Proximate and functional characterization of developed Malabar Tamarind (*Garcinia cambogia*) Paste

Abstract

Garcinia cambogia, widely recognized for its potential health benefits, has been traditionally utilized in culinary and medicinal applications. This study investigates the functional and nutritional properties of a developed Malabar tamarind (*Garcinia cambogia*) paste with potential applications in the food industry. The paste was analyzed for its functional attributes including foaming, water and oil holding properties. All the nutrients (moisture, protein, crude fat, fiber) estimated during the study were analyzed by using standard AOAC methods. Carbohydrate was estimated by difference method. The findings indicate that the Malabar tamarind paste exhibits favorable functional properties, making it suitable for various food formulations. The results reveal that Malabar Tamarind paste is rich in moisture and carbohydrates, with significant amounts of dietary fiber and minimal fat content. The paste exhibited excellent water holding and oil absorption capacities, indicating its potential as a thickening and stabilizing agent in food products. Overall, this study provides valuable insights into the utilization of Malabar tamarind paste as a functional ingredient in food product development, offering opportunities for innovation and diversification in the food industry.

Keywords: Proximate analysis, functional property, characterization, Malabar tamarind paste

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Introduction

Malabar tamarinds are borne on a slender Asian shrub related to the evergreen tree found in Asia and southwest India. The fruit has been utilized in Asian countries. for centuries as a food supplement with no harmful effects. The fruit exhibits a distinctive sweet acid taste and a unique texture [1] . It is of interest that the natives consider the use of this fruit sprinkled on food to make the food more "filling and satisfying." Garcinol and guttiferone K of *Garcinia cambogia (G. gummi-gutta)* has protective effects against lipid and protein oxidation *in vitro* and may have some promising effects *in vivo* because they are good antioxidants[2]. Traditionally, it has been used in Ayurvedic medicine for various purposes, including digestive health and as a natural appetite suppressant[3]. Apart from its traditional use in cooking (especially in curries and chutneys), Malabar tamarind extract is popular as a dietary supplement. Supplements often contain standardized HCA extracts, marketed for weight loss and appetite control[4]. It is least used in areas out of its cultivation and limited utilization for its nutritional and medicinal properties[5]. A food paste is a semi-liquid colloidal suspension, emulsion, or aggregation used in food preparation or eaten directly as a spread.paste forms of food are often convenient for both preparation and consumption. They require minimal cooking and can be easily stored, making them ideal for busy individuals or those with limited time for meal preparation [6]

Developing standardized method for preparing Malabar tamarind paste and characterizing its quality parameters can ensure consistency and safety in food production. Analyzing factors such as moisture content, pH etc. will help in proving its credibility. Malabar tamarind holds cultural significance in many regions where it is grown and studying its traditional uses and promoting its culinary and medicinal applications can contribute to the preservation of cultural heritage and indigenous knowledge [7]. Investigating the nutritional composition of Malabar tamarind paste can provide valuable insights into its potential health benefits. Understanding the properties of Malabar tamarind paste can lead to the development of new culinary products and recipes. Exploring its flavor profile, texture, and usability in different cuisines can inspire chefs and food manufacturers to create innovative dishes and food products. Characterizing its sensory attributes and consumer acceptance can help determine market potential and guide product development efforts to meet consumer preferences.

The creation of this culinary paste signifies an investigation into utilizing the diverse flavors and health benefits of Malabar Tamarind in crafting a flexible and enjoyable product. Crafting the paste entails precise ingredient selection and blending, with a keen focus on the Malabar Tamarind. Our objective through this detailed procedure is to attain a seamless fusion of tastes and consistencies that enhance the distinct qualities of the Malabar Tamarind, providing a delightful culinary journey.

The purpose of this study is not only to develop a new culinary product but also to evaluate the functional and physiochemical characteristics of Malabar tamarind paste to support its credibility as a new culinary ingredient. As the world's culinary culture continues to develop, the use of exotic and unique ingredients such as tamarind opens the door to new culinary experiences that cater to a wide variety of palates. We hope to enrich culinary knowledge and promote delicious and nutritious food options through this study.

