Crude fat only. These findings of the optimum composite ratio and other blends could contribute in addressing the food insecurity for low income countries.

Keywords

Optimization, Protein, Dietary Fibre, Bamboo Shoots, Mixture Analysis