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BIOCHEMICAL AND SENSORY EVALUATION OF SURVEYED JACKFRUIT GENOTYPES IN GODAVARI ZONE OF ANDHRA PRADESH, INDIA

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ABSTRACT

The present investigation entitled “Biochemical and sensory evaluation of surveyed jackfruit genotypes in Godavari zone of Andhra Pradesh” was conducted at Horticultural Research Station, Venkataramannagudem. Survey was conducted in Devarapalli, Mettaupparagudem, Venkataramannagudem, Jaggannapeta, Kommugudem, Krishnampalem and Ramannapalem villages of West Godavari district. During the survey thirtyone genotypes were identified and all they were compared with the check variety Palur-1. Highest TSS 29.5 °Brix (VJC -17), reducing sugars 13.25% (VJC-17), total sugars 27.82% (VJC-17), ascorbic acid 13.28 mg/100 g (VJC-13) and β-carotene 0.582 mg/100 g (VJC-18) were recorded higher than the check variety Palur-1. VJC-16, VJC-17, VJC-18 and VJC-19 showed maximum score (9) for colour, taste, flavour, texture and overall acceptability.

Keywords : Jackfruit, Flakes, biochemical, evaluation.

Introduction

Jackfruit (*Artocarpus heterophyllus* Lam.) belongs to the family Moraceae, which includes mulberry (*Morus* spp.) and figs (*Ficus* spp.). It is native to the rain forests of Western Ghats, India ((Rowe-Dutton, 1985). The name “jackfruit” is derived from the Portuguese “jaca” which in turn derived from Malayalam language ‘Chakka’. It is known as panasa in Sanskrit and Telugu, kathal in Hindi, phanas in Marathi.

Jackfruit is an evergreen medium to large-sized tree, 10-20 m tall, occasionally reaching 30 m, with a long taproot and a dense crown. Jack fruit trees come up well under humid and warm climate condition.

Lateritic soil supplied with adequate moisture and one of the most drought tolerant, hardy fruit crop and traditionally it is a farmer’s household fruit. The ripe fruit contains yellow pulp rich in carotene, vitamins and minerals. Other parts of the fruit contain pectin, which have high value for preparation of jelly. Every 100 g of ripe fruit pulp contains carbohydrate (18.9 g), protein (1.9 g), fat (0.1 g), moisture (77%), fibre (1.1 g), total mineral matter (0.8 g), phosphorus (30 mg), calcium (20 mg), iron (500 mg), Vitamin A 540 (I.U.), thiamine (30 mg) and 84 calories (Samaddar, 1985). Jackfruit is rich in phytonutrients which have antimicrobial, anti-diabetic, anti-inflammatory, antioxidant and anti-helminthic properties

(Shanmugapriya *et al.*, 2011). Jackfruit could be very useful in the treatment of the dreaded diseases of human being such as AIDS. Jacaline protein found in jackfruit seed inhibited the growth of HIV infection under 'in -vitro' conditions (Prakash *et al.*, 2009). Lectine, a natural protein from fruit is used in cancer treatment. Carotenoids found in jackfruit can prevent several chronic generative diseases such as cancer, cataract, cardiovascular diseases and age -related muscular degeneration (Krinsky *et al.*, 2003).

Lot of variability is existing in the Godavari zone of Andhra Pradesh and *in-situ* evaluation of these germplasm for biochemical parameters will be useful for identification of new genotypes for the commercial cultivation in the state. Evaluation of germplasm is the basic tool for identification of superior genotypes. The knowledge on biochemical parameters of different types of jackfruit would help the growers to identify actual characters of good quality jackfruit for using different purposes.

