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RESEARCH ARTICLE :

Nutrition knowledge on jackfruit- A comparative study among farmers and non-farmers of Thrissur district in Kerala

■ **N. Mridula and Baiju Thoppil**

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SUMMARY : Jackfruit is a super food that is truly organic, nutrition packed and that gives a good yield without substantial input. However, the public has not utilized its possibilities, commercially and nutritively. Resultantly much of this nutrition-packed fruit and its parts are wasted, making jackfruit an underutilized fruit crop. Kerala government declared jackfruit as the state fruit crop in March 2018. In this circumstance, the present study was taken upto explore the nutrition knowledge of the farmers and non-farmers regarding jackfruit and its various parts. The study was conducted by randomly selecting 65 farmers and 65 non-farmers from the various Panchayats of Chavakkad, Ollukkara, Puzhakkal and Kodakara blocks of Thrissur district in Kerala state. Assessment of the knowledge score indices showed that significant difference existed between the trained and untrained non-farmers as well as the among trained and untrained farmer populations. Also, it was seen that the females showed higher knowledge score indices among the non-farmers.This study urges the government and the concerned departments to conduct more trainings and awareness campaigns on the nutritional aspects of jackfruit so that it can contribute to local food security, can create additional income to farming families and SHGs through value addition and marketing and enable the agripreneurs to start new enterprises based on it, thus, augmenting the rural economy.

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Author for correspondence :
N. Mridula
Central Training Institute (KAU), **Mannuthy (Kerala) India**
Email: mridulanarayanan @gmail.com

BACKGROUND AND OBJECTIVES

Jackfruit, scientifically *Artocarpus heterophyllus* Lam., is a tropical fruit crop which is considered as a super food because of its nutritional qualities. It is an evergreen tree of Indian origin, belonging to the family Moraceae and is widely grown in Asia. Research has justly observed, the fruit contains beneficial phytochemicals, protein, vitamins, minerals, antioxidants, polyphenols, alkaloids and carotenoids. Every part of this tree has rich chemical and elemental constituents that have been providing significant health benefits to the human race from the ancient times.

India is a major grower of jackfruit. As per the annual report of National Horticulture

Table A: Questionnaire to assess the nutrition knowledge on jackfruit

Sr No.	Put ✔ in appropriate column as per your knowledge	Correct	Incorrect	Don't know
1.	Jackfruit provides energy			
2.	Fruit and seeds of jackfruit contain protein			
3.	Jackfruit contains round 70-80 % water			
4.	Jackfruit is rich in calcium and magnesium that helps to maintain bone health			
5.	Jackfruitis suitable for daily consumption			
6.	Jackfruit contains cholesterol			
7.	Jackfruit is rich in Vitamin B6 which is rarely seen in fruits			
8.	Jackfruit has beneficial dietary fibres			
9.	The presence of copper in Jackfruit makes thyroid metabolism easier			
10.	The low glycemic index of unripe Jackfruit makes it a suitable food for the diabetic patients			
11.	Starch is present in jackfruit			
12.	Manganese present in the jackfruit helps to control the blood sugar			
13.	Jackfruitis rich in B complex vitamins			
14.	Vitamin A, E and carotene that help to protect the human body from cancer are present in the Jackfruit			
15.	Iron which helps to combat anemia is present in jackfruit			
16.	The leaves and seeds of jackfruit are nutrition-rich			
17.	Potassium that helps to control blood pressure is present in jackfruit			
18.	Jackfruit is rich in vitamin C, which ensures immunity and health to the eyes and skin			
Have you participated in any seminar or training or awareness campaign or exhibition on jackfruit?		Yes	No	

Board (2017), area under jackfruit in India is 1.56 lakh hectares and the production is 18.26 lakh metric tons. Kerala state, one of the significant producers, produces 30-60 crore jackfruits annually. The entire production is without any substantial input water, fertilizers or pesticides. This makes jackfruit a truly organic, nutrition packed crop with great potential for value addition. However, the public has not utilized its possibilities, commercially and nutritively. Resultantly much of this nutrition-packed fruit and its parts are wasted, making jackfruit an underutilized fruit crop.

Realizing the jackfruit's potential to contribute to food and nutritional security combating climate change and to employ its income generating capacity by processing and value addition, Kerala government declared jackfruit as the state fruit crop in March 2018. In this circumstance, the present study was taken upto explore the nutrition knowledge of the farmers and non-farmers regarding jackfruit and its various parts.

