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FORMULATION AND EVALUATION OF GUAVA (Psidium guajava) LEAVES POWDER INCORPORATED MASALA BISCUIT

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ABSTRACT
The development of functional foods using locally available plant resources has gained increasing importance due to their potential health benefits. The present study aimed to formulate and evaluate masala biscuits incorporated with guava leaves powder and to assess their sensory acceptability and nutrient composition. Fresh guava leaves were collected, shade dried, powdered, and incorporated into masala biscuits at three different levels (5 g, 6 g, and 7 g). Sensory evaluation was conducted using a five-point hedonic scale by a trained panel. Nutritional analysis was carried out to determine macro- and micronutrient content. Results revealed that biscuits incorporated with 5 g guava leaves powder obtained the highest overall acceptability score (mean = 3.3). Nutritional analysis indicated increased fiber, vitamin C, and mineral content with higher levels of incorporation. The study concludes that guava leaves powder can be effectively utilized in bakery products to enhance nutritional value while maintaining acceptable sensory qualities.
KEYWORDS: *Functional Food, Guava Leaves Powder, Masala Biscuit, Sensory Evaluation, Nutritional Analysis.*

1. INTRODUCTION

The growing awareness of the relationship between diet and health has increased interest in the development of functional foods enriched with bioactive plant ingredients. Functional foods not only provide basic nutrition but also offer physiological benefits that may reduce the risk of chronic diseases. Incorporating plant-derived ingredients into commonly consumed food products has emerged as an effective strategy to enhance nutritional quality while maintaining consumer acceptability (Roberfroid, 2002).

Guava (*Psidium guajava*) is a tropical plant widely cultivated in India and other subtropical regions, valued not only for its fruit but also for its medicinally important leaves. Guava leaves are rich in phytochemicals such as flavonoids, tannins, phenolic compounds, and antioxidants, which exhibit antimicrobial, anti-inflammatory, antidiabetic, and antioxidant properties (Gutierrez et al., 2008). In traditional medicine systems, guava leaves have been used for the management of gastrointestinal disorders, diabetes, and infections, highlighting their therapeutic potential (Joseph & Priya, 2011).

Recent nutritional research has focused on utilizing plant leaves and herbal powders as functional ingredients in processed foods to improve dietary fiber, micronutrient content, and antioxidant capacity. Bakery products, particularly biscuits, serve as an ideal vehicle for nutrient fortification because of their wide acceptability, long shelf life, and convenience of consumption across all age groups (Manley, 2011). The incorporation of plant-based powders into biscuits has been shown to improve nutritional value without significantly altering product quality when used at optimal levels (Kaur & Singh, 2017).

Despite the recognized health benefits of guava leaves, their utilization in value-added food products remains limited. Developing innovative food products using guava leaves powder may provide a low-cost functional snack while promoting the use of locally available natural resources. Therefore, the present study was undertaken to formulate masala biscuits incorporated with guava (*Psidium guajava*) leaves powder and to evaluate their sensory acceptability and nutritional composition.

2. MATERIALS AND METHODS

2.1 Research Design

The present study was conducted using a systematic three-phase research design to develop and evaluate guava leaves powder incorporated masala biscuits. In Phase I, fresh guava leaves were processed through cleaning, shade drying, and grinding to prepare guava leaves powder. Phase II involved the formulation and development of masala biscuits by incorporating different proportions of guava leaves powder into the standard recipe. Phase III included the standardization of the developed products followed by sensory evaluation to assess appearance, texture, flavor, and taste, along with statistical analysis of the obtained data to determine overall acceptability and identify the most suitable formulation.

2.2 Preparation of Guava Leaves Powder

Fresh, young, disease-free guava leaves were collected from a local farm at Nilakottai. The leaves were washed thoroughly to remove dust and impurities and allowed to drain. Shade drying was carried out at room temperature for three days until the leaves became crisp. The dried leaves were ground into fine powder and stored in airtight zip-lock covers.

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2.3 Formulation of Masala Biscuit

Masala biscuits were formulated using whole wheat flour incorporated with guava leaves powder at three different levels, namely T1 (5 g), T2 (6 g), and T3 (7 g). The formulation also included baking powder, salt, chili powder, cumin seeds, asafoetida, black pepper, turmeric powder, butter or ghee, yogurt, coriander leaves, and green chilies. All dry ingredients were mixed uniformly, followed by the addition of fat and yogurt to prepare a soft dough. The dough was then rolled, cut into desired shapes using molds, and baked in a preheated oven at 180°C for 15–20 minutes until the biscuits turned golden brown and crisp.

2.4 Sensory Evaluation

Sensory evaluation of the developed masala biscuits was conducted in the Home Science laboratory of Government Arts College for Women, Nilakottai. Faculty members of the department served as panelists for evaluating the products. The biscuits were assessed based on sensory attributes such as appearance (color), texture, taste, and flavor. A five-point hedonic scale was employed to determine the overall acceptability of the formulated products.