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2. Materials and Methods

2.1 Locale of the study:

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The present research work was done in 02 laboratories to fulfil all the objectives related to the study. In first the preparation of Malabar Tamarind paste was performed in the Food processing laboratory, School for Home Sciences, Babasaheb Bhimrao Ambedkar University, Lucknow. For the preparation of paste and Proximate analysis of paste were performed in Food Science Analysis Laboratory School for Home Sciences, Babasaheb Bhimrao Ambedkar University, Lucknow

2.2 Sample collection and preparation

For investigation and processing, the fruit of Malabar Tamarind was deseeded and then hot smoked to obtain a particular variety of dried Garcinia Cambogia rind with a dark brown to black color as shown in figure 1. The samples were taken at random from the village market in Narikkuni, which is in the Kerala state's Kozhikode district. About 10 to 15 grams were contained in each dried rind, and 200 grams of samples were collected. After soaking the samples for a whole night, they were pressure cooked for three to four whistles. After that, the Malabar tamarind was pounded into a pulp with a grinder and allowed to strain for five minutes in a hot pan. After cooling, the Malabar tamarind paste was finally bottled in glassware.

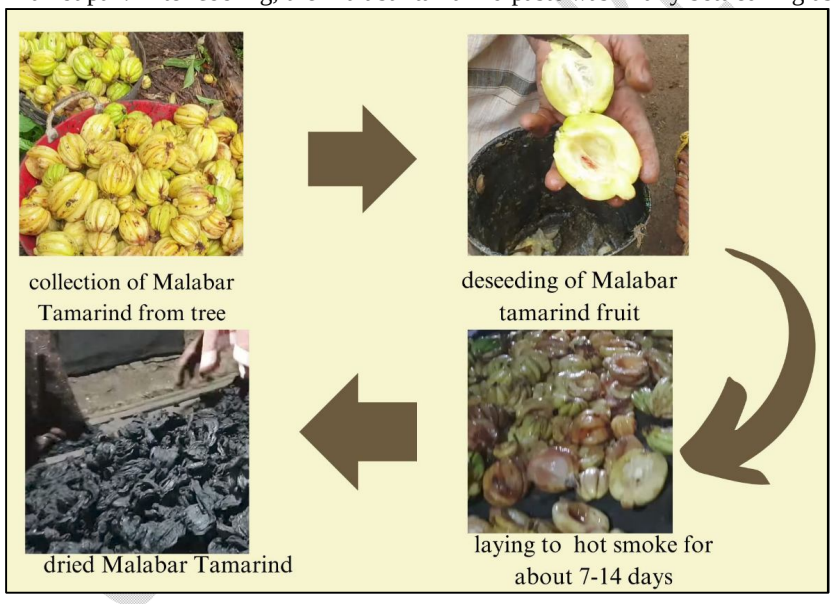

Figure 1 Flowchart of process involved in obtaining dried Malabar tamarind

2.3 Preparation of paste

The process of making Malabar tamarind paste involves washing dried rinds under running water to get rid of any dirt and then letting them soak overnight. The Malabar tamarind rinds are then

pressure-cooked for three to four whistles. Afterwards, to make a thick paste, the rinds are added to a regular blender. After removing the paste, it is strained in a hot pan until the appropriate consistency of paste is achieved [8]. The paste is then allowed to cool for about five minutes before being bottled in glassware to avoid spoiling. The flow chart representing the preparation is shown in figure 2 and figure 3.

