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Morphological Screening of Jackfruit (*Artocarpus heterophyllus* Lam.) Genotypes for Vegetable Purpose

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Abstract

Twenty jackfruit genotypes with six and eight weeks old harvested fruits were screened for qualitative and quantitative characters that are suitable for vegetable purpose. Good diversity was noticed for qualitative characters like fruit shape and fruit rind colour. Among the quantitative characters studied, fruit length was found to be higher in genotype NSP-3 (33.67 cm) of six week old fruit and HV-1 (33.67 cm) of eight week old fruit. The fruit width was more in GTC-3 (14.27 cm) of six week old fruit and in Swarna (15.67 cm) of eight week old fruit. The fruit weight was found to be higher in both six and eight week old fruits of GTC-3 (1.93 kg and 2.32 kg respectively). The rind thickness was found lesser in both six and eight week fruits of NSP-2 (0.33 cm and 0.37 cm respectively) and core thickness was lesser in both six and eight week fruits of KV-1 (3.75 cm and 3.77 cm, respectively). Mesocarp thickness of six week fruit was found maximum in GTC-3 (3.67 cm) and in eight week old fruit; Lalbagh Madhura recorded the higher (3.77 kg) mesocarp thickness. The lesser rind weight was found in KV-2 of both six and eight week fruits (0.13 kg and 0.17 kg respectively) and the four genotypes of eight week fruit recorded the minimum core weight *viz.,* KV-1, KV-2, KV-3 and HV-2 each of 0.11 kg. The mesocarp thickness in both six and eight week old fruit of GTC-3 found the highest (1.29 and 1.63 kg respectively) and the higher edible portion recovery of both six and eight old week fruits was recorded in KV-2 (71.33% and 75.07%).

Keywords: Tender jackfruit, Vegetable jackfruit, Vegan meat, Morphological characterization

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Jackfruit (*Artocarpus heterophyllus* Lam.) is one of the important fruit crops of tropical region, belonging to moraceae family. It is believed to have originated from the forests of Western Ghats of India and later the cultivation has been distributed throughout the tropical lowlands of northern and southern hemisphere around the globe. In India, it is widely distributed in the states of Assam, Bihar, Tripura, West Bengal, Uttar Pradesh, Kerala, Tamil Nadu and Karnataka (Rai *et al*., 2003). Presently in India, jackfruit is cultivated in an area of 1.87 Lakh ha with the production of 1.87 Million MT (Anonymous 2022). It is largest tree borne fruit on earth and is a heavy yielder than any other fruit trees. (Shyamalamma *et al.,* 2017 and Bharathi *et al.,* 2022).

The jackfruit is utilized at different stages for various purposes *viz.,* at tender stage, it can be used as vegetable in many culinary dishes and can be processed into pickles, chutney, powders, canned slices and this is the best meat alternative. In mature stage, it is used for making papad, chips and various culinary dishes. The ripe fruits are often relished fresh and also processed into jam, jelly, juice, squash, fruit powder and pulp is used as natural ingredient in ice-cream *etc*. Due to increasing adaptability of vegan lifestyle, there is huge demand for dummy meat or

meat substitute products. Jackfruit at tender stage will be having meat like texture because of its fiber. It is often deliberated as super food and is in high demand because of its immense nutritive value. The nutritional composition per 100 g of tender fruit include 84 per centage of moisture, 2.6 g of protein, 0.3 g of fat, 0.7 g of minerals, 2.8 g of crude fiber, 9.4 g of carbohydrates, 51 Kcal. of energy, 287-323 mg of potassium, 40 mg of phosphorous, 30 mg of calcium and 0.567 mg of iron (Gopalan *et al*., 1989). These phytochemicals possess anti-inflammatory, anti-bacterial, anti-tumor and other nutraceutical properties with low glycemic index and almost zero cholesterol compared to its ripe stage (Swami *et al*., 2012).

The variations witnessed in the qualitative (fruit shape) and quantitative (fruit length, width and weight of the fruit; thickness and weight of the rind, mesocarp and core; recovery of edible portion) traits of the tender jackfruit genotypes can be attributed to their virtue of cross pollination and seed propagation (Wangchu *et al.,* 2013 and Sampath *et al*., 2019). The screening of the jackfruit genotypes for the vegetable purpose will help in selection of elite trees possessing high yield potential with better nutritional and cooking quality, this will further lead to the development of good varieties resulting in commercialization of the tender jackfruit as a vegetable.