Material and Methods

Survey was conducted in Godavari Zone of Andhra Pradesh. Information regarding superior genotypes were collected from the farmers and fruit traders of Godavari zone. The selected jackfruit trees were identified in the farmer's fields. However, jackfruit being an underutilized crop were grown in backyard without any management practices, mixed with other fruit trees. The observations on various characters of each genotype were recorded timely and periodically in the farmers' fields during the year 2022. The harvested fruits brought to the laboratory for the biochemical analysis. The biochemical characters include total soluble solids (hand refractometer), total sugars (Lane and Eynon method (AOAC, 1960), reducing sugars (Lane and Eynon method (AOAC, 1960), non-reducing sugars (Lane and Eynon method (AOAC, 1960), titrable acidity (Ranganna, 1986), ascorbic acid content (Ranganna, 1986)) and β -carotene content. The ripe flakes of different jackfruit types were subjected to sensory evaluation by a panel of ten judges consisting of teaching staff and students of College of Horticulture, Venkataramannagudem. Sensory characters *viz.*, colour, texture, flavour, taste and overall acceptability were evaluated on a 9-point hedonic scale as described by Ranganna (1995). The data collected from different observations was analyzed using the method of descriptive statistics.

Results and Discussion

Total Soluble Solids (TSS)

Data presented in Table 1.1 showed that the total soluble solids ranged from 14.3 °Brix (VJC-8) to 29.5

°Brix (VJC-17) among 31 genotypes studied. The mean TSS recorded in present study was 20.92 °Brix. It was recorded that five genotypes VJC-16 (28 °Brix), VJC-17 (29.5 °Brix), VJC-18 (28.6 0Brix), VJC-19 (27.8 °Brix) and VJC-23 (26.8 °Brix) were recorded higher TSS and rest twenty-six genotypes (VJC-1 to 15, VJC-20 to 22 and VJC-24 to 31) recorded lesser TSS than the check variety Palur-1 (26.6 °Brix).

Titratable acidity (%)

Data given in Table 1.1 showed the titratable acidity content ranged from 0.18% (VJC-17) to 0.91% (VJC-8) and the mean titratable acidity of 0.39%. It was observed that twelve genotypes under study *viz.*, VJC-1 (0.27%), VJC-2 (0.28%), VJC-14 (0.25%), VJC-16 (0.22%), VJC-17 (0.18%), VJC-18 (0.24%), VJC-19 (0.21%), VJC-21 (0.29%), VJC-23 (0.28%), VJC-24 (0.22%) VJC-25 (0.25%) and VJC-30 (0.28%) recorded lower titratable acidity and rest nineteen genotypes *viz.*, VJC-3 to 13, VJC-15, VJC-20, VJC-22, VJC-26 to 29 and VJC-31 were recorded higher titratable acidity than the check variety Palur-1 (0.29%)

Reducing sugars (%)

Data presented in Table 1.2 showed that reducing sugars ranged from 4.45% (VJC-8) to 13.25% (VJC-17). The mean reducing sugars recorded in present study was 8.00%. It was found that six genotypes VJC-16 (10.73%), VJC-17 (13.35%), VJC-18 (11.58%), VJC-19 (9.58%), VJC-23 (9.34%) and VJC-25 (9.27%) were recorded higher reducing sugars and rest twenty-five genotypes (VJC-1 to 15, VJC-20 to 22, VJC-24, VJC-26 to 31) recorded lower reducing sugars than the check variety Palur-1 (9.20%).

Total sugars (%)

Data given in Table 1.2 showed that the total sugars content ranged from 13.82% (VJC-8) to 27.82% (VJC-17). The mean reducing sugar recorded in present study was 19.79%. It was recorded that four genotypes VJC16 (24.63%), VJC-17 (27.82%), VJC-18 (25.81%) and VJC-23 (23.62%) were recorded higher total sugars and rest twenty-seven genotypes (VJC-1 to 15, VJC19 to 22, VJC-24 to 31) recorded lower total sugars than the check variety Palur-1 (23.54%).

Non reducing sugars (%)

The results represented in Table 1.2 showed that among 31 genotypes non-reducing sugars ranged from 8.98% (VJC-12) to 14.57% (VJC-17). The mean non-reducing sugars of 11.79%. It was recorded that one genotype VJC17 recorded higher non-reducing sugar (14.57%) and rest thirty genotypes (VJC-1 to 16 and

VJC-18 to 31) recorded lower non-reducing sugars than the check variety Palur-1 (14.34%).