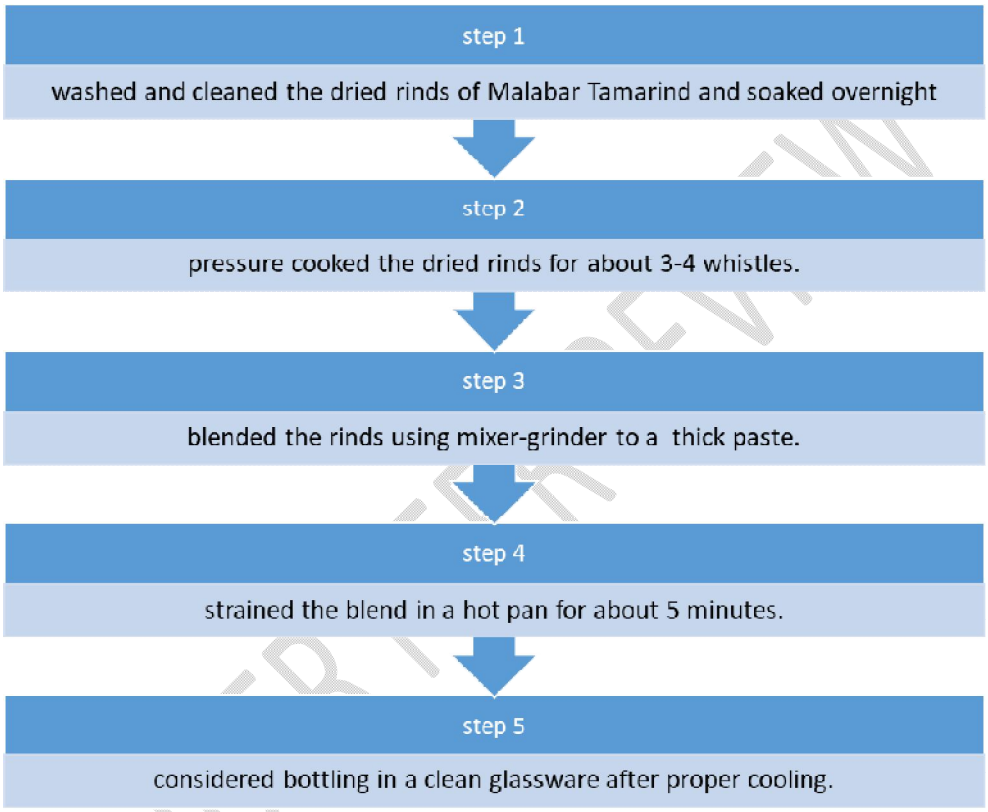

Fig. 2 Malabar Tamarind paste processing flow chart

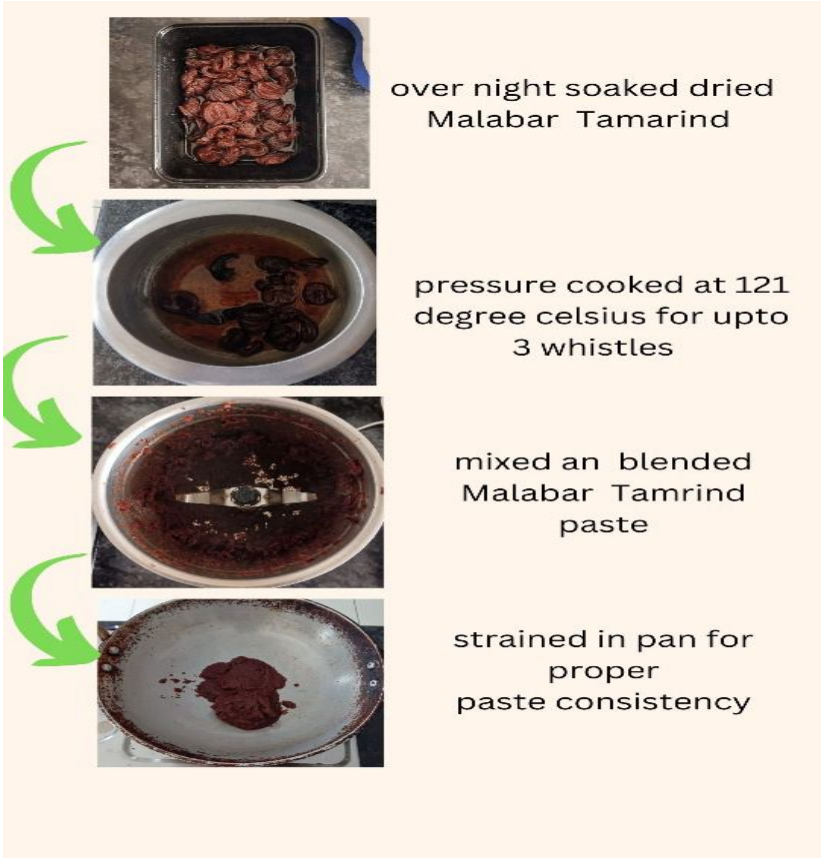

Figure 3 Representation of Malabar Tamarind paste preparation

2.4 Nutritional analysis

2.4.1 Determination of Moisture Content

The moisture level was assessed through gravimetric analysis using oven drying at a temperature of 102 °C for a duration of 04 hours, as outlined in the AOAC 1990 guidelines. The moisture content was determined conventionally by measuring the loss in mass and expressed as a percentage by mass (grams per 100 grams). [9]

