

Formulation and Standardization of Bael Fruit Gulab Jamun Premix

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Abstract - Bael fruit (*Aegle marmelos*, family: Rutaceae) is valued for its exceptional nutritional and medicinal properties. Originating from India, it is regarded as a sacred fruit associated with the goddess Parvati. Rich in carbohydrates, proteins, vitamins (A, B₁, B₂, and C), minerals (potassium, phosphorus, iron, and calcium), fatty acids, and dietary fibre, bael fruit contains about 61% moisture, contributing to its functional food potential. Stevia (*Stevia rebaudiana*, family: Asteraceae), known as “Ka-a He-e” or “sweet grass,” is a natural, calorie-free sweetener 200–400 times sweeter than sugar, exhibiting anti-diabetic, antioxidant, anti-inflammatory, and antimicrobial properties. Its incorporation provides a healthier alternative to refined sugar in traditional sweets. This study aimed to develop a Bael Fruit Gulab Jamun sweetened with Stevia as a nutrient-rich, low-calorie dessert. Three formulations containing 3%, 5%, and 7% bael fruit powder were evaluated for sensory attributes, including appearance, flavour, colour, texture, and taste, using a five-point hedonic scale. The 5% bael fruit powder formulation (BFGJ2) received the highest overall acceptability. Nutritional analysis of the optimised product showed protein (17.75 g), carbohydrates (53.39 g), energy (393.76 kcal), fat (12.89 g), fibre (1.1 g), calcium (455.75 mg), iron (2.75 mg), phosphorus (508.5 mg), and carotene (206.25 mg), confirming its high nutritional value. Packaged in reusable airtight polyester pouches, the product maintained good shelf-life and quality. Economic evaluation indicated a production cost of ₹120 with a profit margin of ₹10 per unit. Thus, bael fruit-based gulab jamun sweetened with stevia offers a nutritious, low-calorie, and economically viable alternative to conventional sweets.

Keywords: Bael Fruit, Gulab Jamun, Low-Calorie Dessert, Nutritional Analysis, Stevia, Sensory Evaluation.

I. INTRODUCTION

Bael (*Aegle marmelos*), an indigenous fruit of India, is recognised for its rich nutritional profile and therapeutic properties in traditional medicine. The fruit contains essential vitamins, minerals, dietary fibre, and bioactive compounds with antioxidant, anti-inflammatory, and digestive benefits. Incorporating bael into commonly consumed foods provides a promising avenue for enhancing dietary quality. Gulab Jamun, a traditional Indian sweet, is widely popular but typically high in sugar content, which can pose health concerns. The use of Stevia, a natural non-caloric sweetener, offers a healthier alternative to conventional sugar, reducing caloric intake while maintaining palatability. This study focuses on the formulation and standardization of Bael Fruit Gulab Jamun with Stevia syrup, aiming to combine traditional flavours with modern nutritional awareness. The research evaluates sensory acceptability, nutrient composition, shelf-life, and cost-effectiveness of the developed product, highlighting its potential as a nutritious, low-calorie dessert suitable for health-conscious consumers.

II. MATERIALS AND METHODS

2.1 Raw Materials

Ingredients: Bael fruit pulp powder, milk, ghee, wheat flour and Stevia syrup.

Procedure: Preparation of bael pulp powder, mixing with Wheat flour, Milk powder and Milk, forming dough balls, frying, and soaking in Stevia syrup solution.

Optimisation: Different concentrations of Stevia syrup (5%, 10% and 15%) were tested for taste and texture.

Evaluation: Organoleptic testing with 25 participants, texture analysis, and shelf-life determination.

2.2 Standardization and Formulation

Three formulations were developed:

- BFGJ1: 3% bael fruit powder
- BFGJ2: 5% bael fruit powder
- BFGJ3: 7% bael fruit powder

2.3 Sensory Evaluation

The samples were assessed on appearance, colour, flavour, texture, taste, and overall acceptability by a semi-trained panel of Twenty-five people using a five-point hedonic scale (1 = Dislike very much, 5 = Like very much).

2.4 Nutrient Analysis

Using standard AOAC (2010) procedures, the proximate composition—energy, carbs, protein, fibre

and micronutrients (calcium, phosphorus, iron, vitamin C, carotene, thiamine, niacin and riboflavin)- was examined.

