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Development of a Nutritious Instant Fig–Banana Pancake Premix Powder: Formulation, Nutritional, Sensory and Cost Evaluation

KUDMETHA VINEELA[1], K. SUMANA MOUNYA[2]
[1,2]*Department of Food Science, Veeranari Chakali Ilamma Women's University (VCIWU), Koti, Hyderabad, Telangana, India*

Abstract- ***An instant fig–banana pancake premix powder was developed as a convenient, nutrient-dense breakfast alternative to conventional refined-flour pancake mixes. Four formulations, including a control, were prepared by blending wheat flour with fig powder, banana powder, dates powder, jaggery powder, baking powder and cardamom powder in varying proportions. A structured consumer survey (n = 52) was conducted to assess awareness, purchase behaviour and attitudes toward fruit-based pancake premixes. The optimised formulation (5 g fig powder, 15 g banana powder, 50 g wheat flour, 15 g dates powder, 10 g jaggery powder, 2.5 g baking powder and 2.5 g cardamom powder per 100 g premix) was evaluated for proximate composition and sensory acceptability. The product contained 62.4 g carbohydrate, 5.2 g protein, 1.1 g fat and 7.4 g dietary fibre per 100 g, with 8.7% moisture and 3.8% ash. Sensory evaluation using a 9-point hedonic scale (n = 25 panellists) gave high mean scores for appearance (8.36), flavour (8.46), consistency (8.18), absence of defects (8.16) and overall acceptability (8.46); one-way ANOVA confirmed significant differences among sensory attributes ($p < 0.05$). The estimated production cost was ₹26.30 per 100 g, supporting a suggested retail price of ₹32 per 100 g. The results indicate that the fig–banana pancake premix combines appreciable dietary fibre, natural sweetness and favourable sensory quality with a commercially viable cost structure, making it a promising candidate for small-scale functional-food production.***

Keywords: ***fig; banana; instant pancake premix; nutritional composition; sensory evaluation; consumer survey; cost analysis***

I. INTRODUCTION

Changing lifestyles, urbanisation and increasingly busy schedules have driven a growing consumer preference for convenience foods that require minimal preparation time (Kent & Evers, 2000; Potter & Hotchkiss, 2000). Among ready-to-cook breakfast products, instant pancake premixes are particularly popular because of their ease of preparation and broad consumer acceptance across age groups (Manley, 2000; Albala, 2013). Conventional pancake premixes, however, are typically formulated from refined wheat flour, sugar and milk solids, and consequently provide limited dietary fibre, vitamins, minerals and natural antioxidants (Kent & Evers, 2000).

Consumer interest in functional foods containing naturally occurring bioactive compounds has increased in parallel with health awareness (Granato et al., 2020; Sharma et al., 2022), prompting researchers to enrich cereal-based convenience foods with fruits, pulses, millets and pseudocereals (Gupta et al., 2021; Kour et al., 2023; Chauhan & Maurya, 2024; Ubale et al., 2023). Fig (Ficus carica L.) is a nutritionally dense fruit rich in dietary fibre, calcium, potassium, iron and phenolic antioxidants (Solomon et al., 2006; Veberic et al., 2008; Vinson et al., 2005), while banana (Musa spp.) is a widely available source of carbohydrate, potassium, vitamin B6 and dietary fibre that also imparts natural sweetness and textural softness to bakery products (Mohapatra et al., 2010; Wall, 2006; Kaur et al., 2019; Emaga et al., 2007). Dates (Phoenix dactylifera L.) and jaggery are traditional, minimally refined sweeteners that additionally contribute minerals and antioxidant phenolics compared with refined sugar (Al-Farsi & Lee, 2008; Baliga et al., 2011; Jaffé, 2012; Singh et al., 2013).

Although fruit- and grain-enriched pancake premixes have been reported individually — including formulations based on plantain flour (Bertin et al., 2017), peanut flour (Yemmireddy et al., 2013),

pseudocereals (Kour et al., 2023), lentil flour (Santos & Vasconcelos, 2025), wheat–tigernut composite flour (Obinna-Echem et al., 2024) and millet blends (Nalbandian et al., 2025; Pradeepika et al., 2026) — the combined use of fig and banana powders in a single instant pancake premix has received little research attention. This study therefore aimed to (i) formulate and standardise an instant fig–banana pancake premix using wheat flour, dates powder and jaggery as complementary ingredients, (ii) evaluate consumer awareness and purchase intent toward such a product, and (iii) characterise the nutritional composition, sensory acceptability and production cost of the optimised formulation.

