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Assessment of Physico-chemical Properties of Commercial Jackfruit (*Artocarpus heterophyllus* Lam.) Cultivars of Karnataka

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ABSTRACT: An investigation was undertaken during the year 2024 at College of Horticulture, Mudigere to study the physico-chemical properties among seven commercial jackfruit cultivars of Karnataka. The physico-chemical properties of the selected jackfruit cultivars were significantly different. The characteristics studied were *viz*., dry matter, texture, colour, TSS, protein, crude fiber, carbohydrates, calcium, potassium, total sugars, reducing sugars, non-reducing sugars and total carotenoids. The physical characteristics of fruit such as the highest dry matter (30.96 %), flake texture (43.35 N), TSS (28.47ºBrix), colour value L* (65.10) and a* (29.73) was observed in Shankara cultivar whereas, the color value b* (52.73) was higher in case of cultivar Prakashchandra. With respect to bio-chemical parameters of the fruit, the maximum reducing sugars (9.63 %), non-reducing sugars (15.51 %), total sugars (25.14 %) and carotenoids (567.80 µg/100g) was obtained in cultivar Shankara while, Siddu cultivar recorded the maximum calcium content (46.08 mg/100g) and Tamaka selection-2 obtained the maximum potassium content (401.64 mg/100g). Among proximates, cultivar Vietnam super early recorded the maximum protein (2.59 %) and crude fiber (3.90 %) content while, the carbohydrate content was maximum (24.50 %) in Tamaka selection-2.

Keywords : Cultivars, TSS, calcium, potassium, total sugars.

INTRODUCTION

Jackfruit is indigenous to the rain forests of the Western Ghats of India and is cultivated throughout the tropical lowlands in South and Southeast Asia, parts of central and eastern Africa and Brazil. Major jackfruit producers are Bangladesh, India, Myanmar, Thailand, Vietnam, China, The Philippines, Indonesia, Malaysia and Sri Lanka (Marak *et al.,* 2019). In India, it has wide distribution in Assam, Tripura, Bihar, Uttar Pradesh, the foothills of the Himalayas and South Indian states of Kerala, Tamil Nadu and Karnataka, with an area of 188,000 ha and production of 1946,000 MT (Anon., 2022).

The ripe jackfruit is considered to be delicious and nutritious. It is sweet and has an exotic flavour and it comprises carpel, seed embedded in carpel and the skin, rind, sheath, core and unfertilized floral parts or undeveloped perianths. The bulbs are fully developed perianths enclosed by a narrow strip of undeveloped perianths is considered inedible. The ripe jackfruit bulbs are normally eaten fresh or incorporated into fruit salad or used in ice cream, confectionaries, etc. and the seeds are eaten when boiled or roasted.

Jackfruit is a power house of important nutrients. The flesh of jackfruit is rich in β-carotene, calcium and riboflavin while the seeds are rich in phosphorous, calcium, iron, thiamine and vitamin C. Jackfruit contains phytonutrients: lignans, isoflavones, and saponins that have health benefits that are wide ranging. Flakes of ripe fruits are rich in nutritive value containing 18.90 g carbohydrates, 0.80 g minerals, 30 IU vitamin A and 0.25 mg thiamine for everyhundred gram which provides about 94 calories (Samaddar, 1985). Jackfruit also contain good amount of carotenoids(150-300 µg) natural pigments synthesized in plants which impart yellow-reddish colour, in addition to their colorant properties, they have provitamin A activity. Jackfruit are rich in nutritive values they can be utilized for therapeutic purposes such as anti-inflammatory, anti-oxidant, anti-fungal, anti-bacterial, anti-diabetic and anti-aging property. Presence of carotenoid known to have beneficial effects on several chronic degenerative diseases, such as cancer, inflammation, cardiovascular disease, cataract and age-related macular degeneration (Prakash *et al.,* 2009).

