

**Research Note :****JACKFRUIT: A FOOD OF PROMISE****Jitendra Singh\*, P.S.Chauhan, Kavita A., Prerak Bhatnagar and R.R.Meena<sup>1</sup>***College of Horticulture and Forestry, Agriculture University, Kota Campus, Jhlarapatan, Jhalwar- 326 023 (Raj.)*<sup>1</sup>*KVK, Jhalawar**\*E-mail : jsingh\_rau2s@rediffmail.com*

**ABSTRACT :** The world over there is heavy reliance on three crops—rice, wheat and maize to fulfill dietary energy requirement of the mankind. There are many other crops of promise which can be utilized to share the dominating reliance on these crops. Jackfruit is one of them. Its ripe fruits contain 22.4–24 per cent carbohydrates and are rich source of it. They contain 0.8 per cent mineral matter. The seeds containing 32.6–38.4 per cent carbohydrates are richer than fruits. Their mineral matter content is 1.2–3.5 per cent and are hence better than fruits in this regard. Of the total weight of fruits, pulp constitutes about 30 per cent. It indicates good proportion of edible mass of fruits. The fruits can be hence popularized as one of the food crops of high utility. It can be grown on marigold soil with less input. It can go as one of the components in agr/horti based farming system under agroforestry.

**Keywords :** Jackfruit, food value, hunger, malnutrition, food security, nutrition security.

The world over, there is heavy reliance of population on rice, wheat and maize to meet out food requirement of the mankind. These three crops altogether meet more than 50 per cent of the total dietary energy requirement across the globe. There are many other crops which have the potential to grow well in marginal soil with low inputs. Jackfruit is one of them. It is grown in India, Myanmar, Sri Lanka, Southern China, Malaysia, Vietnam, Indonesia and the Philippines. Jackfruit derives its name from portuguese word Jacca which has been derived from Malyalam word Chakka. The plant is native of India. It is found growing wild in evergreen tropical forests of Western Ghats upto 1200 m altitude.

In India 32 million people are destined to go sleep without food. In our country the number of hungry and malnourished people is almost equal to the population of America. Report says that the weight of 43.5 per cent Indian children is less than their required weight. The problem in this regard is graver than even the Sub-Sahara region of Africa. As per report of Food and Agriculture Organization, Agriculture Development International Fund, World Food Plan, India was at the top in the list with 21.7 crores malnourished people. Before dealing to option inclined towards use of underutilized fruit- jackfruit, let us examine the pervasiveness of hunger and malnutrition situation across the globe.

**World scenario of hunger and malnutrition**

The situation of hunger and malnutrition is invasive globally. The following figures and facts provide a view of hunger and malnutrition:

- ✓ 8700 lacs people are not having food to eat
- ✓ Of the total malnourished population, 98 per cent lives in developing countries
- ✓ Two-third of world's total hungry people live in seven countries, i.e., Bangladesh, China, Congo, Ethiopia, India, Indonesia, and Pakistan
- ✓ The problem of hunger is very insistent in Asia and pacific, Sub-Sahara and Latin America-Caribbean countries where 578.0 million, 239 million and 53 million people are food insecure
- ✓ Of the total hungry population, 60 per cent is ladies only
- ✓ Out of every 6th child, one borne of less weight in developing countries
- ✓ Due to malnutrition, every year 26-lac children die
- ✓ Of the total death of children, every third instance of death is attributed to hunger
- ✓ At every fifth second one child die due to hunger-borne disease

- ✓ 75 per cent of the world's poorer of the poor, i.e. 1400 million ladies, gents and children live in rural area and depend upon agriculture and allied sectors for their livelihood
- ✓ 50 per cent sufferer of hunger are from farming community

## HUNGER AND MALNUTRITION

Hunger denotes to inadequacy of food. Malnutrition implies to imbalance of macro and micro-nutrients in the body. It is estimated on the basis of age of children below three years age. Malnutrition may be due to inadequate or improper intake or biological activities which remain unaffected by physiological or environmental reasons. In India poverty is estimated on the basis of minimum consumption expenditure which is based on consumption of 2400 calories in rural areas and 2100 calories in urban areas. Of the total household in the country, 1.9 per cent is under curse of hunger. The situation is very much harsh in West Bengal, Orissa, Assam, and Bihar.