RESOURCES AND METHODS

The study included two groups of respondents - farmers and non -famers. Only those farmers with farming experience of ten years were selected for the study. Non-farmers were unassociated with any agricultural activity. Following the criteria, 65 farmers and 65 non-farmers were selected at random from the various Panchayaths of Chavakkad, Ollukkara, Puzhakkal and Kodakara blocks of Thrissur district in Kerala state. A structured questionnaire containing 18 statements about the nutritive qualities of jackfruit was developed based on relevant review of literature and expert opinions (Table A). This questionnaire was administered to the respondents asking them to choose one among the three options, by ticking "correct", "incorrect" and "don't know." Every accurate response fetched one mark, wrong answer negative one mark and "don't know", zero mark. The combined score was tabulated for every respondent. Knowledge score index was found for each respondent by the following formula:

$$\text{Knowledge score index } Z \frac{\text{Obtained score}}{\text{Maximum possible score}} \times 100$$

Parametric t test was employed to find the significant difference between knowledge score indices of the trained and untrained populations.

OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well as discussions have been summarized under following heads:

Carbohydrates and daily consumption/ carbohydrates:

Rahman *et al.* (1999) have reported the presence of a high percentage of starch in jackfruit perianth and seed according to various chemical and histological studies. The starch and dietary fibre content of the flesh increase with the maturity. According to a study carried out by Chrips *et al.*(2008) the carbohydrate concentration of different varieties of jackfruit seed may vary from 37.4 per cent to 42.5 per cent. Carbohydrates, which provide energy to the body, are present in the form of starch in the fruit and seeds (Hettiaratchi *et al.*, 2011). Ahmed *et al.* (1986) have reported that every kilogram of wet weight of ripe perianth provides 2 MJ of energy. This makes jackfruit a "daily bread" for the poor population. Flesh has 80 per cent available carbohydrates and seeds have 20 per cent.

Water:

The moisture content of the boiled jackfruit flesh was high (82%) (Hettiaratchi *et al.*, 2011). The jackfruit bulbs had moisture content of 55.98 to 70.88 per cent (Sathishkumar, 2014). Even the boiled jack flesh showed moisture content as high as 82 per cent (Hettiaratchi *et al.*, 2011).

Protein:

Jackfruit contains 1.5 per cent protein and the seeds of jackfruit contain protein (4.7%), which is higher than beef and marine fishes (Ajayi, 2008 and Hettiaratchi *et al.*, 2011). Jackfruit is rich in nutrients including carbohydrates, proteins, vitamins, minerals and phytochemicals (Ranasinghe *et al.*, 2019). Jackfruit contains amino acids like arginine, cystine, histidine, leucine, lysine, methionine, threonine and tryptophan (Pavanasasivam and Sultanbawa,1973). The flesh of ripe jackfruit contains 1.9 g proteins per 100g. The protein concentration of the jackfruit seeds may vary from 5.3 to 6.8 per cent (Chrips *et al*., 2008). According to Goswami *et al.* (2011), the protein content of the flesh of different varieties of ripen jackfruit has ranged from 0.57 to 0.97 per cent.

Table 1: Test of significance between knowledge score indices of untrained and trained non- farmers

Knowledge score indices of untrained non- farmers	Knowledge score indices of trained non -farmers	T-values
88.8	83.25	-3.39957*
66.6	94.35	*p*-value = .001176
38.85	16.65	(*Significant at 5%
55.5	49.95	level)
44.4	38.85	
44.4	94.35	
27.75	61.05	
16.65	94.35	
44.4	99.9	
-44.4	27.75	
66.6	49.95	
44.4	99.9	
72.15	61.05	
-11.1	94.35	
-38.85	88.8	
72.15		
-22.2		
5.55		
16.65		
55.5		
27.75		
11.1		
66.6		
61.05		
94.35		
33.3		
83.25		
44.4		
55.5		
72.15		
49.95		
44.4		
55.5		
44.4		
44.4		
-44.4		
66.6		
44.4		
72.15		
-11.1		
72.15		
-11.1		
38.85		
72.15		
5.55		
16.65		
55.5		
27.75		
11.1		
27.75		

Vitamins:

Jackfruit is rich in vitamin C (Swami *et al*., 2012) Moreover, it is one of the rare fruits that is rich in B-complex group of vitamins and contains very good amounts of vitamin B6 (pyridoxine), niacin, riboflavin, and folic acid (Mushumbusi, 2015).

Fibre content:

Dietary fibre present in jackfruit makes it a good bulk laxative. A study has found the fibre content of jackfruit to be 0.33-0.40 per cent with no significant changes in different portions of the fruit at different ripening stages (Ong *et al*., 2006). Coronel (1983) reported that the fibre content of immature and ripe jackfruit is 2.6 per cent and 0.8 per cent, respectively.