Ascorbic acid (mg/100 g)

Data presented in Table 1.1 showed that the Vitamin-C ranged from 3.50 mg/100 g (VJC-12) to 13.28 mg/100 g (VJC-13) among 31 genotypes studied. The mean Vitamin-C content recorded in the present study was 7.79 mg/100 g. It was observed that ten genotypes VJC-9 (10.25 mg/100 g), VJC13 (13.28 mg/100 g), VJC-14 (10.5 mg/100 g), VJC-17 (9.84 mg/100 g), VJC-19 (12.01 mg/100 g), VJC-21 (11.23 mg/100 g), VJC-23 (10.73 mg/100 g), VJC-25 (11.28 mg/100 g), VJC-28 (9.32 mg/100 g) and VJC-29 (11.02 mg/100 g) were recorded higher vitamin-C and rest twenty one genotypes (VJC-1 to 8, VJC-10 to 12, VJC-15, VJC-16, VJC-18, VJC-20, VJC-22, VJC-24, VJC-26, VJC-27, VJC30, VJC-31) recorded lower vitamin-C than the check variety Palur-1 (8.55 mg/100 g).

β -carotene (mg/100 g)

Data presented in Table 1.1 showed that among 31 genotypes β -carotene ranged from 0.212 mg/100 g (VJC-12) to 0.582 mg/100 g (VJC-18). The mean β -carotene in present study was 0.368 mg/100 g. It was recorded that five genotypes VJC-16 (0.528 mg/100 g), VJC-17 (0.565 mg/100 g), VJC-18 (0.582 mg/100 g), VJC-19 (0.546 mg/100 g) and VJC-23 (0.532 mg/100 g) were recorded higher β -carotene and twenty-six genotypes (VJC- 1 to 15, VJC-20 to 22, VJC-24 to 31) recorded lower β -carotene than the check variety Palur-1 (0.485 mg/100 g).

Goswami *et al.* (2011) reported that biochemical composition of jackfruit flake influenced by both genotype and place of growth. Variation was recorded in the amount of TSS in the different genotypes of jackfruit studied, it ranges between 14.3 (VJC-8) - 29.5 $^{\circ}$ Brix (VJC-17). The results are accordance with Krishnan *et al.* (2015), Chandrashekhar *et al.* (2017). Selvaraj and Pal (1989) reported that low acidity and high sugars were responsible for the sweet taste of jackfruit. Among the genotypes, titratable acidity ranged from 0.18% to 0.91%. Similar results were reported by Gomez *et al.* (2015) in jackfruit.

Reducing sugars ranged from 4.45%-13.25%, total sugars ranged from 13.82%-27.82% and non-reducing sugars ranged from 8.98% -14.57%. The results were accordance with Reddy *et al.* (2004), Jagadeesh *et al.* (2007), Ibrahim *et al.* (2013), Wangchu *et al.* (2013) and Avani and Bauri (2018). Vitamin- C content varied among the genotypes, ranged from 3.5 mg/100 g (VJC-12) -13.28 mg/100 g (VJC-13). Similar results were recorded by Aseef *et al.*

(2017) and Dey and Baruah (2021). VJC-13 recorded as best one among the genotypes studied.

Among the genotypes, variation was recorded in the amount of β -carotene. Jagadeesh *et al.* (2007) reported that yellow flake colour showed higher carotene content than the light yellow and creamy white flake colour. In the present study, β -carotene ranges between 0.212 (VJC-12) - 0.582 mg/100 g (VJC-18). The results are accordance with Chandrashekhar *et al.* (2017).

