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## Nutritional composition and health benefits of jackfruit seed flour: A review

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### Abstract

Jack fruit (*Artocarpus heterophyllus* Lam) is the largest produced fruit in the world belonging to Moraceae family. Although it originates from India still it is seen in most parts of Asia, Africa, and some regions of South America. Humid and hot region is suitable for the growth of this tree. Due to their diversified use and have remained wild or semi-domesticated it is considered as an underutilized crop. Odisha was the second largest producer of jackfruit in the country after Tripura. Jackfruit contains vitamins like vitamin A, vitamin c, thiamine and riboflavin etc. & also minerals like calcium, potassium, iron, sodium, zinc, and many other nutrients. It has high antioxidant activity so that it will help in prevention of free radicals. It contains potassium and calcium to regulate the blood pressure and beneficial for bone growth. The jackfruit seeds has been utilized for flour processing and utilized for the development of bakery products, extruded products, chapaties preparation etc. Seeds have many medicinal properties such as helpful for improving digestion. It acts as anti-inflammatory, antibacterial, anti-carcinogenic, antifungal agent, and helps in inhibition of melanin biosynthesis, wound healing.

**Keywords:** Nutritional, underutilized, jackfruit seed, health benefits

### Introduction

Jackfruit (*Artocarpus heterophyllus*) is mostly found in Asia, Africa, and South America. In India, major jackfruit growing states are Tripura, Odisha, Kerala, Tamil Nadu, Assam, and Bihar. Jackfruit is the state fruit of Kerala. Odisha is the second largest producer of jackfruit in the country after Tripura (Print, 2022). These trees are distributed in all districts of Odisha mostly confined to forest areas, backyards, wastelands, and road sites with around 3.15 MT of production per annum. The agro-climatic condition of Odisha is suitable for its production & about 15 districts of Odisha contributed a major portion of the jackfruit production in the state. It is also a naturally growing crop in Odisha. A jackfruit tree mostly requires warm and moist conditions to grow. It has high productivity about 25.71 t/ha. A mature tree can yield from ten to two hundred numbers of jackfruits.

The jackfruit is consumed in both raw and ripe stages. Mostly the tender jackfruit is used in Indian cuisine and when it ripens the pulp is used to make a variety of dishes, including custards, cakes, Idli or dosas, pickles etc. Jackfruit seeds are underutilized and less acknowledged by people, but they have considerable nutritional benefits and constitute about 10% to 15% of the fruit. Due to its perishable nature, the seeds are usually discarded as waste, but when stored in a cool, moist environment, they have a shelf life of about one month. To extend the shelf life, the roasted seeds can be made into powders and used to prepare different value-added products. The seeds from ripe fruits can be boiled, baked, or roasted for consumption. It has a milky, sweet taste like Brazil nuts. Jackfruit seed flour is prepared by sun drying and grinding method. It is seen that products with incorporated jackfruit seed flour possess more nutraceutical value leads to better consumer acceptability. Jackfruit seed powder is used as alternative flour in bakery and confectionary industry to develop nutritious products by blending with wheat flour and other low-cost flours.

Hence, the demand for jackfruit seeds has increased consumer awareness in the matter of diet-disease relationship. It is believed that jackfruit seed has potential functional & nutritional properties along with physiological benefits.

### Nutritional Composition

The nutritional and antioxidant properties of jackfruit seeds have not yet been fully explored. Jackfruit seeds provide an ample supply of protein, fiber, and starch. According to a study carried out by Chrips *et al.* the carbohydrate concentration of different varieties of jackfruit seed may vary from 37.4% to 42.5%.

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The protein concentration of the jackfruit seeds may vary from 5.3 to 6.8%. Jackfruit is also a rich source of many minerals such as Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Sulphur, Zinc, Copper etc. On the dry basis jackfruit seeds contain 14 percent protein, 80 percent carbohydrate, 2 percent ash, 1 percent fat. The recorded calorific value of seed flour was 356 kcal/100 g. The presence of vitamins A, Vit-B, Vit- C and pectin compounds; it helps in maintaining pancreatic health and purifies the blood. On an average 1kg seeds contain potassium (1478 mg), copper (10 mg), calcium (3087 mg), iron (130 mg) and sodium (61 mg). However, the nutritional composition depends on the variety and environment, where the seeds have been cultivated. Many flavonoids and isoterpenes are present in the seed that enhance its nutritional profile. It contains phenols, saponins, alkaloids, tannins, steroids etc. It is also a good source of Riboflavin (vit-B<sub>2</sub>). The fresh seeds have considerable amount of ascorbic acid, high amount of phenolic compounds and antioxidant activity, which contribute to about 70 percent of the overall antioxidant activity. Jackfruit seeds contain sulphur and its derivatives, which are responsible for its anti-microbial action.

