

Nutritional Properties And Food Applications Of Monkey Jack Fruit (*Artocarpus Lakoocha*):A Mini Review

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Abstract

Artocarpus lakoocha Roxb. is a large deciduous tree found majorly in the coastal areas of South India. It is a monoecious tree and both the male and female spikes born on the same tree. The flowering starts in the month of December and continues up to the first week of May. The onset of fruit starts in the month of May and continues up to the July. The tree is a large fruit bearer with an average yield of 58.5 to 98 Kg fruits per tree. The fruit is a good source of nutrients and phytochemicals. The seeds of the fruit are rich source of fat and depending on the variety and fruit maturity varies from 3.17 -15%. Seeds also contain a lectin 'agglutinin' which exhibit anti-inflammatory, anti-viral, anticancer and anti-HIV properties. The bark of the tree is rich in tannins (8.5%) and the powder of the bark can be used as a cure to the wounds and skin lesions. Traditionally, the flowers are used in the preparation of *sabji*, the unripe fruit is used for the pickling and ripe fruit is used for the extraction of juice and preparation of curries. This tree exhibit great potential of application in both food and pharmaceutical industry.

Key words: Monkey jackfruit, food applications, nutrients, phytochemicals

Introduction

India is a large country of wide geographical variations. As per the planning commission of India, it has 15 agro-climatic zones while Balasubramanian, (2013) has divided the country into 20 agro ecological zones. Out of its total land area of total 3.28 million Km² nearly 21.8% is covered under forest which houses a variety of the flora which is either unexplored or has limited application with in a confined area. Monkey jackfruit (*Artocarpus lakoocha* Roxb.) is such a wild fruit. It has its origin in India and is found majorly in Kerala and Tamilnadu. It has been also reported in some subtropical areas of North India. In Ayurveda it is known as *Granthiphala*, *Kshudra Panas*, *Lakuch* and *Pitanaasha*, while in Hindi various names like *Dahu*, *Barhal*, *Beng*, *Dahu*, *Sans*, *Lokoocha* are prevalent (Gautam and Patel, 2014).

Taxonomy

Monkey jackfruit belongs to family *Moraceae* and genus *Artocarpus*. The family *Moraceae* has about 60 genera and more than 1000 species. Many of these species have been used for food and medicinal purposes since ancient time. Some of the major species belonging to this genus are *Artocarpus altilis*, *Artocarpus camansi*, *Artocarpus heterophyllus*, *Artocarpus hirsutus* and *Artocarpus lakoocha* (Hari et al. 2014). The detailed taxonomy of the tree has been provided in Table 1:

Table 1: Taxonomy of the *Artocarpuslakoocha*

| | |
|---------|-------------------|
| Kingdom | Plantae |
| Phylum | Tracheophyta |
| Class | Mangoliopisda |
| Order | Rosales |
| Family | <i>Moraceae</i> |
| Genus | <i>Artocarpus</i> |
| Species | <i>Laucha</i> |

Morphology

This grows as a large deciduous tree which reaches to a height of 15- 18 meters. The leaves of this tree are elliptical or subovate with a length of 10-25 cm. It is a monoecious tree and both the male and female spikes born on the same tree. The emergence of male spikes starts in the month of December and continues upto the first week of May. While, the female spikes emerges in the second week of May and continues up to third week of May. Mannan *et al.* (1990) has reported the onset of the flowers in the month of October. The male flowers are yellow orange in colour and female flowers are reddish in colour. The presence of a single stamen and pistil represent the male and female flowers, respectively (Haque and Majumder, 2006). The onset of fruits starts in the month of May to July depending on the variety and geographical area (Islam *et al.* 2018). The fruits are irregular in shape, ranging from 5 to 10 cm in length and 3 to 6 cm in diameter with an average weight of 200-350 g. The fruit yield per tree varies from 58.5 to 98 Kg. The unripe fruits are green in colour, turns yellow on ripening and brown on over ripening. The image of the fruit is depicted in figure 1 and the detailed morphology of the tree is provided in Table 2.