The present investigation was undertaken to assess the biochemical properties of the commercial jackfruit cultivars of Karnataka to identify superior genotypes with desirable biochemical attributes suitable for processing and table purpose.

MATERIAL AND METHODS

The investigation was carried out with an objective to study the biochemical variations among different commercial jackfruit cultivars of Karnataka during the year 2024.Ripe fruits of jackfruit cultivars were procured from various locations in Karnataka.

Dry matter content was analysed using hot air oven method. The fruit texture was estimated using fruit texture analyzer and flake colour was measured used lovibond colour meter. TSS of the pulp was measured with the help of hand refractometer and protein, crude fiber, minerals and sugars were estimated (Ranganna, 1978). Carbohydrate content was determined according to Gopalan *et al.* (1985).

RESULTS AND DISCUSSION

Physical parameters of fruit. The effect of jackfruit cultivars on physical parameters of the fruit were observed and presented in Table 1.

Dry matter is an important parameter which decides the quality of fruits, it refers to the solid components of the fruit, excluding the water content. High dry matter containing fruits is desirable for dehydrated product preparation as they will be having a high dry recovery rate. Significantly higher percentage (30.96 %) was noticed in T_4 (Shankara), followed by T_3 (29.50 %) and the lowest dry matter was found in the T_1 (Prakashchandra) *i.e.*, 25.42 per cent. The genetic variability, climatic factors and management may be the reason for variation in dry matter content. These results are in agreement with the reports of Chandana (2023).

The highest texture/firmness was recorded in T_4 *i.e.,* Shankara (43.35 N), which was *on par* with T_3 (43.31 N) and the lowest texture/firmness was found in T_1 (Prakashchandra) (23.98 N). The texture of fruit depends on cell structure, moisture content, sugar content, fiber content of fruit *etc*. These contents vary depending on environmental conditions. Similar results were observed by Balamaze *et al.* (2019); Chandana (2023).

With respect to TSS, significantly higher TSS was attained in T_4 *i.e.,* Shankara (28.47 °Brix) followed by T_6 (27.17 °Brix), and the lowest value (22.60 °Brix) was recorded in T_2 (Tamaka selection-1). The variation in TSS might be due to the existing variability in genotypes, micro-climate, cultural practices, photosynthetic efficiency and synthesis of metabolites by different cultivars. Similar findings were recorded by Avani and Bauri (2018); Biswajit and Kartik (2021); Jayavalli *et al.* (2024).

The results of colour tests revealed that the *L** value (lightness or darkness) ranged from 65.10 to 35.73 in different cultivars. T_4 (Shankara) recorded the highest colorimetric value for *a** (redness or greenness) *i.e.,* 29.73, which was followed by T_6 (27.73) and the lowest *a** value was found in T_2 (Tamaka selection-2) (3.53). Whereas, the *b** index (blueness or yellowness) was the highest (52.73) in T_1 (Prakashchandra), which was followed by T_2 (50.33) and the lowest *b** value (32.10) was recorded in T_3 (Tamaka selection-2). Such variation in the flake colour is probably due to the inherent variation in fruit. Similar results were observed by Balamaze *et al.* (2019); Ranasinghe *et al.* (2019); Chandana (2023).

Bio-chemicalparameters of fruit. For numerous elements of fruit production, from cultivation and harvesting to processing and consumption, biochemical characteristics are essential. They guarantee that the products that fulfill the quality standards are safe to eat and offer the desired nutritional and sensory experiences. Different jackfruit cultivars showed relatable difference in bio-chemical parameters (Table 2).

