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Flocourtia jangomas L. fruits found in Brahmaputra valley agro-climatic condition: A nutritional study

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Abstract: Fruits have always been a leading part of our diet. Fruits and other parts of plants have been used for their medicinal properties in different purposes, mostly human health. Generally, fruits are delicious and also rich in phytochemicals which have immense health benefits. Pharmaceutical companies are always craving for the discovery of newer elements in plants which can be used as medicines. The fruits of *Flacourtia jangomas* L., mostly eaten raw, are sparingly available in Brahmaputra valley agro-climatic condition and subject for study on its basic nutritional and nutraceutical properties covering the parameters such as total carbohydrate, crude proteins, dietary fibers, total phenols and flavonoids as well as antioxidant properties. The results showed satisfactory information as total carbohydrate amounting 14.1±1.2%, total protein content at 4.21±0.78%, ash content at 0.735±0.11%, total lipid 0.16±0.03%, total phenolics content 390 mg GAE/100g of dry matter, flavonoid content at 6.66 mg GAE/100g dry matter, crude fibre content at 1.01±0.11%, ascorbic acid at 105.63 mg/100g dry matter. Antioxidant activity of methanolic extract of dry fruit matter reveals that 11µg/ml can reduce half of the reactive oxygen species (in DPPH method). These results show a good promise on the potentiality of the fruit to be used as a good source of bioactive compounds along with basic food nutrients.

Keywords: *Flacourtia jangomas*, Indian coffee plum, Nutraceuticals, Poniyol

Introduction

Flacourtia jangomas L. is a small tree, under Salicaceae family, found dominantly in southeastern parts of Asia, also known as Indian Coffee Plum having oval to slightly elongate alternate leaf, white flower with racimose inflorescence. The fruit is eaten raw or used to prepare jam. The bark is used for different purposes because of its beneficial phytochemicals with medicinal values. This fruits, locally known as Paniyal or Poniyol, is very much popular among consumers. The ancient cultures in India, China and other countries have studied and documented these in different forms naming Ayurveda, Yunani etc. (1). Though modern medicine has achieved some successful milestone, yet villagers in India and some other countries still rely on these herbals and readily available fruits as remedies for some common diseases like cough, fever, stomach problems etc. (2). The plant has been used traditionally for the treatment of different diseases in India (3). *F. jangomas* contains bioactive component counting tannins, minerals, ascorbic acid, tartaric acids, amino acids and phenolic compounds (4). It also showed prominent antibacterial activity against gram-positive and gram-negative bacteria (5). Apart from medicinal values, fruits are also heavily loaded with vitamins and minerals, along with a good amount of protein, carbohydrate and lots of dietary fibers. In this context, it is important to analyze this fruit

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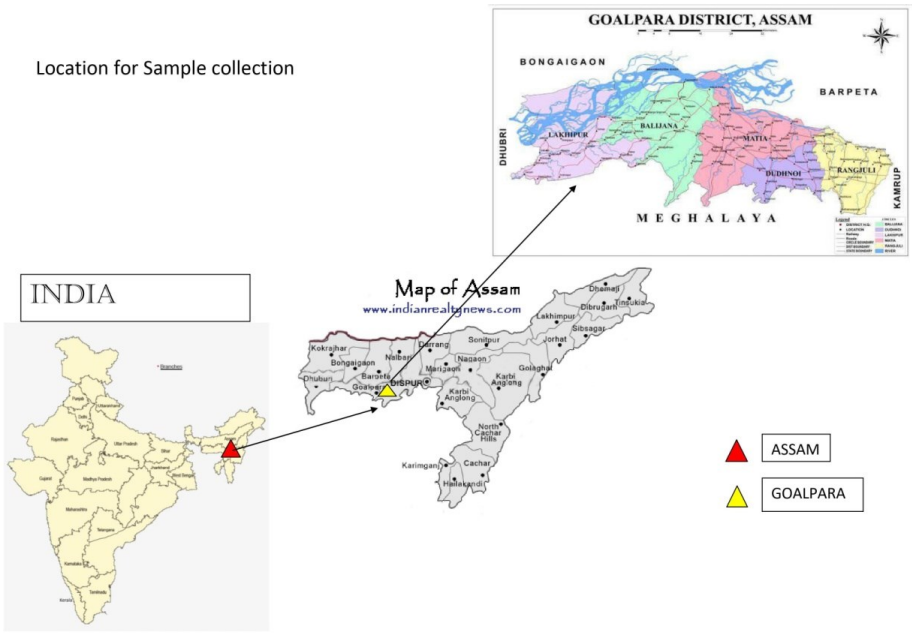
which is commonly consumed in the region of NE India in its season for its nutritional values. *F. jangomas* fruits, a small fleshy reddish-brown (mature stage), with immense medicinal properties, found sparingly in Brahmaputra valley agro-climatic condition. However, it is believed to be originated in India. Present study involves the analysis of fruits for its nutritional parameters.

Methods and Materials

Sample collection: The fruits of *F. jangomas* were collected from Goalpara district of Assam (fig.1). (Location: Goalpara district is situated between longitude 92°55′0″ E and Latitude 25°5′0″ N, occupying an area of about 3786 sqkm, with an average annual rainfall varying from 2200 to 2700 mm. The temperature varies from 12° to 17°C in winter and 24° to 35°C in summer season, and humidity 76.6 % in average). For the experiment purpose, fruits were collected fresh from a local village market (Figure 1). The fruits were then rushed to the biotech hub, Pandu College, where the chemical analyses were to be performed.

Photograph of *Flacourtia jangomas* L.

Sample preparation: Fresh, healthy fruits were first chopped then and adequately oven-dried (at 60°C) until the moisture content removed and adhering to fixed weight. Seeds were removed. Then the sample was ground with mixture grinder to powdered form (40 to 60 Mesh) and kept in an airtight container for further analyses.



