

Jackfruit: It's Functional Components Boon to Human Health

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Introduction

Since antiquity, jackfruit, has been a valuable source of healthy food, particularly during the summer when food is scarce. It is a nonseasonal fruit that has made a significant contribution to the food supply of people and cattle when staple food grains are scarce. As a result, it's known as poor man's food (Singh et al., 1963). It is the national fruit of Bangladesh and is frequently consumed by most rural people. Experiments in the past have suggested that jackfruit has a wide range of therapeutic properties, including antioxidant, anti-inflammatory, antibacterial, anticariogenic, antifungal, antidiabetic, and hypoglycemic properties. However, it is an underutilized fruit on a commercial scale, owing to a higher percentage of inedible portion, which results in more waste, difficulty peeling and separating edible bulbs from the rind, lack of knowledge about proper postharvest practises, and inadequate processing facilities in the regions where they are grown. As a result, following proper postharvest methods and converting jackfruit into minimally processed items like precut jackfruit may encourage more people to eat jackfruit, and converting jackfruit waste materials into valuable products may help with waste management.

India is presently recognised as the Diabetic Capital of the World, as the number of diabetics continues to rise. As a fibrous fruit with a low glycemic index (60-65), jackfruit is advantageous to diabetics because fibre delays the absorption of sugar into the bloodstream. Now that it has been clinically proven that Jackfruit lowers blood sugar levels and aids in the reversal of diabetes, it is a good natural source to manage glucose levels rather than relying on expensive pharmaceuticals or being insulin reliant externally (Parihar et al., 2021). The jackfruit, also known as "kathal" in English, Panas (Hindi), Kanthal (Bengali), Palaa (Tamil), Phanas (Gujarat & Mar), and Chakka (Malayalam). The scientific name for jackfruit is *Artocarpus heterophyllus*, and the fruit belongs to the Moracea family and is endemic to

Southeast Asia (Ajiboye et al., 2018). There are about 100 species in this genus, which are found in the Indo-Malayan region and China. In tropical regions like as Bangladesh, India, Sri Lanka, Vietnam, Thailand, Malaysia, and Indonesia, the fruit is widely grown. Bangladesh grows over 70 distinct species of fruits (Uddin et al., 2021). After banana, mango, and pineapple, it ranks fourth in terms of production volume (Saha et al., 2021). In Bangladesh, the jackfruit ranks third in terms of fruit production.

Botanical description

Tree is monoecious, with both male and female inflorescences on the same branch. Cross-pollination is used to fertilise the plants, and seeds are used to propagate them. The entire fruit growth process takes three to seven months from the time of pollination, depending on the country (Baliga et al., 2011). At five years of age, the jackfruit tree can reach a height of 8 to 25 metres and a canopy diameter of 3.5 to 6.7 metres. It has a straight stem and a dense canopy that is usually shaped like a dome. The greyish-brown, scaly, uneven, and rough bark of the tree trunk is rarely buttressed (Rahman et al., 1999). The tree grows best in tropical humid and rainy climates but rarely survives cold and frosty conditions. The tree thrives in humid, rainy regions in the tropics, although it is susceptible to cold and frost. The jackfruit, the largest of all cultivated fruits, can weigh between 4.5 and 30 kg, with a maximum weight of 50 kg. Jackfruits come in two varieties: one is small, fibrous, squishy, and mushy, while the other has delicious carpels with a texture similar to raw oysters. The other is crisp and crunchy, but not very sweet. Even though they are tough to digest, the huge seeds of this nonleguminous plant are edible (Siddappa et al., 1957). A single seed is enclosed in a white aril encircling a thin brown spermoderm, which covers the fleshy white cotyledon.

The fruit axis, persistent perianth, and real fruit are the three main parts of the fruit. The axis, or core, of the fruit is inedible and, due to the presence of laticiferous cells, is rich in latex, which holds the fruits together (Prakash et al., 2009). The perianth is the most significant and substantial part of the fruit. It is divided into three sections: a lower fleshy edible part known as the bulb; a middle fused portion that produces the syncarp's rind; and an upper free and horny non-edible region known as the spikes. The ripe fruit (arils or flesh) contains sweet yellow bulbs and seeds with a pleasant flavour. Each fruit is 30–40 cm long

and oblong cylindrical in form. When fully mature, they taste acidic to sweetish. All components of the fruit are edible except the spiky outer bark (Anonymous et al., 1985).

