

DEVELOPMENT OF A NUTRITIOUS SNACK BAR USING SUPERFINE STRING HOPPER FLOUR BY-PRODUCT AND HORSE GRAM (*Macrotyloma uniflorum*) FLOUR

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ABSTRACT

The growing global concern for sustainable food systems has encouraged the utilization of agro-industrial by-products and underexploited crops in functional food development. This study aimed to formulate a nutritious snack bar using superfine string hopper flour by-product, an underutilized rice-based processing fraction, and horse gram (*Macrotyloma uniflorum*) flour, a protein and fiber rich legume. Three flour combinations (50:30:20, 40:40:20, and 30:50:20 of string hopper by-product, horse gram flour, and wheat flour, respectively) were prepared and evaluated for nutritional (moisture, protein, fat, fiber, ash, and carbohydrate content), sensory, and storage characteristics (pH, color, sugar, moisture, microbial quality, and sensory stability). The formulations were standardized using guar gum (1%) as a binder, margarine (8%) as a fat source, and date paste (40%) as a natural sweetener. Sensory evaluation was conducted using a five-point hedonic scale, and data were analyzed using the Friedman test (95% confidence). The blend containing 40% string hopper by-product, 40% horse gram flour, and 20% wheat flour achieved the highest acceptability. After optimizing sweetness enhancement using a date paste-groundnut mixture, 40% date paste incorporation by direct mixing was the most preferred, while coconut milk improved texture and mouth feel. The optimized snack bar contained $14.75 \pm 0.63\%$ moisture, $8.83 \pm 0.26\%$ protein, $6.94 \pm 0.07\%$ fat, $3.20 \pm 0.55\%$ fiber, $2.85 \pm 0.80\%$ ash, and $63.43 \pm 1.11\%$ carbohydrates. Shelf-life evaluation over four weeks showed superior quality retention under refrigeration (4 ± 1 °C), while ambient samples (28 ± 2 °C) developed mold after 16 days. Overall, the findings reveal the potential of this flour blend in developing sustainable, nutrient-enriched, and shelf-stable snack foods.

Keywords: functional food, horse gram, nutrient enriched snack bar, string hopper flour by-product, waste valorization