Antioxidants:

Antioxidants are the compounds that are able to delay, retard or prevent oxidation process (Halliwell, 1997). They protect the body and biomolecules from the damage caused by generation of excess free radicals. Jackfruit contains a wide range of phytonutrients such as carotenoids that can act as antioxidants (Baliga *et al*., 2011). Jagtap *et al*. (2010) state that the antioxidant activities of jackfruit flesh extracts is correlated with the total phenolic and flavonoids content. According to Soong and Barlow (2004), fresh seed and flesh possess substantial ascorbic acid equivalent antioxidant effects and 27.7 and 0.9 gallic acid equivalent phenolic contents, which are believed to have contributed to about 70 per cent of the total antioxidant activity.

Other nutrients and minerals:

Jackfruit is also rich in potassium which aids in lowering blood pressure and reversing the effects of sodium that causes a rise in blood pressure that affects the heart and blood vessels. This in turn prevents heart disease, strokes and bone loss and improves muscle and nerve function (Swami *et al*., 2012). Vitamin B6 present in jackfruit helps to reduce homocysteine levels in the blood, consequently lowering the risk of heart disease (Fernando *et al*.,1991). Jackfruit is also a good source of vitamin C which is also essential for the production of collagen, gives firmness and strength to the skin (Babitha *et al*., 2004) and maintains oral health.

Jackfruit has abundance of important minerals (Gunasena *et al*., 1996). It is rich in magnesium, which

Table 2: Test of significance between knowledge score indices of untrained and trained farmers

Knowledge score indices of untrained farmers	Knowledge score indices of trained farmers	T-values
11.1	83.25	-3.79834*
66.6	94.35	*p*-value = .000275
61.05	16.65	(*Significant at 5%
94.35	49.95	level)
33.3	38.85	
83.25	33.3	
44.4	61.05	
55.5	94.35	
44.4	99.9	
-44.4	27.75	
66.6	49.95	
44.4	99.9	
72.15	61.05	
-11.1	94.35	
-38.85	88.8	
72.15	61.05	
-22.2	72.15	
5.55	27.75	
16.65	49.95	
55.5	38.85	
27.75	61.05	
	49.95	
	38.85	
	105.45	
	61.05	
	94.35	
	99.9	
	27.75	
	49.95	
	99.9	
	61.05	
	94.35	
	88.8	
	55.5	
	61.05	
	66.6	
	99.9	
	72.15	
	49.95	
	38.85	
	33.3	

Table 3: Contd.……..…

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61.05
94.35
99.9
27.75
49.95
99.9
61.05
94.35
88.8
38.85
33.3
61.05
33.3
22.2
27.75
99.9
27.75
49.95
99.9
61.05
72.15
44.4
88.8
49.95

is important for the absorption of calcium and helps strengthen the bones and prevents bone-related disorders such as osteoporosis. Iron in jackfruit helps to prevent anemia and aids in proper blood circulation and copper plays an important role in thyroid gland metabolism (Singh and Singh, 1991).

According to a study carried out by Fernando *et al.* (1991), the hot water extract of jackfruit leaves significantly improved glucose tolerance in the normal subjects and the diabetic patients when investigated at oral doses equivalent to 20 g/kg. The ripened fruit is a good energy source with 95 kcal and is Cholesterol free. (FAO, 2018 and Joy *et al*., 2019). Unripe jackfruit has low glycemic index and hence, is safe for diabetic patients and improves the insulin resistance in them (Vishwanath, 2019).

There was significant difference between the knowledge score indices between trained and untrained public (Table 1). Similar trend followed among trained and untrained farmer population (Table 2). In both cases the indices were higher for the trained population which suggested trainings on jackfruit helped them to become more knowledgeable on the nutritional value of jackfruit.

A significant difference was noted for the knowledge score indices between males and females among the non-farmers. Among them, the females showed higher knowledge score indices. The t-value is 2.71374. The p-value is .008422. The result is significant at $p<.05$.

On the other hand, such a statistical relation was not noticed for farmer population. The t-value is 1.19377. The p-value is .236095. The result is not significant at $p < .05$.

Conclusion:

This study supports similar research findings that state the trained population possessed more knowledge regarding a given subject than the untrained population (Cardwell *et al*., 2016).

Jackfruit has the potential to ensure food security and it will be the most sought –after crop in future. It is highly nutritious and gives a good yield without requiring much input and aftercare. Still 70 per cent of the production is wasted and it is still an underutilized food crop.

This study urges the government and the concerned departments to conduct more trainings and awareness campaigns on the jackfruit and its nutritional value among to the general public, farmers, self-help groups and other entrepreneurs. Such initiatives will contribute in a big way to local food security, can create additional income to farming families and SHGs through value addition and marketing and enable the agripreneurs to start new enterprises based on it. Thus, the criminal wastage of this potential crop can be prevented and the rural economy and local food stock can be augmented in the process.

Authors' affiliations :
Baiju Thoppil, Department of Agriculture, Government of Kerala, Kerala India

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