Table 2: Morphology of monkey jack tree

| Parameter | Value/Attribute |
|----------------------------|---------------------------|
| Tree height (meters) | 5.2 – 6.9 |
| Tree canopy (meters) | 4.2 - 6.3 |
| Tree surface | Smooth to rough |
| Bark colour | Light brown to dark brown |
| Leaf colour | Light green to dark green |
| Leaf shape | Broadly ovate to oblong |
| Leaf length (cm) | 16.3 – 24 |
| Leaf width (cm) | 10.6 – 15.5 |
| Petiole length (cm) | 2.2 – 2.9 |
| Flowering season | December to May |
| Fruiting season | May to July |
| Fruits yield per tree (kg) | 58.5 – 98 |
| Fruit weight per unit (g) | 150 -350 |

Source: Adopted and modified from Islam *et al.* 2018



a.

b.

c.

Figure 1: a. Flowers of monkey jackfruit b. fruits of monkey jackfruit c. Dissection view of unripe fruits

Physiochemical properties of the monkey jackfruit pulp

On cutting the skin of the jackfruit excludes white latex. The unripe fruit has a white pulp which turns into yellow to orange or reddish on ripening. The yield of the pulp per fruit varies according to the size of fruit and has been reported in the range of 102.33 g to 216.36 g per fruit. The unripe fruit is sour in taste and its consumption may cause loss of appetite and tridosha impotency. The ripe pulp of the fruit is consumable and it has a unique flavour which is a mixture of sweet, sour and tangy which resembles the kiwi fruit. A large variation in the physicochemical attributes of the pulp has been reported depending on the variety, geographical location, size of fruit, maturity stage of fruit and extraction method. On an average the TSS of the ripe pulp has been reported in the range of 12.89 to 20.20 °B. The titratable acidity is reported to be 0.87 to 2.66% and TSS/acid ratio as 4.85 to 23.22 (Islam *et al.* 2018).

Table 3: Physiochemical attributes of monkey jack fruit pulp

| Parameter | Value/Attribute |
|------------------------|---------------------------------|
| Yield per fruit (g) | 102.33 – 216.36 |
| Colour | Yellow to orange |
| Pulp taste | Intermediate sour to sweet sour |
| TSS (°B) | 12.89 – 20.20 |
| Titratable acidity (%) | 0.87 – 2.66 |
| TSS: acid | 4.85 – 23.22 |

Source: Islam *et al.* 2018

Nutritional properties of monkey jack fruit

Monkey jackfruit is a good source of carbohydrates, fat, protein, dietary fiber, minerals (phosphorous, iron) and vitamins (vitamin A, Vitamin C, Vitamin B1) (Jahan *et al.* 2011). Table 4 discusses the nutritional values of the monkey jackfruit. The fruit contains a large amount of moisture i.e. 81.32 to 86.95% but the nutrients can be concentrated by drying the pulp to a powder. The fruit is a poor source of proteins, good source of carbohydrates and excellent source of fat. The major sugars present in jackfruit are fructose, glucose and sucrose. The fat is particularly present in the seeds of the fruit and is a mixture of saturated and unsaturated i.e. palmitic, oleic, stearic, linoleic, lauric and arachidic acids. It is also a good source of β -carotene which is a precursor of vitamin A. It is also rich in ascorbic acid i.e. Vitamin C. Both ascorbic acid and β -carotene exhibit

antioxidant activities and β -carotene also helps in the normal vision. Besides these, this fruit is also a good source of minerals. It is an excellent source of iron i.e. 28 to 80 mg/ 100g, which is above the daily value (Sarala and Krishnamurthy, 2014).