Analysis of chemical composition:

Total carbohydrate was estimated using the method as described by Clegg (6) with some optimization by boiling 100mg sample in hydrochloric acid (2.5 N) and then using anthrone to detect color reaction. Total crude protein was estimated following the AOAC (7) method with adjustments for the sample using the micro Kjeldahl apparatus. Similarly, crude dietary fibre was estimated using the method described by Maynard (8) where the sample had to be digested with sulphuric acid and digestion mixture.

The total lipid of the sample was extracted using petroleum ether following the AOAC (9)

method. Total minerals were removed in the form of ash content in the muffle furnace.

Total phenolic compound (TPC) estimation was done from methanolic extract using Folin Ciocalteu reagent following the method of as described by Chang *et al.,* (10) with some modifications. Gallic acid was used as a standard for this experiment. Total phenolic content was calculated using the formula

$$\mathbf{TPC = C \times V/M}$$

Where, C is the concentration of the Gallic acid (mg/ml), V is the volume of plant extract (ml) and, M is the weight of pure plant extract (g).

Similarly, flavonoid content was estimated following the assay described by Subhasree *et al.,* (11) using aluminium chloride and quercetin is used as the standard. The antioxidant activity was measured from the DPPH reducing power IC_{50} assay, a method as described by Khalaf *et al.,* (12). The amount of ascorbic acid present in the samples was calculated by extracting the sample in 4% oxalic acid and titrating the extract against the 2,6- dichlorophenol indophenols dye until the endpoint was pink colour appears that persist for a few minutes, as the method described by Sadashivam and Balasubramaniam (13). The amount of dye consumed was equivalent to the amount of ascorbic acid present in the samples. The standard ascorbic solution is used as the reference, and the following formula does the calculation-

$$\text{Amount of ascorbic acid (mg/100g)} = \frac{0.5 \text{ mg} \times V_2 \times \text{total volume of the extractant (20)} \times 100}{V_1 \times 5 \text{ ml} \times \text{weight of the sample.}}$$

Where, V_1 = volume of dye consumed for standard ascorbic acid solution, V_2= volume of the dye consumed for sample.

Statistical analysis: The data were subjected to statistical analysis. All the assays were recorded in triplicates, and the values were expressed as mean ± SEM.

Results

The experiments showed definitive results (Table 1). Total carbohydrate amount was recorded 14.1 ± 2.1%. Total Crude protein content was recorded 4.21 ± 0.78%. Crude fiber content was found 1.01±0.11%. Total mineral in the form of ash content was recorded at 0.735 ± 0.11%. Total soluble fat was recorded at 0.16 ± 0.03%. A total phenolics compound was found 390mg GAE/100g of dry matter. Flavonoid content was recorded 6.66 mg QE/100g dry matter. Vitamin C in the form of ascorbic acid was recorded 105.63 mg/100g dry matter. The methanolic extract of *F. jangomas* can reduce 50% reactive oxygen species at the concentration of 11µg/ml (in DPPH radical oxygen scavenging IC_{50}).

Table: Phytochemical constituents of *F. jangomas* L.

Experimentation	Observation (±SEM)
Crude protein	4.21% ±0.78
Total carbohydrate	14.1% ±2.1
Crude fibre	1.01% ±0.11
Total lipid	0.16% ± 0.03
Ash content	0.735% ±0.11
Total phenolics compounds	390 mg GAE/100g dm ±3.9
Total flavonoids	6.66 mg QE/100g dm ±0.05
Ascorbic acid	105.63 mg/100g dm±2.9
Antioxidant activity IC_{50} (DPPH method)	11µg/ml

dm, dry matter

Discussion

There are scanty of literature that reveals the research work done on *F. jangomas*, particular fruit from Northeastern India. As because the plant *F. jangomas* is not cultivated in the mainstream by the farmers and hence drew less importance. The only wild plant serves the consumers' choice. It also does not taste sweet and hence not much popular in the market. But from this observation and also from a few literature sources, it was observed that it has a good amount of phenolics, flavonoids and ascorbic acids and hence it is a good source of antioxidants. Quantity of carbohydrate was reported (14) about 12.67 % whereas this study finds it in a similar amount at 14.1%. But the

former study found phenolic content at a very high amount at 2507.41 mg GAE/100g for the Malaysian *F. jangomas,* whereas in this study, we observed 390 mg GAE/100g of dry matter. This may happen due to the ecological diversity of the two samples. However, flavonoid content has been found at a low 6.66 mg QE/100g of dry matter. Because of the presence of phenolics, flavonoids and a higher amount of ascorbic acid, it exhibited good antioxidant values. IC_{50} value of methanolic extractant of dry fruits matter is corresponding to the 11µg/ml, which is required to a reduced half amount of reactive oxygen species (in DPPH method). The resultant 1.01% crude fiber is a pretty good amount in general. And the fruit is also found rich in vitamin C at 105.63 mg/100g of dry matter. Literature review reveals that ethanolic extract of leaves (1mg/ml) of *F. jangomas* showed higher scavenging activity than ascorbic acid (15). Moreover, unripe fruits of *F. jangomas* was investigated for antioxidant activity and revealed their strong antioxidative power (16).

Conclusion

The fruit has a vast diversified positive effect against different diseases and complications such as anti-diarrheal activity, analgesic activity, antibacterial and antifungal activity. The fruits of *F. jangomas* have shown potentiality for further investigation to identify novel bioactive components. The fruits extract may be a potential therapeutic agent for the control of oxidative and non-oxidative damage caused by reactive oxygen species. Ethno-medicinal investigations may lead to offer essential clues in the identification and development of traditionally used medicinal plants into modern drugs.

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