**Table 1:** Proximate Composition of Jackfruit seed

Proximate Composition	Tulyathan V. et al. (2002) <sup>[13]</sup> (%)	Tiwari et al. (2015) <sup>[12]</sup> (g)	Abida Sultana et al. (2017) (%)
Moisture	7.70±0.20	51.6-57.77	39.22±0.18
Ash	3.97±0.04	1.25-1.50	1.30±0.10
Crude Protein	11.02±0.46	6.6	16.01±0.11
Crude Lipid	1.01±0.12	0.4	0.98±0.02
Crude Fiber	2.36±0.04	1.5	3.56±0.14
Total Carbohydrate	81.64	38.4	42.49±0.21

The variations of results in moisture, ash, protein, lipid, fibre & total carbohydrates may be caused due to different seed varieties, environmental conditions, and also depends on the procedure for estimation & taking sample

**Table 2:** Mineral Composition of jackfruit Seed Flour in mg/100 gm

Component	Amount(mg/100gm)	Source
Calcium	115.85	Abida Sultana et al. 2017
Magnesium	96.75	Abida Sultana et al. 2017
Potassium	705.71	Abida Sultana et al. 2017
Phosphorus	0.13-0.23	Tiwari et al. 2015 <sup>[12]</sup>
Iron	0.002-1.2	Tiwari et al. 2015 <sup>[12]</sup>
Lithium	0.05	Abida Sultana et al. 2017
Sodium	38.41	Abida Sultana et al. 2017
Ammonium	12.33	Abida Sultana et al. 2017

The value of potassium (705.71 mg/100 gm), calcium (115.85 mg/100 gm) and magnesium (96.75 mg/100 gm) were present is much higher in quantity than the other minerals. Here the Sodium to Potassium ratio is less than one, may recommended by doctors to prevent hypertension. As it is rich source of Calcium can also be helpful for bone development.

### Health Benefits

Jackfruit seeds are brown in color, round and oval shape, 2-4 cm long, and 1.5-2.5 cm thick. A single fruit contains 100 to 150 seeds comprising 10-15 percent of the total fruit weight. Seeds obtained from ripened fruits are well dried in the sunlight, and stored properly for further use. Still, a very high

quantity of seeds is wasted annually because lack of awareness regarding its nutritional and bio-active profile as well as ignorance of its processing and storage properties. Storage under cool and humid environment can increase the shelf life of seeds up to 30-35 days. The utilization of jackfruit seeds as a protein substitute can pave a way to cope with the deficiency disorders like PEM. Consumption of jackfruit seeds is quite beneficial since they promote digestion, exhibit anti-carcinogenic properties, and prevent skin wrinkles. Bioactive compounds like isoflavones, lignans, and saponins present in jackfruit seeds possess many health benefits. Sulphur and sulphur compounds present in the seeds have antimicrobial properties. Germinated jackfruit seeds showed antifungal, anti-bacterial and immune-modulatory properties. Hence seeds are suitable for the production of pharmaceutical products to enhance the power of the drug. Jacalin is an important lectin present in the seed evaluates the immunity of an HIV diseased person when used as a tool. For good hair growth jackfruit seeds are very beneficial besides healthy blood circulations and also healthy digestion. High amount of starch, low in calcium and iron and very good source of vitamin B2 (Arpit and John, 2015) <sup>[3]</sup>. This seeds are also helpful in bone health because rich in magnesium which is an essential mineral necessary in absorption of calcium and works along with calcium for strengthening the bones and prevents disease like Osteoporosis (Maurya, 2016). Because of these medicinal values and effective ingredients, seed flour has great importance for use in marketing and food manufacturing industry. Seeds are also consumed as a substitute of potatoes. These can be used as a source of protein by incorporating the seed flour in food formulations. Now-a-day, the roasted seeds are extensively used in the preparation of many food products. Roasted seeds are also added into cappuccino as a substitute to fulfill the rising demand of cocoa powder. Apart from roasting, the seeds can be consumed as boiled, germinated or as flour and are also used in the preparation of tomato sauces, curry, syrups, and brine dishes.

### Conclusion

Jack fruit seed is underutilized and limited to the home scale level. From the different studies, it is seen that the medicinal & nutritional importance of jackfruit is so high, which can't be ignored. However due to ignorance, the seeds are generally discarded as waste. It can exhibit high potential to be utilized as a functional ingredient. This needs to explore its utilization at a higher level through research and awareness among the consumers, industries and policy makers. The aim of this article is to disseminate the knowledge on the nutritional and health benefits of jackfruit seeds, to promote the cultivation of jack fruit trees for commercial scale food production in Odisha and developing value added products.

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