Material and Methods

The present study was conducted during the off season (October to December, 2020) and main fruit bearing season of 2020-21 (March to June, 2021) based on the survey at different jackfruit growing areas of Karnataka. Among the surveyed trees, the genotypes established at different locations in GKVK campus and Kachahalli village of Doddaballapura taluk of Bengaluru Rural district were finalized for the study based on bearing conditions and fruit availabililty.

Morphological Characters

The morphological characters were recorded as per the guidelines of Bioversity International, Rome (formerly, IPGRI) jackfruit descriptors (IPGRI, 2000). The morphological characters were grouped into qualitative and quantitative characters.

Qualitative Characters

The characters whose data is non quantifiable (fruit shape) was grouped as qualitative characters. Such parameters were documented and analyzed based on the score given for each character in jackfruit descriptor.

Quantitative Characters

The quantitative characters such as fruit length, fruit width, fruit weight; rind, core and mesocarp thickness; rind, core and mesocarp weight along with recovery percentage of the 20 genotypes (Table 1) were recorded at six and eight weeks after fruit set (opening of female inflorescence). The genotypes HV-1 and HV-2 were kept for reference as standard checks because of their use as vegetable types (Shyamalamma *et al.,* 2008).

Statistical Analysis

The data for the above said quantitative characters were recorded at six and eight weeks after fruit set. Three replications in each genotype (Three fruits per tree) were used for recording all quantitative traits. The data was computed using one way ANOVA (Kavya *et al.,* 2019) and analysis was done in Microsoft Excel separately for the fruits of both six and eight weeks after fruit set.

Results and Discussion

Fruit Shape

Fruit shape is one of the major traits, which determines the tender jackfruit recovery per cent. Thus a good fruit shape will determine better recovery. The fruits with irregular shape and bumpy surfaces contribute to more wastage while cutting the tender jackfruit. Good diversity was recorded among the genotypes studied where, spheroid shape was noticed in two genotypes Swarna and GTC-3; oblong shape was seen in three genotypes *i.e.,* Lalbagh Madhura,

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TABLE 1

List of jackfruit genotypes screened for vegetable types

Genotype/ Variety	Abbreviation Used	Location
Lalbagh Madhura	LM	Jackfruit orchard -2 Department of Horticulture, GKVK
Byrachandra	BC	Hithakari Nursery, Shivakote, Bengaluru
Swarna	SW	Jackfruit orchard -1 Department of Horticulture, GKVK
Muttamvarika	MV	Jackfruit orchard -1 Department of Horticulture, GKVK
Gumless	GL	Jackfruit orchard -1 Department of Horticulture, GKVK
Horticulture Vegetable type -1	HV-1	Dept. of Horticulutre, GKVK
Horticulture Vegetable type -2	HV-2	Dept. of Horticulutre, GKVK
Kachahalli Vegetable type -1	KV-1	Kachahalli village, Doddaballapura Tq., Bengaluru Rural dist.
Kachahalli Vegetable type -2	KV-2	Kachahalli village, Doddaballapura Tq., Bengaluru Rural dist.
Kachahalli Vegetable type -3	KV-3	Kachahalli village, Doddaballapura Tq., Bengaluru Rural dist.
GKVK Tissue Culture lab-1	GTC-1	Dept. of Horticulutre, GKVK
GKVK Tissue Culture lab-3	GTC-3	Dept. of Horticulutre, GKVK
GKVK Avenue-18	GA-18	GKVK campus
GKVK Avenue-20	GA-20	GKVK campus
National Seed Project-1	NSP-1	NSP, GKVK
National Seed Project-2	NSP-2	NSP, GKVK
National Seed Project-3	NSP-3	NSP, GKVK
GKVK Horticulure orchard-9	GH-9	Jackfruit orchard -1 Department of Horticulture, GKVK
GKVK Horticulure orchard-11	GH-11	Jackfruit orchard -1 Department of Horticulture, GKVK
GKVK Horticulure orchard-15	GH-15	Jackfruit orchard -1 Department of Horticulture, GKVK