II. MATERIALS AND METHODS

2.1 Materials

Ripe bananas, fresh figs, wheat flour, dates powder, jaggery powder, baking powder, cardamom powder and common salt were procured from a local retail market. Raw materials were manually sorted to remove damaged pieces, dust and foreign matter prior to processing.

2.2 Preparation of fig and banana powders

Figs were washed, sliced into uniform pieces and dried in a hot-air tray dryer at a controlled temperature until a low, stable moisture level was reached. Dried slices were cooled, ground into fine powder using a laboratory mill, sieved for uniform particle size and stored in airtight, low-moisture packaging. Ripe bananas were washed, peeled, sliced and similarly dried, ground, sieved and stored under airtight conditions until formulation.

2.3 Formulation of the premix

Wheat flour, fig powder, banana powder, dates powder, jaggery powder, baking powder and cardamom powder were combined in four formulations — a control (without fig or banana) and three treatments (T1–T3) — differing in the proportion of fruit powders (Table 1). Dry ingredients were weighed precisely and blended to homogeneity, then packed in airtight pouches.

Table 1. Formulations of instant fig–banana pancake premix powder (g per 100 g premix)

Formulation	Wheat flour	Fig powder	Banana powder	Dates powder	Jaggery powder	Baking powder	Cardamom powder
Control	80	0	0	10	8	1.5	0.5
T1	65	10	15	10	8	1.5	0.5
T2	55	25	20	10	8	1.5	0.5
T3 (selected)	50	5	15	15	10	2.5	2.5

T3 was selected as the optimised formulation on the basis of sensory acceptability (Section 3.3) and was used for subsequent nutritional and cost evaluation.

2.4 Pancake preparation

Batter was prepared from each premix by gradual addition of water to pouring consistency, followed by a short resting period. A fixed volume of batter was cooked on a lightly greased, preheated non-stick griddle until golden-brown on both sides. Pancakes from all formulations were prepared under identical conditions for sensory comparison.

2.5 Sensory evaluation

A semi-trained panel of 25 members evaluated coded pancake samples, presented in random order, for appearance/colour, flavour, consistency, absence of defects and overall acceptability using a 9-point hedonic scale (9 = like extremely, 1 = dislike extremely). Water was provided for palate cleansing between samples.

2.6 Proximate composition

Moisture, ash, protein and carbohydrate content of the optimised premix were determined in triplicate. Moisture was determined by moisture analyser to constant weight; ash by incineration in a muffle furnace; protein by the biuret method; carbohydrate by the anthrone method, following AOAC (2019) principles.

2.7 Consumer survey

A structured online questionnaire was administered to 52 respondents to assess awareness of pancake premixes, prior purchase behaviour, consumption frequency, nutritional awareness of fig and banana, preference for fruit-based premixes, purchase intent, willingness to recommend the product, purchase-decision factors and the perceived importance of convenience.

2.8 Cost analysis

Production cost per 100 g of premix was estimated from raw-material, processing/energy, packaging, and labour and miscellaneous costs, and a 20% profit margin was applied to derive a suggested selling price.

2.9 Statistical analysis

Sensory scores were expressed as means and analysed by one-way analysis of variance (ANOVA) under a completely randomised design to test for significant differences among attributes ($p < 0.05$).

III. RESULTS AND DISCUSSION

3.1 Consumer survey

Consumer awareness of pancake premixes was high, with 94.2% of respondents having heard of such products and 88.5% having previously purchased or consumed one; 46.2% reported frequent pancake consumption. Nutritional awareness of the constituent fruits was similarly high (banana, 96.2%; fig, 94.2%), consistent with the widespread familiarity of both fruits among Indian consumers. A majority of respondents (76.9%) indicated a preference for a fruit-based premix over a plain formulation, 84.6% expressed willingness to purchase the product if it were nutritious, convenient and reasonably priced, and an equal proportion (84.6%) indicated willingness to recommend it to others (Table 2). Nutrition (51.9%) and taste (30.8%) were identified as the strongest purchase drivers, ahead of convenience (15.4%) and price (1.9%), while 98.1% of respondents rated convenience and quick preparation as important or very important when selecting breakfast products. These findings indicate a favourable market context for a nutritionally enhanced, fruit-based pancake premix, and support prioritising nutritional messaging and flavour quality over price positioning in product communication.