The loss of weight = Final weight - Initial weight / Weight of sample × 100

The loss of weight equals to moisture percentage present

2.4.2 Determination of ash content

Ash recognized by properly weighing 8-12 grams of Malabar Tamarind paste into a previously weighted crucible. The sample was torched at 550°C to proper burning.[10]

Percentage (%) of Ash = (Mass of ash)/ (Mass of sample)

2.4.3 Determination of protein content

The chemical analysis, including the determination of total protein, was conducted using the AOAC (2005) method [11]. The Kjeldhal technique was employed to calculate the total protein by determining the amount of nitrogen through a specific formula[12].

$$\text{Nitrogen \%} = \frac{\textit{sample titre} - \textit{blank titre} \times \textit{normality of Hcl} \times 14 \times \textit{volume made up of the digest} \times 100}{\textit{liquot of the digest taken} \times \textit{weight of sample taken} \times 1000}$$

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(Protein % = nitrogen % × 6.5)

2.4.4 Determination of crude fat

The Association of Official Analytical Chemists (AOAC) acknowledges the "Soxhlet" method as the established technique for analyzing crude fat. In this method, the crude fat content of the food sample is determined through solvent extraction, followed by measuring the weight of the extracted fat. The total fat percentage is then calculated using a specific formula.[13]

$$\% \; crude \; fat = \frac{W2 - W1}{S}$$

$$\% \; crude \; fat = \frac{W2 - W1}{S} \times 100$$

Where,

W1= Weight of empty flask (g)
W2 = Weight of flask and extracted fat (g)
S = Weight of sample

2.4.5 Determination of fiber content

Sulphate of Sulphur (0.255N) and potassium hydroxide (0.313N) solvent were employed for acid and base digestion, respectively. After heating the solution for 30 minutes in a muffle oven

to remove carbonaceous materials, the volume loss was measured as crude fiber[14].

$$\text{Fiber \%} = \frac{W2-W1}{W} \frac{W2-W1}{W} \times 100$$

Where,

W1 = weight of crucible + weight of sample after drying

W2 = weight of crucible + weight of sample after ashing

W = weight of sample

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2.4.6 Determination of Carbohydrate Content

Starch was calculated using the following method:

Total carbohydrates (per 100 g) = 100 (ash + moisture + fats + protein + crude fiber).

2.5 Functional properties

2.5.1 Determination of Water absorption capacity %

One gram sample was weighed into 25 ml graduated conical centrifuge tubes and about 10 ml of water added. The suspensions were allowed to stand at room temperature (30 ± 2 °C) for 1 hr. The suspension was centrifuge at 200 x g (2000 rpm) for 30 minutes. The volume of water on the sediment was measured and the water absorbed expressed as percent water absorption based on the original sample weight[15].

2.5.2 Determination of Oil holding capacity %

One gram sample was weighed into 25 ml graduated conical centrifuge tubes and about 10 ml of refined vegetable oil was added. The suspension was centrifuge at 200 x g (2000 rpm) for 30 minutes. The volume of oil on the sediment was measured and the oil absorbed expressed as per cent oil absorption based on the original sample weight[16].

2.5.3 Determination of Foaming Capacity

The foam capacity was calculated, after blending 2 g dry weight of the sample suspended in 100 mL of distilled water, using a Warring blender whipped at 160 rpm for 5 min and recording the volume of the resultant mixture (after 30 sec the mixture was poured into a 250 mL measuring cylinder), from the relation [17]:

$$\text{Foaming capacity} = \frac{\frac{volume\ after\ whipping - volume\ before\ whipping}{volume\ before\ whipping}}{\frac{volume\ after\ whipping - volume\ before\ whipping}{volume\ before\ whipping}} \times 100$$

2.5.4 Determination of Forming stability

Foam stability was calculated, after recording the foam volumes obtained, as described above at five different time intervals (5, 15, 30, 60 and 120 min), from the relation[18]:

$$\text{Forming stability} = \frac{\frac{foam\ volume\ after\ time\ (t)}{initial\ foam\ volume}}{\frac{foam\ volume\ after\ time\ (t)}{initial\ foam\ volume}} \times 100$$

3. Result and discussion

3.1 Nutritional analysis

The proximate analysis of Malabar tamarind (Garcinia cambogia) paste reveals a comprehensive nutritional profile, highlighting its potential as a valuable food ingredient. The moisture content of the paste is 9.24%, indicating that nearly 9% of the paste is water. This relatively low moisture content suggests a longer shelf-life and reduced risk of microbial spoilage, which is advantageous for both storage and transportation.