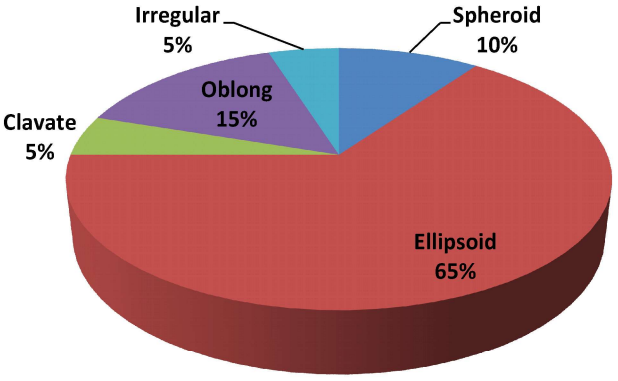

Fig. 1 : Diversity in fruit shape noticed among the screened tender jackfruit genotypes

Byrachandra and GH-15. NSP-1 exhibited clavate shape and HV-1 with irregular shape; remaining 13 gentoypes were ellipsoid fruit shape (Fig. 1).

Similar type of diversity in fruit shape among different jackfruit genotypes was also reported by Rai *et al.* (2003), Dey and Baruah (2019), Akter and Rahman (2017). The variations in the fruit shape are mostly attributed to genotypic character.

Fruit Rind Colour

Rind or outer surface colour is the primary thing that catches attention in any fruit. Generally, dark green shades of tender fruit are preferred over its lighter ones. Majority of the genotypes exhibited green colour, where as three genotypes *i.e.,* GA-18, GA-20 and NSP-1 tender fruits were greenish yellow colour. The genotypes NSP-4, NSP-3 and HV-2 had brownish yellow, brown and pale green colours respectively (Fig. 2).

Variation in fruit skin colour is because of accumulation of one or more combination of colour pigments such as chrorophyll, anthocyanins and

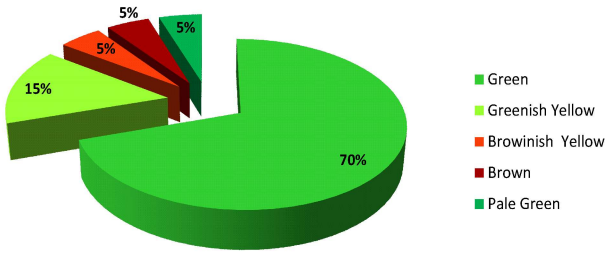

Fig. 2 : Diversity in fruit rind colour noticed among the screened tender jackfruit genotypes

carotenoids in the fruit rind (Akter and Rahman, 2017). They also reported good range of variability in fruit skin colour of jackfruit genotypes.

Quantitative Characters

Fruit Length

Fruit length, which is convenient to hold in a single hand is preferred in tender jackfruit. The fruit length among the studied genotypes differed significantly ranging from 23.77 cm to 33.67 cm with a mean of 29.48 cm in six week's fruits and a range of 28.07 cm to 37.67 cm with a mean fruit length of 33.62 cm was recorded in eight week's fruit (Table 2). NSP-3 had the higher fruit length (33.67 cm) and two genotypes *viz.,* Swarna (31.9 cm) and NSP-2 (31.47 cm) were found on par with in the six week old fruits. In the eight week old fruits, the genotype HV-1 recorded the higher fruit length (37.67 cm) and the tree genotypes *viz.,* Swarna (36.80 cm), GTC-3 (36.77 cm) and Gumless (36.07 cm) were found on par with HV-1. The least was noticed in both 6 week and eight week old fruit of KV-2 (23.77 cm and 28.07 cm respectively).

The variations in fruit length could be due to genetic and environmental factors. Rai *et al.* (2003), Chandrashekar *et al.* (2018), Dey and Baruah (2019) and Kavya *et al.* (2019) have also noticed good diversity in fruit length of jackfruit genotypes in their study.

Fruit Width

The width of the tender jackfruit visually determines the suitability of fruit for vegetable type. A significant difference in the fruit width was noticed among the genotypes ranging from 7.5 cm to 14.27 cm with the mean of 10.72 cm in the six week old fruits. In the eight week old fruits, the range was 9.49 cm to 15.67 cm was noticed with a mean fruit width of 12.29 cm (Table 2). The genotype GTC-3 recorded the highest fruit width (14.27 cm) followed by Swarna (13.10 cm) in six week old fruits. In the eight week old fruits, Swarna recorded higher fruit width (15.67 cm) followed by GTC-3 (14.60 cm). The least fruit width was recorded from KV-2 (7.50 cm) in the six week old fruit and in the eight week old fruit, KV-1 exhibited the least fruit width (9.49 cm).

