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GREEN BANANA FLOUR: POTENTIAL INGREDIENT IN THE PRODUCTION OF GLUTEN-FREE PASTA WITH IMPROVED FUNCTIONAL PROPERTIES

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Abstract: The objective of the present study was to ascertain the impact of varying ratios of rice flour (RF) to green banana flour (GBF) on the physico-chemical characteristics, sensory acceptability of cooked pasta and storage stability. GBF is produced from unripe bananas that have been dried and ground. RF was substituted with GBF at five levels: 0%, 10%, 20%, 30%, and 40%. With regard to the proximate composition, notable alterations were discerned in the quantity of fat, ash and fibre with an increase in the percentage of GBF in the pasta sample. The pasta sample containing 40% GBF exhibited the following proximate composition: $2.38 \pm 0.12\%$ fat, $7.92 \pm 0.03\%$ protein, $3.98 \pm 0.05\%$ ash and $9.94 \pm 0.08\%$ fibre. The pasta sample made from 100% RF exhibited the following proximate composition: $1.75 \pm 0.14\%$ fat, $12.28 \pm 0.24\%$ protein, $2.46 \pm 0.08\%$ ash and $3.36 \pm 0.33\%$ fibre. Additionally, a reduction in cooking time and cooking losses was observed in pasta samples with higher concentrations of GBF. In terms of sensory evaluation, an overall decline in pasta acceptability was noted with the increase in GBF percentage.

Keywords: green banana flour, pasta, sensory evaluation, cooking properties

• Introduction

The contemporary consumer is not merely seeking to satisfy a physiological need; they are also demanding food products that are healthy and contain the necessary nutrients to prevent nutrition-related diseases and to improve physical and mental health. In this regard, a close relationship between nutrition and health has been established, and functional foods containing ingredients with a specific health benefit have been developed using technological processes. GBF is of high nutritional value due to its composition of resistant starch (up to 58.5%) and fibre (up to 15.5%), as well as vitamins (in particular vitamin B6 and vitamin C), minerals (potassium and magnesium), and phenolic acids including anthocyanins. The results provide substantial evidence for the use of GBF as a partial replacement for RF to obtain fortified pasta formulations, and these findings are useful in the development of new food products with improved functionality.

• Material and method

- Ingredients:** Rice flour, green banana flour, fresh whole eggs, egg whites, guar gum and xanthan gum were purchased from local specialized stores in Timisoara, Romania.
- Production of the pasta samples:** The gluten-free pasta samples (control and with varying substitution levels of RF with GBF) were prepared in accordance with the AACC International Method 10-50.05, with minor modifications.
- Sensory evaluation of pasta samples.** A panel of 20 panelists have evaluated gluten-free pasta samples using a 9-point hedonic scale.
- The physico-chemical characteristics, sensory acceptability of the cooked pasta and storage stability of the gluten-free pasta samples** were evaluated using standard laboratory procedures.

• Results and discussion

The findings of this study indicate that GBF can be employed as a means of designing and developing food products with enhanced nutritional characteristics. The partial substitution of RF for GBF in the manufacturing recipe of gluten-free pasta resulted in an improvement in the nutritional profile, characterized by an increase in fibre, fat and ash content. Nevertheless, the incorporation of more than 30% GBF in the gluten-free pasta formulation resulted in unfavorable outcomes with regard to other parameters, including cooking time, cooked weight, cooking loss, and sensory acceptance.

Table 1. Proximate composition of gluten-free pasta samples

Proximate composition (%)	Gluten-free pasta samples				
	PC	P10GBF	P20GBF	P30GBF	P40GBF
Moisture	9.65±0.11	9.32±0.22	9.14±0.09	8.84±0.33	8.62±0.22
Fat	1.75±0.14	1.88±0.04	2.04±0.11	2.16±0.08	2.38±0.12
Protein	12.28±0.24	10.92±0.09	9.88±0.14	8.76±0.33	7.92±0.03
Crude fibre	3.36±0.33	6.84±0.22	7.66±0.06	8.72±0.21	9.94±0.08
Ash	2.46±0.08	2.88±0.03	3.26±0.44	3.54±0.33	3.98±0.05
Carbohydrates	70.50±0.44	68.52±0.22	68.02±0.04	67.98±0.08	67.16±0.14

Table 2. Cooking properties of gluten-free pasta samples

Treatments	Gluten-free pasta samples				
	PC	P10GBF	P20GBF	P30GBF	P40GBF
Cooking time (min)	9.22±0.13	8.82±0.09	8.50±0.33	8.23±0.33	8.03±0.33
Cooked weight (g)	4.66±0.06	3.62±0.33	3.44±0.52	3.26±0.22	3.08±0.08
Cooking loss (%)	4.54±0.22	4.42±0.03	4.38±0.05	4.26±0.33	4.09±0.28

Table 3. Sensory evaluation of gluten-free pasta samples

Sensory evaluation	Gluten-free pasta samples				
	PC	P10GBF	P20GBF	P30GBF	P40GBF
Color	5.12±0.07	4.96±0.07	4.76±0.23	4.62±0.06	4.44±0.09
Appearance	5.74±0.24	4.88±0.24	4.72±0.33	4.55±0.11	4.32±0.14
Odor	4.28±0.14	4.65±0.33	4.84±0.22	4.92±0.36	5.08±0.07
Flavor	4.55±0.27	5.06±0.13	5.30±0.24	5.48±0.09	5.66±0.04
Overall acceptance	5.66±0.06	4.82±0.14	4.56±0.22	4.37±0.08	4.22±0.42

• Conclusions

The results demonstrate that the gluten-free pasta samples under study exhibit a superior nutritional profile, characterized by higher fibre, ash and fat content, and lower carbohydrate content. The pasta samples demonstrated a reduction in cooking time, cooked weight, and cooking losses, which collectively resulted in a decline in overall acceptability. The utilization of green banana flour as a potential ingredient in the production of gluten-free pasta with enhanced nutritional characteristics represents a promising avenue for further research.