## FOOD AND NUTRITION SECURITY

Food security means availability of adequate, safe and health good foods which is essential for active and healthy life of people. Food means every thing which an individual eat or drinks for growth and survival. Of course, food security is intermingled with nutrition security but the area of nutrition security is extensive. Nutrition security mean to adequate nutrition status of an individual with respect to protein, energy, vitamin and mineral matter. Summatively, food and nutrition security means availability and accessibility of an individual to food which is essential for helathy and pleasing life.

Food problem is of two types; 1. Quantitative and 2. Qualitative. Quantitative types include total demand and supply of food, whereas, qualitative type include availability of nutritious and balanced diet foods. As per an estimate, on an average, an individual should get 880g food (Table 1) including pulses but availability is declining. During 2010, it declined and remained only 441g. It is the greatest reason of food and nutrition insecurity. Nobel laureate Amartya Sen said that if grains stored in godowns of FCI is stacked in, they will reach moon and also come back. It means our godowns have grains; availability is there, but access is not there. Poor and needy people fail to purchase it at the prices of BPL. It is negative situation of food and nutrition security.

However, the situation can be averted by resorting the measures additive to the food pool. There are many fruit crops which can be used to strengthen the food pool of the country. In spite of this unacceptably high number of people suffer from food insecurity. Jackfruit holds utility in this regard. The chapter intends to highlight the plant profile focusing more on food value so that there may be retrospection as regard to utility of jackfruit in food web of the society.

## Jackfruit : The plant profile

Jackfruit belongs to the family Moraceae. It is related to the genus *Artocarpus*. This is the third largest genus in the family. Its plants are monoecious, flowers are minute and numerous. They appear on a fleshy rachis. Male inflorescence is axillary and borne near end of twigs. Female inflorescence appears on short axillary leafy twigs called footstalks or on trunk or branches. It is large and prickly. Its colour is greenish oblong and grow to a length of 4-12cm with a diameter of 2-7cm at the time of maximum receptivity. Individual female flowers are characterized by a small, greenish perianth and a unilocular ovary with relatively long style. After 15-28 days of emergence of inflorescence, stigma becomes receptive. The mean number of individual flower per female inflorescence varies from 1910-11245. Individual tree produces 8-103 female inflorescence during a year (Pushpakumara, 5).

Male inflorescence is found mainly at the terminal shoots and branches of the trees crown and also on the main stem. Initially male inflorescences are light green with a smooth surface which becomes yellowish and rough when anthers appear. They are cylindrical or barrel shaped 2-11cm long and 1-5 cm wide. The male inflorescence remains densely covered with minute yellow flowers. Each male flower has a single stamen with a short anther filament. Male inflorescence doesn't continue to grow after anthesis. It drops off 25-39 days after emergence from stipule. At the last stage, when male inflorescence is about to drop-off, black moulds often develop on the surface, turning it black before dropping down. A single anther produces a large number of pollen grains ranging from 500-1100 . If this is equated, a single male inflorescence appears to produce five to six million pollen grains (Pushpakumara, 5). The pollen grains are sticky in the early morning in the newly opened anthers and on rainy days, and they dry on sunny days. They are visible with the naked eye as a yellow powder. The male inflorescence doesn't produce nectar on any other pollinator rewards other than pollen.

The plant produces large, round-cylindrical to pear shaped, greenish fruit known as syncarp. Syncarp is a type of multiple fruit which consists of several achenes (fruitlet or true fruit). It takes three months time in maturity after emergence of inflorescence from the stipules. Fruit stalks usually produce more than one inflorescence. However, in some cases young syncarp (fruit) and inflorescence buds are produced on the same stalk. In such situation maturation of syncarps generally takes place chronologically. The inflorescence which emerges earlier is more sure to produce syncarp. The length of syncarp varies from 16.70 cm to 12.34 cm. The weight of syncarp varies from 1.6-20.0 kg. The outer surface of syncarp remains covered with a stiff rind and spines. It gives off very powerful fruity aroma when ripe (Pushpakumara, 5). The spine is formed from the tip part of the perianth of individual flower which later joints to form rind. The syncarp axis (core) is the modified mature inflorescence axis. It is dome shaped, rigid and slightly fleshy. The axis contains vascular element, it is lacticiferous in nature and is non edible. The fruitlets or true fruits are indehiscent and consists of fleshy, yellow white pericarp (aril) surrounded with the seeds. The fruitlets are 3-11cm long, 2-4cm wide and weigh about