TABLE 2

Variations noticed in fruit length, width and weight of jackfruit genotypes at six and eight week old tender fruits

Genotypes	Fruit length (cm)		Fruit width (cm)		Fruit weight (kg)	
	6 week	8 week	6 week	8 week	6 week	8 week
Lalbagh Madhura	31.23	33.17	11.57	12.80	1.21	1.67
Byrachandra	30.47	33.17	11.93	13.62	1.40	2.19
Swarna	31.90	36.80	13.10	15.67	1.61	1.87
Muttamvarika	30.67	32.20	11.50	13.23	1.41	2.23
Gumless	29.37	36.07	10.20	12.67	1.34	1.78
HV-1	30.83	37.67	11.00	14.07	1.20	2.14
HV-2	29.33	33.90	10.27	11.93	1.05	1.84
KV-1	25.27	30.81	10.53	9.49	1.03	1.30

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Genotypes	Fruit length (cm)		Fruit width (cm)		Fruit weight (kg)	
	6 week	8 week	6 week	8 week	6 week	8 week
KV-2	23.77	28.07	7.50	9.93	0.54	0.86
KV-3	27.00	32.50	9.67	10.87	0.87	1.40
GTC-1	26.27	30.60	10.23	11.93	1.02	1.48
GTC-3	31.50	36.77	14.27	14.60	1.90	2.32
GA-18	30.33	34.37	10.93	12.30	1.20	1.56
GA-20	30.63	34.40	11.23	12.87	1.13	1.42
NSP-1	30.90	33.70	11.00	12.20	1.29	1.56
NSP-2	31.47	33.17	10.23	12.53	1.39	1.59
NSP-3	33.67	36.67	11.33	12.97	1.16	1.53
GH-9	29.23	31.13	9.47	10.63	0.90	1.20
GH-11	29.27	33.33	9.83	10.67	1.11	1.55
GH-15	26.53	33.87	8.57	10.90	0.75	1.44
Grand Mean	29.48	33.62	10.72	12.29	1.17	1.65
Range Maximum	33.67	37.67	14.27	15.67	1.90	2.32
Minimum	23.77	27.07	7.5	9.49	0.54	0.86
SEm ±	0.82	0.82	0.33	0.31	0.06	0.06
CD at 5%	2.35	2.34	0.95	0.89	0.16	0.18
F test	*	*	*	*	*	*

Dey and Baruah (2019) reported that, the variations in the fruit width can be attributed to genetic factors and soil nutrition. Diversity in fruit width was noticed from the studies of Rai *et al.* (2003), Dey and Baruah (2019), Kavya *et al.* (2019), Akter and Rahman, (2017).

Fruit Weight

It is one of the important characters in selecting the fruit for vegetable purpose. The fruit weight differed significantly in the genotypes ranging from 0.54 kg to 1.90 kg with the mean of 1.17 kg in the six week old fruit and the range of 0.86 kg to 2.32 kg with a mean fruit weight of 1.65 kg was noticed in eight week old fruits (Table 2). Higher fruit weight in both six and eight week old fruit was noticed in GTC-3 (1.90 kg and 2.32 kg respectively), followed by Swarna (1.61 kg) in six week's fruit and Muttamvarika (1.23 kg) in eight week old fruit.

The fruit weight has inverse relation with total bearing habit in a tree (Rai *et al.,* 2003). More the fruit number in the trees, lesser will be the individual fruit weight and vice-versa. Similarly, variation in fruit weight has been reported by Anu *et al.* (2015), Chandrashekar *et al.* (2018) and Phaomei & Mathew (2019).

Rind Thickness

Rind thickness differed significantly among the genotypes ranging from 0.33 cm to 1.57 cm with a mean of 0.63 cm in sex week old fruits. In eight week old fruits, the range was from 0.37 cm to 1.5 cm (Table 3). Lesser rind thickness was noticed in both six and eight week old fruits in genotype NSP-2 (0.33 cm and 0.37 cm respectively) followed by KV-2 (0.37 cm and 0.40 cm, respectively) and HV-2 (0.40 cm and 0.47 cm, respectively). The higher rind thickness was recorded in both six and eight old fruits of GTC-3 (1.57 and 1.5 cm, respectively). Thinner, less tough and less weighed rind type of genotype is more preferred for vegetable type.