According to Mitra and Mani (2000) jackfruit types with TSS and total sugars more than 25 $^{\circ}$ Brix and 20% respectively were found to be suitable for dessert purpose. Under the study 7 genotypes viz., VJC-16, VJC-17, VJC-18, VJC-19, VJC-23, VJC-24 and VJC-25 were found suitable for dessert purpose. The fruits were harvested at three fourth to fully mature but unripe stage and having firm flakes, TSS 15.34 $^{\circ}$ Brix were found suitable for chips purpose (Jagadeesh *et al.*, 2008). In the present study, VJC-1, VJC-2, VJC-12, VJC-13, VJC-16, VJC-17, VJC-18, VJC-19, VJC-23, VJC-24 and VJC-25 produced fruits with firm textured and thick flakes which can be used for chips purpose. VJC-3, VJC-4, VJC-5, VJC-10, VJC-14, VJC-20 and VJC-30 have soft flesh and they are suitable for culinary purpose.

Data presented in Table 1.3 showed that among the genotypes, VJC-16, VJC-17, VJC-18 and VJC-19 showed maximum score (9) for colour, taste, flavour, texture and overall acceptability. VJC-23 and VJC-25 showed maximum score (9) for overall acceptability. This may be due to genetic nature of the genotypes and growing environment. Similar findings were reported by Murugan (2007).

Table 1.1: Biochemical analysis of jackfruit flakes.

S. No.	Genotype	TSS ($^{\circ}$ BRIX)	Titratable acidity (%)	Ascorbic acid (mg/100 g)	β - carotene (mg/100 g)
1	VJC-1	23	0.27	5.80	0.416
2	VJC-2	22.3	0.28	5.10	0.302
3	VJC-3	20.5	0.34	7.54	0.367
4	VJC-4	18.3	0.43	6.58	0.482
5	VJC-5	16.5	0.57	8.23	0.245
6	VJC-6	20.5	0.39	8.03	0.483
7	VJC-7	20.0	0.33	6.55	0.242
8	VJC-8	14.3	0.91	7.82	0.224
9	VJC-9	15.0	0.63	10.25	0.348
10	VJC-10	18.7	0.41	8.12	0.372
11	VJC-11	15.8	0.72	3.83	0.408
12	VJC-12	15.5	0.68	3.50	0.212
13	VJC-13	17.6	0.49	13.28	0.246
14	VJC-14	21.5	0.25	10.50	0.443
15	VJC-15	16.5	0.52	3.59	0.357
16	VJC-16	28.0	0.22	3.80	0.528

17	VJC-17	29.5	0.18	9.84	0.565
18	VJC-18	28.6	0.24	8.52	0.582
19	VJC-19	27.8	0.21	12.01	0.546
20	VJC-20	18.1	0.41	4.00	0.348
21	VJC-21	22.5	0.29	11.23	0.329
22	VJC-22	17.2	0.42	8.39	0.268
23	VJC-23	26.8	0.28	10.73	0.532
24	VJC-24	25.5	0.22	6.00	0.328
25	VJC-25	26.1	0.25	11.28	0.384
26	VJC-26	23.2	0.33	6.91	0.363
27	VJC-27	18.2	0.37	7.38	0.342
28	VJC-28	19.8	0.30	9.32	0.238
29	VJC-29	17.5	0.45	11.02	0.229
30	VJC-30	24.1	0.28	6.78	0.342
31	VJC-31	19.6	0.34	5.58	0.364
	Mean	20.92	0.39	7.79	0.368
Range	Max	29.5	0.91	13.28	0.582
	Min	14.3	0.18	3.50	0.212
Check variety	Palur-1	26.6	0.29	8.55	0.485

Table 1.2 : Biochemical analysis of jackfruit flakes.