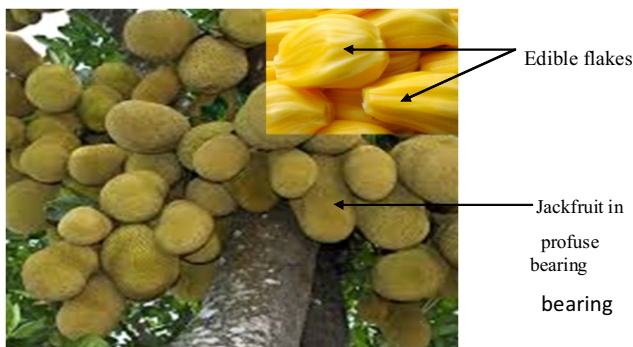


Fig.1: Jackfruit– A food of promise

5-62g. The lower free part of the perianth becomes fleshy and edible. The aril colour varies from yellow to golden yellow or orange. The seed is firm and waxy, oval, oblong or oblong ellipsoid in shape. Each seed is 2.5-4.5cm long, 1-4cm wide and 2.5-14g in weight. Seeds remain covered with coriaceous thin and leathery testa. Many flowers on the inflorescence don't produce fruitlets and develop into tough string like structures called white pulp. The pulp occupies spaces between fruitlets. Number of seeds in a syncarp ranges from 1-645. The inner seed coat is a thin brownish membrane. The seed is thickened at the hilum. The fleshy cotyledons are very unequal. The one cotyledon only may be about one third to one half the size of the

other. The embryo has a superficial radicle. On an average, the syncarp consists of 27 per cent of edible aril, 15 per cent of edible seeds, 20 per cent of white pulp (undeveloped perianth) and rind and 10 per cent core.

**Food Value**

Jackfruit is referred to as “poor man’s food” as well as the “nutrients of giants” due to its nutrient composition. In general 100g raw jack flakes contain 84g water, 9.4g carbohydrates, 3g of fat and 2.6 g protein. It is also rich in minerals such as phosphorus and iron. Jackfruit is a multipurpose fruit for consumption. Being rich in carbohydrates, it is useful as a source of energy. Its unripe or ripe, both kind of fruits can be consumed, cooked or uncooked. Young jackfruit has a mild flavour and distinctive texture. Cooked young jackfruit is used as cuisine in India, Bangladesh, Sri Lanka, Indonesia and Vietnam. Boiled jackfruit is used in curries as a staple food. Jackfruit is known for high medicinal and nutritional values. All parts of the plants are used as food or medicine. Being rich in potassium, jackfruit helps in lowering blood pressure. The fruits contain phytonutrients which act as anti-cancerous or anti-hypertensive. Jackfruit is low in saturated fat, cholesterol and sodium and high in vitamin C content and manganese.

In jackfruit, the edible pulp makes up about 30 per cent while the seeds constitute 5 per cent. The remainder is rind. Seed contains more protein and carbohydrates than the pulp (Table 1)

**Table 1 : Composition of the edible pulp and seed.**

Constituents	Edible pulp (%)	Seed (%)
Water	73.1	51.6
Protein	0.6	6.6
Fat	0.6	0.4
Carbohydrates	23.4	38.4
Fibre	1.8	1.5
Ash	0.5	1.5

The nutrients content varies with different stages of growth as given in Table 2.

**Table 2 : Nutritive value of fruits at different stages of growth (per 100g edible part)**

Constituents	Immature fruits	Mature fruit	Ripe fruits	Seeds
Water (g)	85.2	72	65.6-73.1	51.6-60.9
Energy (g)	51	98	94-98	143-151
Carbohydrates (g)	11.5	8.5	22.4-24	32.6-38.4