TABLE 3

Variations noticed in fruit rind, core and mescoarp thickness of jackfruit genotypes at six and eight week old tender fruits

Genotypes	Rind thickness (cm)		Core thickness (cm)		Mesocarp thickness (cm)	
	6 week	8 week	6 week	8 week	6 week	8 week
Lalbagh Madhura	0.63	0.67	5.07	6.07	3.60	3.77
Byrachandra	0.57	0.63	4.80	5.80	2.97	3.43
Swarna	0.42	0.63	6.13	7.10	2.57	3.70
Muttamvarika	0.93	0.90	6.17	8.10	1.97	2.37
Gumless	0.90	0.97	5.23	5.67	2.23	2.50
HV-1	0.53	0.87	5.93	7.13	1.73	2.83
HV-2	0.40	0.43	4.40	4.70	2.53	3.23
KV-1	0.57	0.50	3.75	3.77	2.57	2.29
KV-2	0.37	0.40	4.40	5.13	1.43	2.23
KV-3	0.47	0.53	4.17	4.93	2.10	2.33
GTC-1	0.77	0.70	5.00	5.13	2.03	2.57
GTC-3	1.57	1.50	4.77	4.73	3.67	3.30
GA-18	0.73	0.80	5.23	5.83	2.20	2.63
GA-20	0.60	0.60	4.50	5.57	2.57	2.97
NSP-1	0.47	0.47	5.53	5.93	2.07	3.00
NSP-2	0.33	0.37	5.13	5.53	1.97	2.17
NSP-3	0.73	0.70	4.97	5.60	2.07	2.37
GH-9	0.60	0.67	5.00	5.90	1.53	1.67
GH-11	0.50	0.47	4.50	5.13	1.93	2.37
GH-15	0.57	0.53	4.33	4.87	1.57	2.10
Grand Mean	0.63	0.67	4.95	5.63	2.27	2.69
Range Maximum	1.57	1.5	6.17	8.1	3.67	3.77
Minimum	0.33	0.37	3.77	3.77	1.43	1.67
SEm ±	0.06	0.04	0.15	0.23	0.09	0.13
CD at 5%	0.16	0.12	0.44	0.66	0.26	0.36
F test	*	*	*	*	*	*

Maximum rind thickness of 2 cm and minimum of 0.5 cm in the genotypes of cluster 1 and 3 respectively was noticed in a study conducted by Anu *et al.* (2015). Mahalakshmi (2017) reported the average rind thickness of 0.86 cm and 1.13 cm in the 30 and 60 days old tender jackfruits respectively.

Core Width

The core width plays a major role in per cent recovery of edible portion. In the present study, a significant difference was noticed ranging from 3.77 cm to 6.17 cm with a mean of 4.95 cm in the six week old fruits. In eight week old fruits, the range was from 3.77 cm to 8.1 cm with a mean core thickness of 5.63 cm (Table 3). Both six and eight week old fruits of KV-1 recorded minimum core width (3.75 cm and 3.77 cm respectively) followed by KV-3 (4.17 cm) and KV-2 (4.40) in six week old fruit; HV-2 (4.70 cm) and GTC-3 (4.73 cm) in eight week's fruits, respectively.

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Core is having insoluble fiber, which is indigestible in human body and hence considered as non edible. Genotypes with lesser core thickness and weight are extremely helpful in identifying a vegetable type. Wangchu *et al.* (2013) from West Bengal and Kavya *et al.* (2019) from Karnataka also reported diversity in core width among the genotypes studied.

Mesocarp Thickness

It is another important visual character that determines the suitability of the fruit for vegetable type. A significant difference in the mesocarp thickness among the genotypes was noticed with a range of 1.43 cm to 3.67 cm and the mean of 2.27 cm in the six week old fruits. In eight week old fruits, the range was from 1.67 cm to 3.77 cm with the mean of 2.69 cm (Table 3). The Highest mesocarp thickness in the six week old fruits was noticed in GTC-3 (3.67 cm) and the genotype Lalbagh Madhura (3.60 cm) was found on par with it. The least was seen in KV-2 (1.43). In the eight weeks fruit, Lalbagh Madhura was recorded highest mesocarp thickness (3.77 cm) and the genotypes Swarna (3.70 cm) and Byrachandra (3.43 cm) were found on par with it. The least was noticed in GH-9 (1.67 cm). For screening a genotype for vegetable type, more mesocarp thickness and weight should be taken in to consideration.