S. No.	Genotype	Reducing sugars (%)	Total sugars (%)	Non-reducing sugars (%)
1	VJC-1	8.39	21.65	13.26
2	VJC-2	8.21	20.2	11.99
3	VJC-3	8.05	19.83	11.78
4	VJC-4	7.46	18.79	11.33
5	VJC-5	6.75	15.87	9.12
6	VJC-6	8.18	19.94	11.76
7	VJC-7	7.88	19.28	11.4
8	VJC-8	4.45	13.82	9.37
9	VJC-9	4.62	14.12	9.5
10	VJC-10	8.19	19.02	10.83
11	VJC-11	5.82	14.98	9.16
12	VJC-12	5.47	14.45	8.98
13	VJC-13	7.3	18.2	10.9
14	VJC-14	8.23	20.53	12.3
15	VJC-15	6.82	16.05	9.23
16	VJC-16	10.73	24.63	13.9
17	VJC-17	13.25	27.82	14.57
18	VJC-18	11.58	25.81	14.23
19	VJC-19	9.58	23.2	13.62
20	VJC-20	6.36	16.58	10.22
21	VJC-21	8.21	21.46	13.25
22	VJC-22	7.09	17.59	10.5
23	VJC-23	9.34	23.62	14.28
24	VJC-24	9.18	22.48	13.3
25	VJC-25	9.27	23.53	14.26

26	VJC-26	8.68	22.01	13.33
27	VJC-27	7.34	18.58	11.24
28	VJC-28	7.82	20.03	12.21
29	VJC-29	7.25	18.1	10.85
30	VJC-30	8.92	21.73	12.81
31	VJC-31	7.56	19.68	12.12
	Mean	8.00	19.79	11.79
Range	Max	13.25	27.82	14.57
	Min	4.45	13.82	8.98
Check variety	Palur-1	9.20	23.54	14.34

Table 1.3: Sensory evaluation of jackfruit genotypes.

S. No.	Genotype	Colour (9)	Taste (9)	Flavour (9)	Texture (9)	Overall acceptability (9)
1	VJC-1	8	8	7	7	7
2	VJC-2	6	8	6	7	6
3	VJC-3	7	7	7	7	7
4	VJC-4	8	7	7	6	7
5	VJC-5	6	7	6	6	6
6	VJC-6	7	8	7	6	7
7	VJC-7	6	7	7	7	7
8	VJC-8	6	6	6	6	6
9	VJC-9	6	7	6	7	7
10	VJC-10	7	7	6	6	6
11	VJC-11	6	6	8	8	8
12	VJC-12	6	6	7	8	7
13	VJC-13	7	7	6	8	6
14	VJC-14	8	7	7	7	7
15	VJC-15	8	7	8	7	8
16	VJC-16	9	9	9	9	9
17	VJC-17	9	9	9	9	9
18	VJC-18	9	9	9	9	9
19	VJC-19	9	9	9	9	9
20	VJC-20	7	6	6	6	6
21	VJC-21	7	7	6	6	7
22	VJC-22	7	7	6	7	7
23	VJC-23	8	9	9	9	9
24	VJC-24	7	7	8	8	8
25	VJC-25	8	8	9	9	9
26	VJC-26	7	8	6	6	7
27	VJC-27	7	7	6	6	7
28	VJC-28	6	7	7	7	7
29	VJC-29	7	7	6	7	6
30	VJC-30	7	8	6	6	6
31	VJC-31	6	7	7	7	7
32	Palur-1	9	9	9	9	9