There was a statistically significant difference was observed in different cultivars with respect to reducing, non-reducing and total sugars. A higher reducing sugars value of 9.63 per cent was observed in the T_4 (Shankara), which was followed by T_6 (9.11 %). In non-reducing sugars the maximum value was found in T_4 *i.e.,* Shankara (15.51 %), which was on par with T_3 (15.21 %). With respect to total sugars, T_4 (Shankara) significantly recorded the maximum 25.14 per cent total sugars, which was followed by T_3 (24.17 %). The minimum reducing, non-reducing and total sugars was found in T_2 (Tamaka selection-2) *i.e.,* 7.40, 12.10 and 19.49 per cent respectively. Several factors like genetic makeup, environment (temperature, relative humidity, light exposure, water availability), etc. can influence the sugar content in plants. These factors affect the photosynthesis process, which is responsible for producing sugars in plants. The current findings align with the range of values documented by Krishnan *et al.* (2015); Avani and Bauri (2018); Biswajit and Kartik (2021).

Among the different cultivars, with respect to total carotenoids statistically maximum values were obtained in T_4 (Shankara) *i.e.,* 567.80 µg/100 g, which was followed by T_6 (417.70 µg/100 g), and the minimum was recorded in T_5 (Vietnam super early) (142.93 µg/100 g). These variations in total carotenoid content could be influenced by the genotypes, growing conditions, geographical location, and soil conditions. Similar results were reported by Aseef *et al.* (2017); Chandana (2023).

The maximum calcium content 46.08 mg/100g was recorded in T_6 (Siddu) which was followed by T_4 (41.42 mg/100g), while the minimum calcium content (29.07 mg/100g) was recorded in T_7 (Dangsuriya). The differences in calcium content among the cultivars might be attributed to their differential abilities to absorb and accumulate calcium. Comparable outcome was noticed by Ranasinghe *et al.* (2019); Amadi *et al.* (2018); Das and Saha (2020).

T_3 (Tamaka selection-2) recorded the significantly higher potassium content (401.64 mg/100g) which was followed by T_6 (369.98 mg/100g), while the minimum potassium content was noticed in T_7 *i.e.,* Dangsuriya (310.65 mg/100g). The variation in potassium content could be due to differential ability of the cultivars to

absorb and accumulate potassium. Similar results were observed by Ranasinghe *et al.* (2019); Amadi *et al.* (2018); Das and Saha (2020).

Proximate content of fruit. Proximate composition generally represents the nutritional quality of product (Table 3). A significant difference was recorded among different cultivars with respect to protein. The highest value for protein (2.59 %) was observed in T_3 (Tamaka selection-2), which was followed by T_1 (2.15 %) and the lowest (1.62 %) was recorded in T_2 (Tamaka selection-1). The variation in protein content among the cultivars could be due to their differential capacity to uptake nitrogen and protein synthesis. The variation in protein content among cultivars were confirmed by the findings of Tiwari and Vidyarthi (2015); Chandana (2023).

Cultivar T_5 (Vietnam super early) significantly recorded a greater crude fiber content of 3.90 per cent, which was on par with T_4 (3.86 %) and the least (1.79 %) was recorded in T_7 (Dangsuriya). This difference in crude fiber might be due to collection of fruits from different agroclimatic zones indicating the influence of genetic and microclimatic factors on crude fiber content of fruit. A similar conclusion was made by Ranasinghe *et al.* (2019); Biswajit and Kartik (2021); Chandana (2023).

With respect to carbohydrate, the significantly higher carbohydrate content was observed in T_3 *i.e.,* Tamaka selection-2 (24.50 %), followed by T_4 (23.61 %) and the lower carbohydrate content (18.59 %) was noticed in T_1 (Prakashchandra). The variation in carbohydrate content among the cultivars could be due to the differential ability of the cultivars to photosynthesize and assimilate carbohydrates due to the genetic makeup and the prevailing environmental conditions. Comparable outcome was noticed by Tiwari and Vidyarthi (2015); Chandana (2023).

Table 1: Effect of jackfruit cultivars on physical parameters of fruit.