The variations in the mesocarp thickness has been reported by Wangchu *et al.* (2013). They attributed that, the variation in mesocarp thickness could be due to cross pollination nature of the crop and also pertaining to genotypic characters.

Rind Weight

One of the important factors that contribute to the total weight of fruit and also the edible portion recovery hence the genotypes with least rind recovery should be considered to prefer for vegetable types. The rind weight exhibited a significant difference among the genotypes ranging from 0.13 kg to 0.42 kg with a mean rind weight of 0.25 kg in six week old fruits and in eight week old fruits, the range was from 0.17 kg to 0.48 kg with a mean of 0.31 kg (Table 4). The least rind weight was recorded in KV-2 and GH-15 (0.13 kg) and seven genotypes found on par with them in the six week old fruits. The KV-2 also recorded least rind weight in eight week old fruits (0.17 kg) and four genotypes were on par with it. The higher rind weight was recorded in NSP-3 (0.42 kg) of six week old fruit and GTC-3 (0.48 kg) of eight week fruit.

TABLE 4

Variations noticed in fruit rind, core, mescoarp weight and recovery of jackfruit genotypes at six and eight week old tender fruits

Genotypes	Rind weight (kg)		Core weight (kg)		Mesocarp weight (kg)		Recovery (%)	
	6 week	8 week	6 week	8 week	6 week	8 week	6 week	8 week
Lalbagh Madhura	0.25	0.31	0.25	0.29	0.69	1.06	57.64	63.27
Byrachandra	0.25	0.26	0.24	0.30	0.92	1.62	65.48	73.80
Swarna	0.28	0.29	0.25	0.23	1.05	1.34	65.52	71.74
Muttamvarika	0.31	0.42	0.26	0.38	0.83	1.36	58.84	61.09
Gumless	0.32	0.38	0.17	0.21	0.84	1.16	62.80	65.05
HV-1	0.20	0.37	0.21	0.39	0.79	1.37	66.27	63.93
HV-2	0.20	0.28	0.11	0.17	0.72	1.37	69.04	74.58
KV-1	0.18	0.24	0.11	0.19	0.73	0.97	71.33	75.07
KV-2	0.13	0.17	0.11	0.17	0.30	0.54	55.55	63.24
KV-3	0.20	0.24	0.11	0.20	0.52	0.90	59.64	63.88
GTC-1	0.25	0.40	0.15	0.21	0.61	0.92	60.09	62.06

Genotypes	Rind weight (kg)		Core weight (kg)		Mesocarp weight (kg)		Recovery (%)	
	6 week	8 week	6 week	8 week	6 week	8 week	6 week	8 week
GTC-3	0.41	0.48	0.13	0.15	1.29	1.63	67.93	70.63
GA-18	0.19	0.26	0.21	0.27	0.77	1.03	64.34	65.87
GA-20	0.24	0.23	0.12	0.14	0.76	1.04	67.48	73.24
NSP-1	0.21	0.23	0.18	0.19	0.88	1.14	68.01	73.04
NSP-2	0.35	0.34	0.21	0.24	0.84	1.02	60.25	64.31
NSP-3	0.42	0.47	0.14	0.16	0.52	0.73	44.78	48.17
GH-9	0.18	0.19	0.15	0.22	0.55	0.78	61.31	64.59
GH-11	0.25	0.35	0.14	0.16	0.69	0.98	61.56	62.87
GH-15	0.13	0.22	0.12	0.17	0.48	1.01	63.04	70.15
Grand Mean	0.25	0.31	0.17	0.22	0.74	1.10	62.55	66.53
Range Max.	0.42	0.48	0.26	0.39	1.29	1.63	71.33	75.07
Min.	0.13	0.17	0.11	0.14	0.30	0.54	44.78	48.17
SEm ±	0.03	0.02	0.02	0.01	0.04	0.05	1.07	1.13
CD at 5%	0.09	0.06	0.05	0.03	0.11	0.15	3.05	3.22
F test	*	*	*	*	*	*	*	*

Rind weight should be less and higher and more rind weight leads to increase in total fruit weight and the recovery of edible portion will be less. Variations in rind weight from 2.70 kg to 6.41 kg were reported from Kavya *et al.* (2019) and the rind weight of 1.15 kg to 4.7 kg was reported from Akter and Rahman, (2017) in their study.