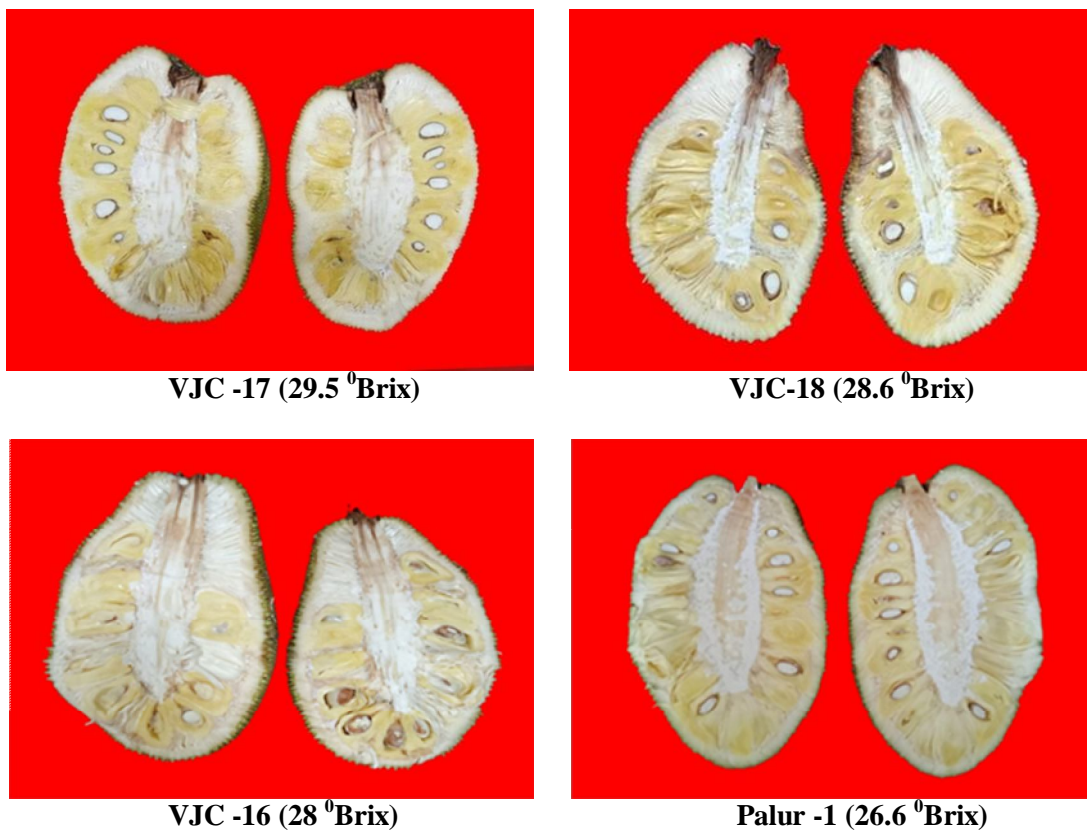


Plate 1.1 Top 3 performance of Genotypes showing higher TSS content compared to the check variety Palur-1.