Table 4: Nutritional composition of monkey jack fruit

| Parameter | Value |
|--------------------------------|-----------------|
| Moisture (%) | 81.32 - 86.95 |
| Carbohydrates (%) | 1.32 - 8.62 |
| Fat (%) | 3.17 - 15 |
| Proteins (%) | 0.12 - 0.51 |
| Fibre (%) | 1.84 - 10.21 |
| Ash (%) | 1.5 - 5.33 |
| Energy (Kcal) | 72.53 - 114.87 |
| Calcium (%) | 0.083 - 0.26 |
| Potassium (%) | 0.76 - 1.47 |
| Magnesium (%) | 0.098 - 0.15 |
| Zinc (ppm) | 19.82 - 24.92 |
| Copper (ppm) | 7.81 - 12.84 |
| Iron (ppm) | 284.95 - 802.01 |
| Ascorbic acid (mg/100g) | 171.07 |
| Beta-carotene (μ g/100 g) | 3718.16 |

Source: Sarala and Krishnamurthy, 2014; Yadav et al., 2018

Phytochemical and medicinal properties

Different components and chemical extract of this plant also provide possible sources for new drugs (Tijani et al. 2008). Monkey jackfruit is a good source of antioxidants, flavonoids and phenolics which are strong antioxidants (Jasprica et al. 2007). Antioxidants from the plant sources play an important role to maintain normal health and to prevent cardiovascular diseases (Pandey and Bhatnagar 2009). Antioxidants neutralize the free radicals which can cause oxidative damage and enhance ageing (Goze et al. 2009). The pulp of ripe fruit is consumed as a refresher or tonic to the liver (Gautam and Patel, 2014). Its fruit is also a good source of steroids and saponins. A lectin 'agglutinin' is found in the seeds of *Artocarpus lakoocha* which exhibit anti-inflammatory, anti-viral, anticancer and anti-HIV properties. Bark of this tree is rich in tannins (8.5%). Any wound or skin lesion can be cured by using powdered form of its bark (Hossain et al. 2016, Tomar et al. 2015). The heartwood of *A. lakoocha* possesses tyrosinase inhibitory activities and is used in cosmetic products as antioxidant and skin whitening agent (Hossain et al. 2016). Along with its anti-ageing and whitening properties it can also be used as a medicine for various diseases like dropsy, skin infections and wounds (Hari et al. 2014). The bark of the plant also contains phytooxyresveratrol (POV) and a dose of 25 micro gram/ml of POV

can help to avert DNA damage to the cell. It has been also reported to be effective in the control of diabetes mellitus, cancer, heart disease, neurodegenerative (Rajurkar and Gaikwad 2012).

Food applications

Juice

Juice can be extracted by pressing from the ripe fruits.

Sabji

The male flowers are used to prepare *sabji* (cooked vegetable). After the cleaning the flowers are cooked by adding oil, cumin seeds, salt, pepper, turmeric and onion. They can be served with *chapatti* or *parantha*.

Pickle

Pickle is prepared from the unripe fruits of *Artocarpus lakoocha*. The freshly harvested fruits are washed in warm water, cut into small pieces and dried in sun for 2-3 hours. To prepare the pickle spices like turmeric, fenugreek seeds, saunf, salt, red chilli powder and garam-masala are added to the fried fruits, mixed well and oil is added. The mixture is kept for one month to get it ready. Sun drying is necessary during this period.

Curry

Pulp of the fruit is being used in curries as its taste is sweet and sour.

Sauce

Fruit and spike of male flowers are used to make delicious sauce.

Other products

Its application in other food preparations like *papad*, *samber*, *chicken curry*, *fish curry*, *chicken samber* etc. has been also reported (Sarla and Krishnamurthy, 2014).

Conclusions

Monkey jackfruit is a high fruit yielding tree with a history of applications in both food and medicinal purposes. The fruit contains less moisture in comparison to other fruits and is denser source of nutrients. The fruit also has medicinal properties and the pulp of ripe fruit is used as tonic for the liver. The skin of the fruit is used to treat wounds and skin lesions. Although, it has been used for the food and medicinal purposes since ancient time but its modern applications are limited. There is a need to conduct more studies on the monkey jackfruit and develop newer ways for its application in food and pharma industry.

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