Core Weight

The core weight plays a prominent role in determining the suitability of a genotype for vegetable purpose. Most of the genotypes with higher core weight would be unsuitable for vegetable types and hence less core weight is preferred. In the present study, a significant difference was recorded for core weight ranging from 0.11 kg to 0.26 kg and a mean of 0.17 kg in six week old fruits and the range of 0.14 kg to 0.39 kg with a mean core weight of 0.22 kg was recorded in eight week old fruits (Table 4). The genotypes KV-1, KV-2, KV-3 and HV-2 had the least core weight of 0.11 kg. The highest was seen in Muttamvarika (0.26 kg), Lalbagh Madhura and Swarna (0.25 kg) in the six week fruits. The genotype GA-20 had the least core weight (0.14 kg) followed by GTC-3 (0.15 kg) and the highest was noticed in HV-1 (0.39 kg) followed by Muttamvarika (0.38 kg).

Azad *et al.* (2007) noticed a poor correlation between core percentage of fruits with the environmental factors. Akter and Rahman (2017) reported the core weight ranged from 167 g to 935 g with a mean core weight of 371.22 g.

Mesocarp Weight

Mesocarp is the most important trait in determining the suitability of a genotype for vegetable purpose. The higher mesocarp weight differed significantly, ranging from 0.30 kg to 1.29 kg with a mean mesocarp weight of 0.74 kg in six week fruits and in eight weeks old fruits, the range was from 0.54 kg to 1.63 kg with a mean fruit weight of 1.10 kg (Table 4). The genotype GTC-3 recorded the highest mesocarp content in both six and eight weeks old fruits (1.29 kg and 1.63 kg, respectively) followed by Swarna (1.05 kg) and Byrachandra (0.92 kg) in six week old fruits and Byrachandra (1.62 kg) of eight week fruit. The least mesocarp weight was noticed in KV-2 at six and eight weeks old fruits (0.30 kg and 0.54 kg, respectively).

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This is the edible portion in the tender jackfruit after separating the core and rind. Thus the mesocarp weight should be higher than core and rind weight in order to get good recovery. Presence or absence of seeds in the mesocarp is also taken into consideration. Mesocarp without seed is preferred but slightly immature or presence of soft seeds is also acceptable.

Recovery

Recovery of edible portion is calculated based on mesocarp weight over total fruit weight. A significant difference was observed in edible portion recovery ranging from 44.78 per cent to 71.33 per cent with a mean of 62.55 per cent in six week old fruit and the range of 48.17 per cent to 75.07 per cent with a mean of 66.53 per cent in eight week old fruits (Table 4). The genotype KV-1 recorded higher recovery in both six and eight week old fruits (71.33% and 75.07% respectively) and the edible portion recovery of four genotypes found on par *viz.,* HV-2 (69.04), Swarna (65.52%), Byrachandra (65.48%) in the six old fruits. In eight week old fruits, four genotypes *i.e.,* HV-2 (74.58%), Byrachandra (73.80%), GA-20 (73.24%) and NSP-1 (73.04%) were found on par with KV-1. The least edible portion was recorded in NSP-3 genotype of six and eight week old fruits (44.78% and 48.17%, respectively).

The recovery of the edible portion is directly proportional to higher mesocarp weight in the total fruit weight. Genotype with good fruit weight might not get good recovery because of contribution of higher rind and core weight. Akter and Rahman, (2020) also reported a huge diversity of 18.39 per cent to 60.74 per cent recovery of edible portion among the jackfruit germplasm of their study.

Based on the morphological characters assessed in the experiment, the parameters such as minimum rind weight and thickness, less core weight and thickness, higher mesocarp weight and thickness at the early growth stages (six to eight weeks) plays the key role in identifying the genotypes/varieties that are suitable for vegetable types. However, the gum/latex exudation was seen throughout the observed stages, it prevails up to the fruit maturity or onset of fruit ripening in Gumless also and its content may be reduced in some genotypes due to biochemical conversions Among different genotypes evaluated, the genotype KV-1 performed the best. The check variety HV-2 also performed well and stood in the second position. Further, KV-1 and HV-1 also recorded higher mesocarp recovery because of less rind weight, core weight and also less core and rind thickness even though they had less total fruit weight. The genotypes NSP-3 and KV-2 got the least recovery because of the more rind weight which added to the total fruit weight and hence reduced in edible portion. The genotypes with higher edible portion recovery could be studied further for its nutritional properties and cooking quality to recommend for vegetable jackfruit type.

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