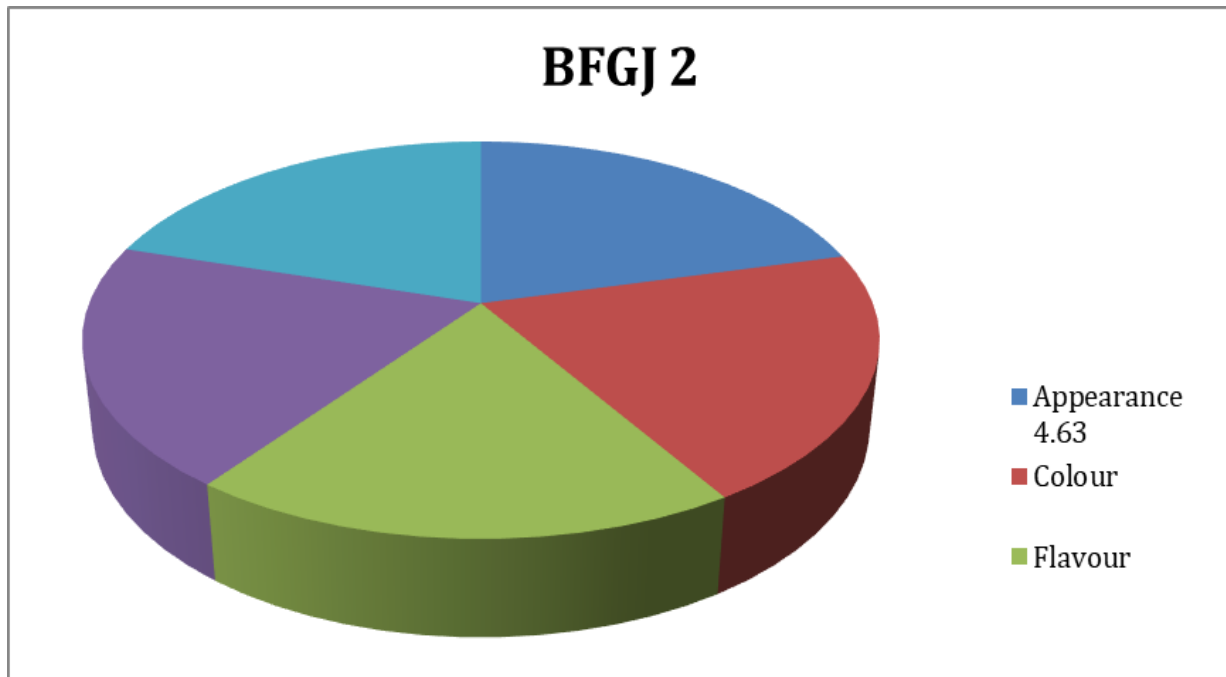
2.5 Cost Analysis

The cost of ingredients and packaging was used to determine the production cost per 100 g.

III. RESULTS

Sensory evaluation showed that sample BFGJ-2 recorded the highest overall acceptability score (5.0) compared to BFGJ-1 (4.8) and BFGJ-3 (4.6). Appearance, colour, and flavour of BFGJ-2 scored 5.0, indicating maximum preference. Nutrient analysis revealed increased dietary fibre and vitamin content due to bael fruit incorporation, while the use of stevia reduced total sugar and caloric value. Vitamin C content increased from 1.8 mg (control) to 2.2 mg in the developed product. Shelf-life study indicated acceptable sensory quality during the storage period with no significant deterioration. Cost analysis showed the total production cost of ₹120 per 100 g, making the product economical compared to commercial samples.

Sensory Attributes of BFGJ 2



Nutritive value of BFGJ 2

Nutrient composition	Bael fruit	Wheat flour	Milk powder	Total
Moisture (g)	3.08	-	1.58	4.66
Protein (g)	0.09	6.05	11.61	17.75
Fat (g)	0.02	0.85	12.02	12.89
Minerals (g)	0.09	1.35	2.7	4.14
Fibre (g)	0.15	0.95	-	1.1
CHO (g)	1.59	34.7	17.1	53.39
Energy (kcal)	0.06	170.5	223.2	393.76
Calcium (mg)	4.25	24	427.5	455.75
Phosphorus (g)	2.50	177.5	328.5	508.5
Iron (g)	0.03	2.45	0.27	2.75
Carotene (mcg)	2.75	14.5	189	206.25
Thiamine (mg)	0.01	0.25	0.14	0.4
Riboflavin (mg)	-	0.09	0.61	0.7
Niacin (mg)	0.06	2.15	0.36	2.57
Vitamin C	0.4	-	1.80	2.2

IV. DISCUSSION

Sample BFGJ-2 showed the highest acceptability score (5.0), indicating optimum bael fruit incorporation. Vitamin C content increased to 2.2 mg, improving nutritional quality. Use of stevia reduced calorie content without affecting sweetness. The product remained acceptable during storage and was economical (₹120/100 g). Hence, bael fruit–stevia gulab jamun is a healthy and acceptable alternative to traditional sweets.

V. CONCLUSION

The study concluded that bael fruit and stevia can be effectively incorporated into gulab jamun to develop a nutritionally improved, low-calorie product. Sample BFGJ-2 showed the highest sensory acceptability (5.0) with enhanced vitamin content. The developed product was stable, economical (₹120/100 g), and suitable for health-conscious consumers.

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