Table 2. Summary of consumer survey responses (n = 52)

Survey item	Response	%
Awareness of pancake premix	Yes	94.2
Prior purchase/consumption of pancake premix	Yes	88.5
Frequent pancake consumption	Frequently	46.2
Awareness of banana's nutritional benefits	Yes	96.2
Awareness of fig's nutritional benefits	Yes	94.2
Preference for fruit-based premix over plain	Yes	76.9
Willingness to purchase (nutritious/convenient/reasonably priced)	Yes	84.6
Willingness to recommend the product	Yes	84.6
Nutrition as primary purchase factor	Selected	51.9

Survey item	Response	%
Convenience rated important/very important	Yes	98.1

3.2 Proximate composition

The optimised fig–banana pancake premix (T3) contained 62.4 g carbohydrate, 5.2 g protein, 1.1 g fat, 7.4 g dietary fibre, 8.7% moisture and 3.8% ash per 100 g (Table 3). The carbohydrate content, derived mainly from wheat flour and the natural sugars of fig, banana and dates, supports the product's role as an energy-dense breakfast option. The dietary fibre contribution (7.4 g/100 g) reflects the combined fibre content of fig and banana and compares favourably with conventional refined-flour pancake premixes, which typically contain minimal fibre. The comparatively low fat content (1.1 g/100 g) is consistent with the absence of added fats or milk solids in the formulation and may appeal to consumers seeking a lighter breakfast option. Moisture content (8.7%) is within a range generally considered suitable for the storage stability of dry premix powders, while the ash content (3.8%) reflects the mineral contribution of the fruit- and cereal-based ingredients.

Table 3. Proximate composition of the optimised instant fig–banana pancake premix (per 100 g)

Nutrient	Amount
Carbohydrate (g)	62.4
Protein (g)	5.2
Fat (g)	1.1
Dietary fibre (g)	7.4
Moisture (%)	8.7
Ash (%)	3.8

3.3 Sensory evaluation

Mean hedonic scores were high across all attributes: appearance 8.36, flavour 8.46, consistency 8.18, absence of defects 8.16 and overall acceptability 8.46 (Table 4). One-way ANOVA indicated statistically significant differences among the sensory attributes evaluated ($F = 2.529$, $p = 0.044$). The favourable colour score reflects the natural pigmentation of fig, banana, dates and jaggery combined with browning during cooking, while the high flavour score reflects the complementary fruity and caramel notes of fig, banana, dates, jaggery and cardamom. The wheat-flour base provided adequate structural consistency, and pancakes were largely free of textural or visual defects. The overall acceptability score (8.46) indicates that the fig–banana formulation is well accepted by consumers and is suitable as a convenient breakfast or snack product.

Table 4. One-way ANOVA of sensory attribute scores (9-point hedonic scale, n = 25)

Sensory attribute	Mean score	F-value	p-value	Significant ($p<0.05$)
Appearance	8.36	2.529	0.044	Yes
Flavour	8.46	2.529	0.044	Yes
Consistency	8.18	2.529	0.044	Yes
Absence of defects	8.16	2.529	0.044	Yes
Overall acceptability	8.46	2.529	0.044	Yes

3.4 Cost analysis

The estimated raw-material cost of the optimised premix was ₹18.30 per 100 g, with fig powder, banana powder, dates powder and cardamom powder contributing disproportionately to cost relative to their inclusion level, owing to their higher per-kilogram market rates (Table 5). Including processing/energy, packaging, and labour and miscellaneous costs, the total estimated production cost was ₹26.30 per 100 g. Applying a 20% profit margin gave an estimated selling price of ₹31.56, rounded to a suggested retail price of ₹32 per 100 g. This cost structure indicates that the product could be produced and marketed at a price point comparable with existing commercial pancake premixes while

offering an improved nutritional profile, supporting its feasibility for small-scale commercial production.

Table 5. Estimated production cost of the optimised premix (per 100 g)

Cost component	Cost (₹)
Raw materials	18.30
Processing/energy	2.00
Packaging	4.00
Labour and miscellaneous	2.00
Total production cost	26.30
Estimated profit margin (20%)	5.26
Estimated selling price	31.56
Suggested selling price	32.00 (rounded)

IV. CONCLUSION

An instant fig–banana pancake premix powder formulated from wheat flour, fig powder, banana powder, dates powder, jaggery powder, baking powder and cardamom powder was successfully developed and evaluated. The product provided appreciable dietary fibre and carbohydrate content with a comparatively low fat level, achieved high sensory acceptability across all evaluated attributes, and could be produced at an estimated cost of ₹26.30 per 100 g, supporting a viable retail price of approximately ₹32 per 100 g. Consumer survey data indicated strong awareness of and interest in fruit-based pancake premixes, with nutrition and taste identified as the principal purchase drivers. Collectively, these findings support the potential of the fig–banana pancake premix as a convenient, nutritionally improved breakfast product suitable for small-scale commercial development. Future work should address formulation refinement, shelf-life and packaging studies, fortification with additional nutrient-dense ingredients, and consumer testing with a larger and more diverse panel.

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Conflict of Interest
The authors declare no conflict of interest.

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