Protein (g)	85.2	72	65.6-73.1	51.6-60.9
Fat (g)	0.6	0.6	0.4-0.6	6.2-0.6
Fibre (g)	2.6	1.0	0.8-1.8	1.4-1.8
Minerals (g)	0.7	-	0.5-1.2	1.2-3.5
Calcium (mg)	53	22	19-23	23-35
Phosphorus (mg)	20	38	18-68	80-126
Iron (mg)	0.4	0.6	0.7-11	0.8-1.2
Na (mg)	03	02	02	3-22
Potassium (mg)	323	407	88-407	673-841
Vitamin A (mg)	30	40	175	25
Thiamine (mg)	0.12	0.03	0.04-0.09	0.18-0.22
Riboflavin (mg)	0.05	-	0.05	5-0.06
Niacin (mg)	0.5	-	0.9	0.5
Ascorbic acid (mg)	12	0.8	5-5.8	10-17

Source: Wealth of India (9)

The pulp at different stages differ in its nutrient composition (Table 3).

**Table 3 : Nutritive value of jackfruit pulp (per 100g edible portion)**

Constituents	Tender	Ripe	Mature
Moisture (%)	84.0	77.2	64.5
Carbohydrates (g)	9.4	18.9	25.8
Protein (g)	2.6	1.9	6.6
Fat (g)	0.3	0.1	0.4
Fibre (g)	4.4	1.1	1.3
Total mineral matter (g)	0.9	0.8	1.2
Calcium (mg)	50.1	20.0	21.0
Phosphorus (mg)	97.0	30.0	28.0
Iron(mg)	1.5	500.1	0.8
Potassium (mg)	206.0	350.0	246.0
Vitamin A (IU)	0	540.0	17.0
Thiamin (mg)	0.2	30.0	0.2
Riboflavin (mg)	0.1	0.1	0.1
Nicotinic acid (mg)	0.2	0.4	0.3
Vitamin C (mg)	11	7.0	11.0
Calorific value	50	84	139

Source: Anon. (1), Faruque and Ornar (4), SCUC (7)

Jackfruit is rich in fibre, calcium, phosphorus, potassium, magnesium and carbohydrates. Owing to carbohydrates richness, jackfruit is having potential

for the production of fermented beverages. In fermented jackfruit, alcoholic concentration reached to 13 degree GL which shows its utility for demi-sec wines. Based on sensorial analysis, its vines had acceptance at 78 per cent (Asquieri *et al.*, 2).

Jackfruit is good source of essential amino acids. The content is as shown in Table 4.

**Table 4 : Essential amino acids of tender jackfruit**

Element	Tender fruit	Seed
Arginine	1.92	-
Cystine	1.94	0.96
Histidine	0.96	-
Leucin	8.0	5.3
Isoleucine	7.2	4.8
Lysine	4.8	5.8
Methionine	1.44	0.8
Phenylalanine	7.66	4.2
Threonine	5.76	4.3
Tryptophan	1.28	1.12
Valine	8.8 g/16 g N	45g/16 g N

Jackfruit seeds are mostly starchy, but contain moderate amount of protein, calcium and thiamine and have high pectin content. They have high jelling property. Seed composition is furnished in Table 5.

**Table 5 : Composition of jackfruit seed**

Elements	Contents (mg/100g)
Mg	54.0
Na	63.0
P	246.0
Cu	0.2
S	356.0
Cl	14.0
Oxalic acid	4.0
Choline	52.0

Source : Brown (3)

## Rind

The rind is fibrous and rich in pectin and calcium. It has good jelling properties. The rind contains colourless oil (0.03%). It has odour resembling that of the fruit. The waste generated from jackfruit is superior to green grasses. Hence, it can substitute for fodder grasses.

## Leaves and roots

The leaves and stems contain sapogenin. The leaves yield cycloartenone, cycloartanol, alpha sitosterol and tannin. They contain high percentage of fibre. Root contains beta sitosterol, ursolic acid, betulinic acid, cycloartenone and recently identified compound artoflavanone. The detailed composition of leaf is furnished in Table 6.

**Table 6 : Leaf analysis of jackfruit**

Content	Total (%)
Moisture	70.79
Dry matter	29.27
Ash	11.98
Crude fat	3.44
Crude protein	14.20
Neutral digestible fibre	46.92
Neutral acid digestible fibre	46.88
Hemicellulose	0.04
Cellulose	40.25
Lignin	1.42
Silica	2.59
Digestibility of dry matter	50.79

Source: Rajaguru, (6)

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