2.5 Nutritional Analysis

Prepared biscuits were analyzed for energy, carbohydrate, protein, fat, calcium, iron, fiber, vitamin C, potassium, and phosphorus content per 100 g sample.

2.6 Statistical Analysis

Mean sensory scores were calculated and compared to determine the most acceptable formulation.

3. RESULTS AND DISCUSSION

3.1 Sensory Evaluation

Among the three formulations, biscuits containing 5 g guava leaves powder showed the highest acceptability.

Table1: Sensory Evaluation

Treatment	Total Score	Mean score
5 g (T1)	13.3	3.3
6 g (T2)	10.2	2.5
7 g (T3)	11.4	2.8

The higher incorporation levels slightly reduced sensory scores, particularly taste and texture, possibly due to the stronger herbal flavor of guava leaves. Moderate incorporation maintained desirable organoleptic characteristics.

Figure 1: Guava Leaves Powder incorporate Masala Biscuit

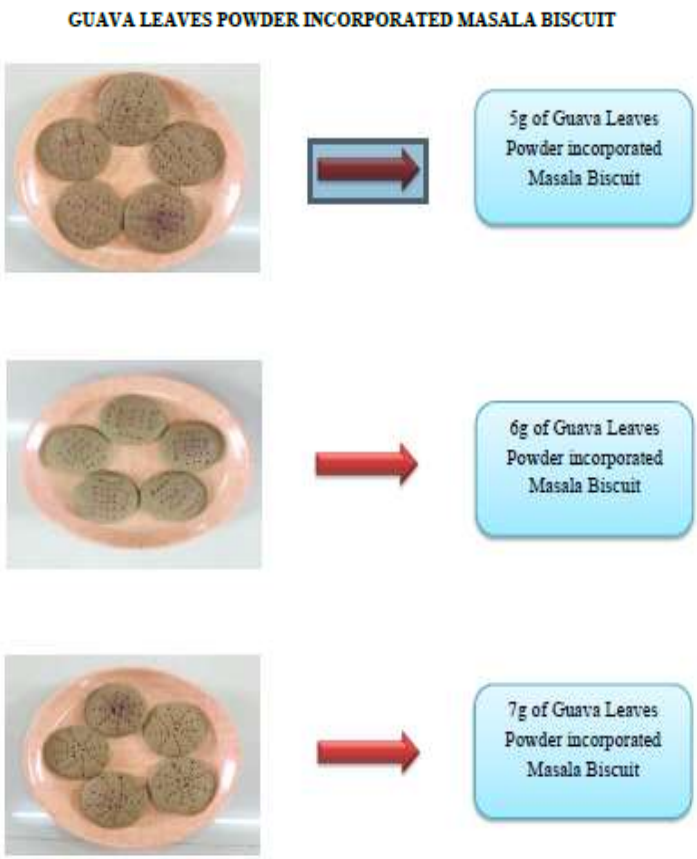


PLATE – I

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3.2 Nutritional Composition

Nutritional values increased with higher levels of guava leaves powder incorporation.

Table 2: Nutritional Composition

Nutrients	T1 (5 g)	T2 (6 g)	T3 (7 g)
Energy (kcal)	531.8	532.6	533.4
Protein (g)	7.37	7.39	7.42
Fiber (g)	1.71	1.76	1.81
Vitamin C (mg)	26.02	30.24	34.41
Calcium (mg)	116.00	116.18	116.36
Iron (mg)	4.03	4.04	4.05
Potassium (mg)	207.62	212.62	217.62

T1 – 5 g Guava Leaves Powder incorporated Masala Biscuit
T2 – 6 g Guava Leaves Powder incorporated Masala Biscuit
T3 – 7 g Guava Leaves Powder incorporated Masala Biscuit

The nutritional analysis of guava leaves powder incorporated masala biscuits revealed a gradual improvement in nutrient content with increasing levels of incorporation. Energy values showed only a slight increase across treatments, indicating that enrichment did not significantly alter caloric content. However, protein, dietary fiber, and vitamin C levels increased progressively from T1 to T3, reflecting the nutritional contribution of guava leaves powder. Similarly, mineral contents such as calcium, iron, and potassium exhibited marginal enhancement, suggesting improved micronutrient density. These findings indicate that incorporation of guava leaves powder enhances the nutritional quality of biscuits while maintaining their suitability as an energy-dense snack food.

3.3 Cost Analysis

The production cost remained constant (₹120 per serving) across all formulations, indicating economic feasibility for commercial production.

4. RECOMMENDATIONS

- Guava leaves powder can be utilized in other bakery and traditional food products.
- Further studies may evaluate shelf life and antioxidant activity.
- Consumer-level acceptability studies with larger sample sizes are recommended.

5. CONCLUSION

The study demonstrated that guava leaves powder can be successfully incorporated into masala biscuits to enhance nutritional quality. Among the tested formulations, the 5 g incorporation level achieved the highest sensory acceptability while providing improved nutrient content. The developed product has potential as a low-cost functional snack contributing to improved dietary intake.

6. ACKNOWLEDGEMENT

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