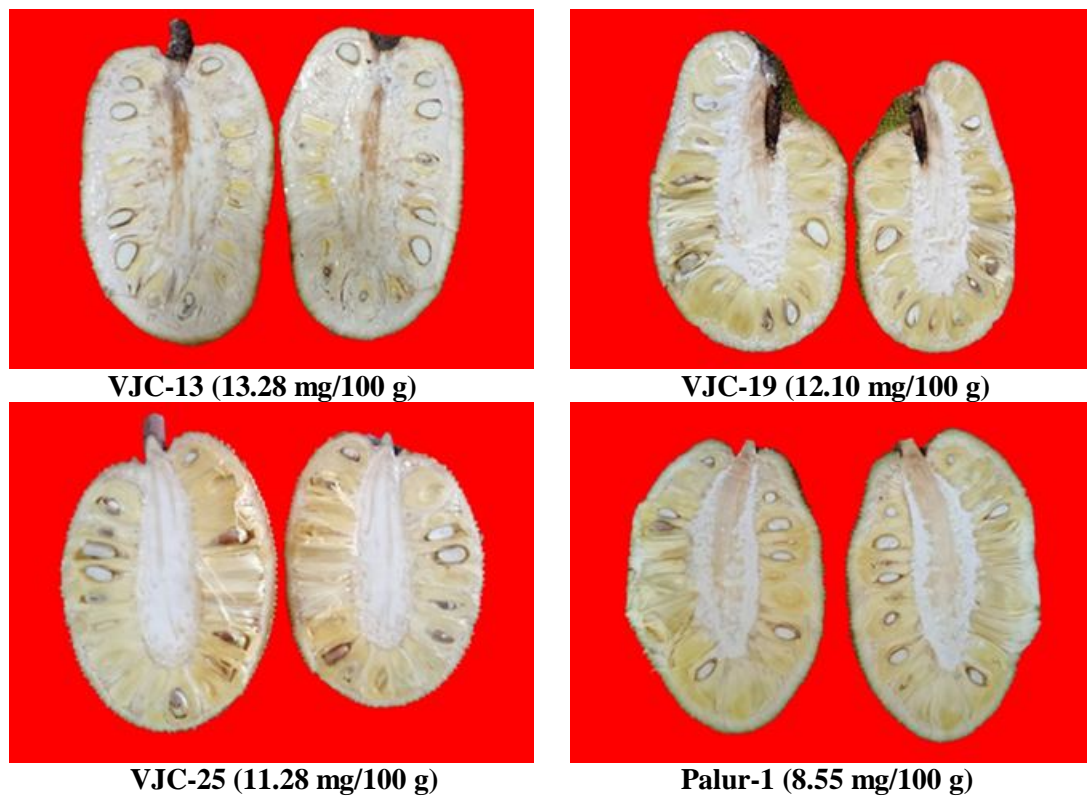


Plate 1.2 : Top 3 performance of genotypes in ascorbic acid content compared to the check variety Palur-1.

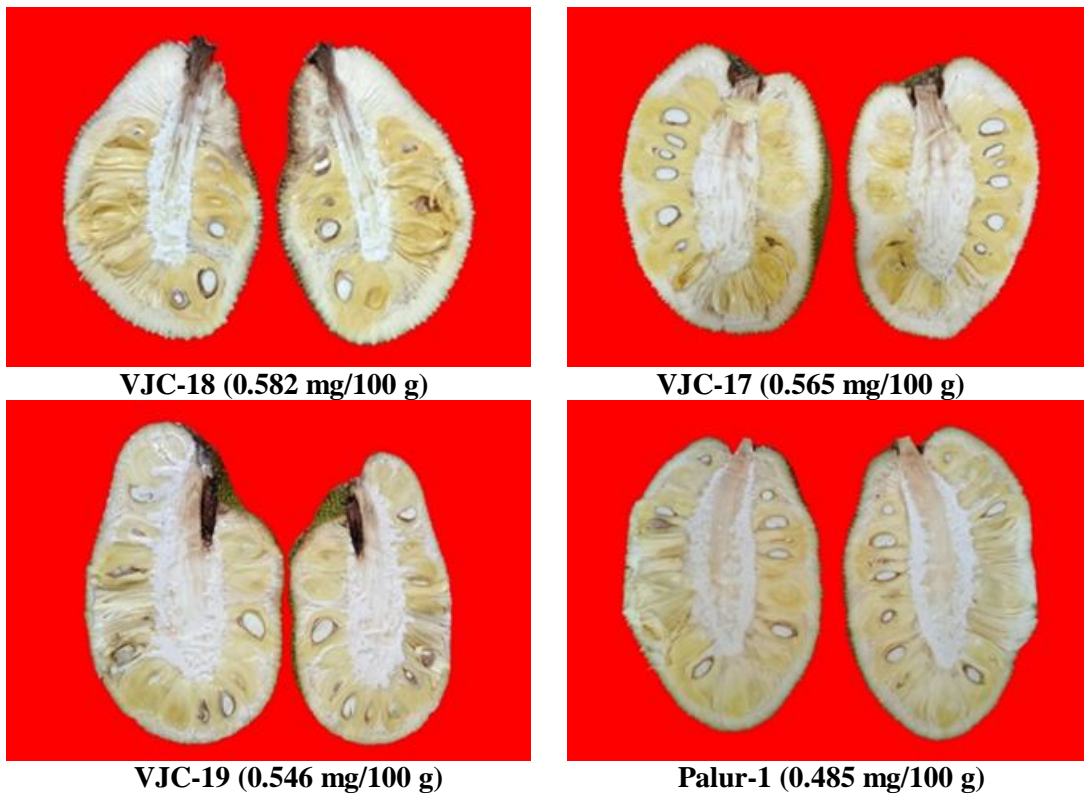


Plate 1.3 Top 3 performance of genotypes showing higher β -carotene content compared to the check variety Palur-1.

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