Phytochemical composition

The flesh (30-32%), seeds (18%), and rind (5-55%) make up the three sections of the jackfruit compound fruit (Anuradha et al., 2017). Apart from the pulp, the underutilized sections of the jackfruit, such as the seed and rind, have been shown to have high nutritional content. Depending on the kind, jackfruit has a different chemical composition. Jackfruit has a low caloric content, including 94 calories per 100 grams (Mukprasirt et al., 2004). The carbohydrate content of different jackfruit seed cultivars can range from 37.4% to 42.5% (Chrips et al., 2008). Arginine, cystine, histidine, leucine, lysine, methionine, threonine, and tryptophan are among the amino acids found in jackfruit (Pavanasasivam et al., 1973). Besides, jacalin is the major protein in jackfruit seed which possessed immunological properties. Ripe jackfruit has 1.9g of protein per 100g of flesh. Vitamin C is abundant in jackfruit. Furthermore, it is one of the few fruits that is high in the B-complex vitamins, including vitamin B6 (pyridoxine), niacin, riboflavin, and folic acid. Jackfruits that are fully ripe have a high nutritional content. Tiwari et al. (2015) found that ripe jackfruit contains minerals such as calcium (30.0-73.2 mg), magnesium (287-323 mg), vitamins, and organic acids. The fibre content of jackfruit was found to be 0.33-0.40%, with no significant differences in fibre content between different parts of the fruit at different stages of ripening. The fibre content of immature and ripe jackfruit has been reported to be 2.6 % and 0.8%, respectively.

According to studies, jackfruit includes a wide range of compounds, including carotenoids, flavonoids, volatile acids, sterols, and tannins, and their content varies depending on the species (Arung et al., 2007). Carotenoids are known to give many foods a yellowish-red colour, and the jackfruit's ratio is believed to give it the different yellow to orange shades of color (Jagdeesh et al., 2010). The kernel has been shown to contain β -carotene, α -carotene, β -zeacarotene, α -zeacarotene, and β -carotene-5,6 α -epoxide, as well as crocetin and a dicarboxylic carotenoid. All-trans-lutein (24–44%), all-trans-carotene (24–30%), all-trans-neoxanthin (4–19%), 9-cis-neoxanthin (4–9%), and 9-cis-violaxanthin (4–10%) are the major carotenoids found in jackfruit, according to recent research. Fruits gathered from

different tree varieties, on the other hand, showed both qualitative and quantitative differences (Faria et al., 2009).

Biological activities

Jackfruit (*Artocarpus heterophyllus* Lam) is high in various high-value compounds with possible physiological benefits. It's antibacterial, antifungal, antidiabetic, anti-inflammatory, and antioxidant properties are well established.

- Jackfruit is a high-fiber fruit that is good to diabetics because the fibre decreases the pace at which glucose is released into the bloodstream. Consumption of jackfruit has now been clinically demonstrated to lower blood glucose levels and aid in the reversal of diabetes. The effect of *Artocarpus heterophyllus* leaves on normal human subjects and mature-onset diabetes patients' glucose tolerance. When tested at oral doses comparable to 20 g/kg of starting material, the extracts of *Artocarpus heterophyllus* considerably improved glucose tolerance in normal volunteers and diabetic patients (Fernando et al., 1991).
- The crude methaolic extracts of *Artocarpus heterophyllus* stem and root, barks, stem and root heart-wood, leaves, fruits, and seeds were partitioned with petrol, dichloromethane, ethyl acetate, and butanol, revealing fractions exhibiting a broad spectrum of antibacterial activity (khan et al., 2003).
- The total phenolic and flavonoid content of jackfruit flesh extracts is related to antioxidant activity. Fresh seed and flesh, according to Soong et al., 2004, contain significant ascorbic acid equivalent antioxidant effects and 27.7 and 0.9 gallic acid equivalent phenolic contents, respectively, which are considered to have contributed to roughly 70% of the overall antioxidant activity. Vitamin C, found in jackfruit, protects the skin from the damage that happens as a result of the natural ageing process and prolonged sun exposure. Vitamin C is also necessary for the creation of collagen, which gives the skin rigidity and strength (Babitha et al., 2004), as well as maintaining oral health.
- Isolated bioactive compounds from the fruits of *Artocarpus heterophyllus* have anti-inflammatory properties. Flavonoids found in jackfruit help to prevent the release of inflammatory mediators from mast cells, neutrophils, and macrophages (Fang et al., 2008).

Conclusion

Despite the fact that jackfruit (*Artocarpus heterophyllus*) has a high nutritional value, it is neglected by people due to a lack of knowledge about its nutrient content and optimal application in food formulations. Due to its purported health benefits, jackfruit consumption has increased in recent years. The pulp and seeds of the jackfruit are high in various high-value chemicals with possible physiological benefits. Jackfruit is a very nutritious and appealing fruit crop due to its diverse bioactive profile. Consumers can benefit from the wide range of health benefits of jackfruit by using standardized jackfruit products.

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