Treatments	Dry matter (%)	Flake texture (N)	TSS (°Brix)	Flake colour		
				L*	a*	b*
Prakashchandra	25.42	22.76	26.17	54.20	9.13	52.73
Tamaka selection-1	28.50	24.50	22.60	61.77	3.53	50.33
Tamaka selection-2	29.50	43.31	26.47	65.10	25.00	32.10
Shankara	30.96	43.35	28.47	47.40	29.73	36.90
Vietnam super early	29.18	40.27	24.37	35.73	15.13	48.10
Siddu	27.87	32.55	27.17	47.77	27.73	34.60
Dangsuriya	26.64	26.21	24.50	62.63	26.17	33.10
S. Em ±	**0.185**	**0.124**	**0.188**	**0.331**	**0.198**	**0.079**
C.D. @ 1%	**0.55**	**0.38**	**0.57**	**1.00**	**0.60**	**0.24**

Table 2: Effect of jackfruit cultivars on biochemical parameters of fruit.

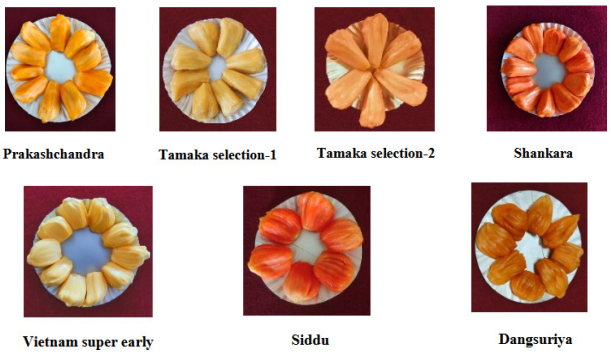
Treatments	Reducing sugars (%)	Non-reducing sugars (%)	Total sugars (%)	Total carotenoids (µg/100g)	Calcium (mg/100g)	Potassium (mg/100g)
T_1	8.73	15.23	23.96	361.87	33.37	335.33
T_2	7.40	12.10	19.49	161.13	31.15	344.09
T_3	8.96	15.21	24.17	400.83	37.45	401.64
T_4	9.63	15.51	25.14	567.80	41.42	330.05
T_5	8.11	14.28	22.38	142.93	39.38	321.02
T_6	9.11	15.04	24.15	417.70	46.08	369.98
T_7	8.35	13.64	21.99	399.10	29.07	310.65
S. Em ±	**0.102**	**0.114**	**0.094**	**1.612**	**0.150**	**0.459**
C.D. @ 1%	**0.31**	**0.35**	**0.29**	**4.86**	**0.46**	**1.38**

Treatment details

T_1 : Prakashchandra; T_2: Tamaka selection-1; T_3: Tamaka selection-2; T_4: Shankara; T_5 :Vietnam super early; T_6 : Siddu; T_7 : Dangsuriya

Table 3: Effect of jackfruit cultivars on proximates of fruit.

Treatments	Protein (%)	Crude fiber (%)	Carbohydrates (%)
Prakashchandra	2.15	1.86	18.59
Tamaka selection-1	1.62	2.32	22.64
Tamaka selection-2	1.72	3.68	24.50
Shankara	1.70	3.86	23.61
Vietnam super early	2.59	3.90	20.37
Siddu	1.83	2.08	20.53
Dangsuriya	1.57	1.79	21.23
S. Em ±	**0.021**	**0.055**	**0.180**
C.D. @ 1%	**0.07**	**0.17**	**0.54**



CONCLUSIONS

From the present investigation, it can be concluded that the commercial jackfruit cultivars selected under different regions of Karnataka exhibit wide variations in terms of physio-chemical characters. The variations in these characters of the jackfruit cultivars can be utilized in crop improvement programme of jackfruit in future as well as for processing.

FUTURE SCOPE

The cultivars selected for the study can be further analyzed for processing of different value added products.

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Conflict of Interest. None.

REFERENCES

Amadi, J. A. C., Ihemeje, A. and Afam, A. O. C. (2018). Nutrient and Phytochemical Composition of Jackfruit (*Artocarpus heterophyllus*) Pulp, Seeds and Leaves. *International Journal of Innovative Food, Nutrition and Sustainable Agriculture, 6*(3), 27-32.