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The fat content is 3.8%, which is moderate and suitable for consumers seeking a low-fat diet. The ash content, representing the inorganic mineral residue, is 5.28%. This indicates the presence of essential minerals, which contribute to the overall nutritional value of the paste.

Protein content is 7.03%, making Malabar tamarind paste a moderate source of protein. While it may not be a primary protein source, it can still contribute to the overall protein intake when included in various food products. The fiber content is notably high at 10.77%, making this paste an excellent source of dietary fiber. High fiber content is beneficial for digestive health and can aid in preventing conditions such as constipation and other digestive disorders.

Carbohydrate content stands at 63.88%, indicating that the paste is rich in energy-providing macronutrients. This high carbohydrate content makes it suitable for use in energy-dense food products. Overall, the nutritional composition of Malabar tamarind paste indicates that it is a nutrient-rich ingredient that can enhance the dietary value of food products, particularly those requiring high fiber and carbohydrate content. Table 1 represents the results of the proximate tests conducted.

Table 1 Nutritional composition (%) of Malabar Tamarind (*Garcinia cambogia*) Paste

Test	Parameters	Result

Proximate analysis	Fat %	3.8
	Moisture content %	9.24
	Ash %	5.28
	Crude Fiber %	10.77
	Carbohydrate %	63.88
	Protein %	7.03

3.2 Determination of functional properties.

The functional properties of Malabar tamarind paste were also evaluated, and the results demonstrate its versatility in various food applications. The paste exhibits a high-water absorption capacity (50.6%), which indicates its potential use as a thickening agent. This property is particularly beneficial in the preparation of sauces, soups, and other food products where water retention is essential for maintaining consistency and texture.

The oil absorption capacity of the paste is 43.6%, which is beneficial in applications such as frying or dough preparation. This property allows the paste to absorb oil efficiently, enhancing the texture and flavor of fried foods and baked goods. The ability to absorb oil can also contribute to the mouthfeel and palatability of various food products.

Foaming capacity (25%) and foaming stability (33%) are also notable functional properties of Malabar tamarind paste. While the foaming capacity is moderate, the higher foaming stability indicates that once formed, the foam is relatively stable and can be maintained over time. This is advantageous in the production of foamy food products such as whipped toppings and certain desserts, where foam stability is crucial for product quality.

In summary, the proximate and functional characterization of Malabar tamarind paste highlights its potential as a multifunctional food ingredient. Its nutritional composition, coupled with its excellent water and oil absorption capacities, and stable foaming properties, make it a promising candidate for use in a wide range of food applications. Further research and development can explore its full potential in creating health-promoting and functional food products. Table 2 shows the results of functional attributes.

Table 2 Test results for functional properties

Name of test	Result
Water absorption capacity (%)	50.6
Oil absorption capacity (%)	43.6
Foaming capacity (%)	25
Foaming stability (%)	33

Conclusion

The proximate and functional characterization of Malabar tamarind (Garcinia cambogia) paste reveals its potential as a valuable ingredient in the food industry. The proximate analysis shows that the paste is rich in carbohydrates (63.88%) and dietary fiber (10.77%), with moderate amounts of protein (7.03%) and fat (3.8%). The low moisture content (9.24%) suggests a longer shelf-life and improved storage stability, while the ash content (5.28%) indicates the presence of essential minerals.

Functionally, Malabar tamarind paste demonstrates high water absorption capacity (50.6%) and oil absorption capacity (43.6%), making it suitable for applications requiring thickening, moisture retention, and enhanced texture, such as in sauces, soups, fried foods, and baked goods. Additionally, its foaming properties, with a foaming capacity of 25% and foaming stability of 33%, highlight its potential in producing stable foamy food products.

Overall, the nutritional and functional properties of Malabar tamarind paste make it a versatile and beneficial ingredient for developing health-promoting and functional food products. Its incorporation into various food formulations can enhance their nutritional value, texture, and stability, catering to the growing consumer demand for nutritious and functional foods. Further exploration and innovation can unlock new applications and benefits of this promising ingredient.

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