Anonymous (2022). National Horticulture Board Data Base. Annual Report 2022.

Aseef, R. M., Manikandan, K., Kavino, M., Vijayakumar, R. M. and Ganesan, N. M. (2017). Biochemical Evaluation of Local Genotypes of Jackfruit (*Artocarpus heterophyllus* Lam.) in Pudukkotai District. *Journal of Pharmacognosy and Phytochemistry, 6*(5), 2533-2536.

Avani, P. and Bauri, F. K. (2018). Assessment of Different Quality Characters of Twenty Jackfruit Genotypes under New Alluvial Zone of West Bengal. *International Journal of Current Microbiology and Applied Sciences, 7*(12), 2621-2626.

Balamaze, J., Muyonga, J. H. and Byaruhanga, Y. B. (2019). Physico-chemical Characteristics of Selected Jackfruit (*Artocarpus heterophyllus* Lam.) Varieties. *Journal of Food Research, 8*(4), 11-22.

Biswajit, D. and Kartik, B. (2021). Assessment of Biochemical Properties of Jackfruit (*Artocarpus heterophyllus* Lam.) Accessions of Assam. *International Journal of Current Microbiology and Applied Sciences, 10*(3), 1978-1983.

Chandana, S. (2023). Impact of Harvesting Month and Pre-treatment on Physico-chemical Properties of Frozen Jackfruit Bulb. M Sc.(Hort.) Thesis, University of Agricultural and Horticultural Sciences, Shivamogga, Karnataka (India).

Das, K. and Saha, A. (2020). Jackfruit (*Artocarpus heterophyllus* Lam.), A Potential Fruit Crop of Tripura and Exploring its Nutritional Benefits. *Journal of Medicinal Plants Studies, 8*(4), 101-103.

Gopalan, C., Sastri, B. V., Ram and Balasubramanian, S. C. (1985). Nutritive Value of Indian Foods, ICMR, New Delhi, India, pp 88.

Jayavalli, R., Kumanan, K. and Sheeba Joyce Roseleen (2024). Identification of Red Flesh and White Flesh Jackfruit Genotypes. *Biological Forum – An International Journal, 16*(8), 140-145.

Krishnan, A. G., Jayalekshmi, G., Joseph, E. and Sabu, T. S. (2015). Assessment of Physico-chemical properties of Jackfruit Collections from Kuttanad Region of Kerala. *Asian Journal of Horticulture, 10*(2), 262-266.

Marak, N. R., Nganthoibi, R. K. and Momin, C. W. (2019). Process Development for Brining of Tender Jackfruit. *International Journal of Current Microbiology and Applied Sciences, 8*(4), 2408-2414.

Prakash, O., Rajesh, K., Anurag, M. and Rajiv, G. (2009). *Artocarpus heterophyllus* (Jackfruit): An Overview. *Pharmacognosy Reviews, 3*(6), 353-358.

Ranasinghe, R. A. S. N., Maduwanthi, S. D. T. and Marapana, R. A. U. J. (2019). Nutritional and Health Benefits of Jackfruit (*Artocarpus heterophyllus* Lam.): A review. *International Journal of Food Science, 70*(1), 1-12.

Ranganna, S. (1978). Manual of Analysis of Fruit and Vegetable Products. Tata Mc-Graw-Hill Publ., New Delhi, India.

Samaddar, H. N. (1985). Jackfruit. In: Fruits of India: Tropical and Subtropical. Ed. Bose, T.K., Naya Prakash, Calcutta, pp. 487- 497.

Tiwari, K. and Vidyarthi, A. S. (2015). Nutritional Evaluation of Various Edible Fruit Parts of Jackfruit (*Artocarpus heterophyllus*) at Different Maturity Stages. *International Journal of Current Pharmarceutical Review and Research, 1*, 21-26.

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