Quality Evaluation of Some Jackfruit Genotypes of Eastern and North Eastern India

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Abstract

Jackfruit is one of the indigenous and underutilized fruit of Rain Forests of India. Naturally Eastern and North Eastern India have the rich genetic base of jackfruit with wide genetic variability of plant growth, fruiting behaviour, fruit physical and quality attributes of fruit. Present research was aimed to study the quality attributes of some jackfruit genotypes of Eastern and North Eastern India. The properly mature fruits of sixteen selected jackfruit genotypes (soft type) of different locations of Eastern and North Eastern states were collected. Quality parameters like total soluble solids (TSS), titratable acidity, total sugar, reducing sugar, ascorbic acid, carotene, dry matter content *etc.* were evaluated. Sensory evaluation was also carried out to judge the acceptance of the selected jackfruit genotypes. TSS of the bulbs of different jackfruit genotypes ranged from 17.35 to 28.12 °Brix while titratable acidity from 0.42 to 0.93 %. Maximum total sugar and reducing sugar were 17.71 and 8.03 % respectively. A range of ascorbic acid content of fruit pulp of different jackfruit genotypes from 5.24 to 10.12 mg/100g was recorded while it was from 311.2 to 496.7 µg/100g in β-carotene content. The jackfruit selections collected from North Bengal, lower Assam and Tripura were superior with respect to different quality parameters and sensory analysis.

Keywords: *Jackfruit, Eastern & North Eastern India, Quality attributes.*

INTRODUCTION

Jackfruit (*Artocarpus heterophyllus* Lam) is indigenous in the forests of the Western Ghats (India), where it still grows in the wild, as well as in the evergreen forests of Assam and Myanmar. It is cultivated throughout Bangladesh, Burma, India, Indonesia, Malaysia, The Philippines, Sri Lanka, Thailand and to some extent in Brazil and Queensland. Jackfruit is the largest edible fruit in the world (Naik, 1949 and Sturrock, 1959). It gives more yield per tree than most of the fruit crops but is still not classified as a commercial fruit and is rarely grown on regular plantation scale thus considered underutilized fruit. But in jackfruit growing areas, the poor people used to eat this fruit as their daily meal during the production season. Owing to its numerous culinary uses and its availability in plenty during heavy monsoon rains, jackfruit has earned the well deserved name-Poor man's food (Rahman *et al.*, 1995). The unripe fruit has a great demand for use as a popular vegetable, while the ripe fruit is used as dessert fruit. Jackfruit has been reported to contain high levels of protein, starch, calcium, and thiamine (Brukill, 1997). The bulbs (excluding the seeds) are rich in sugar, fairly well in carotene and also contain vitamin C (Bhatia *et al.*, 1955). This fruit is also known to be beneficial to lower the blood pressure, cure of fever and diarrhea, fighting asthma, ulcers, indigestion, tension, nervousness and constipation. It can slow down aging and cell degeneration. Cultivation of this underutilised fruit in Eastern and North Easter India is mostly under homestead areas or in mixed orchards and rarely as solo orchard. Taste and quality of jackfruit bulbs are most important for popularization of the fruit. Not much work has been done so far on evaluation of quality of these available genotypes of jackfruit under this region where a wide

genetic base is available. Thus, in order to evaluate the physicochemical quality attributes of jackfruit genotypes under Eastern and North Eastern India the present study has been undertaken.

MATERIALS AND METHOD

The research work was conducted in the laboratory of Department of Pomology and Post Harvest Technology, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar during 2009 to 2010 and in the laboratory of Division of Horticulture, Institute of Agriculture, Visva-Bharati University, Sriniketan, Birbhum, West Bengal, India during 2011 to 2012. Mature fruits of sixteen different soft fruited jackfruit plants were collected and brought to laboratory from different location of Eastern and North Eastern states of India like Arunachal Pradesh (Selection-1 & 2), Manipur (Selection-3 & 4), Assam (Selection-5,6 & &7), Tripura (Selection-8 & 9), West Bengal (Selection-10, 11, 12 & 13), Bihar (Selection-14 & 15) and Jharkhand (Selection-16). After proper ripening the fruits were opened and the required pulps of fruits were randomly collected from the fruits. The bulbs were separated and sample was prepared for different laboratory processes for estimation of quality by extraction of juice from the bulbs.

Fresh pulps were used to estimate vitamin C, carotene and titrable acidity. Then the other estimations were done from the stored pulps. Total soluble solids (TSS), total sugar, reducing sugar and titrable acidity of pulps of jackfruits were determined as per the methods described in the Hand Book of Analysis for Quality Control of Fruit and Vegetable Products by Ranganna (2002). The total soluble solid content of fruit was determined with the help of hand refractometer (ERMA) of 0 – 32 percent, calibrated at 20°C. The readings were corrected as per international temperature correction table and the result was expressed in °brix. Total acidity was determined by titrating the diluted fruit juice against 0.1 N NaOH solution using phenolphthalin as an indicator and the results were expressed as percentage fresh weight of fruit. The total sugar content was determined by titrating the diluted fruit juice after hydrolysis with hydrochloric acid against Fehling 'A' and Fehling 'B' solutions in presence of methylene blue as an indicator. The reducing sugar content was determined by titrating the diluted juice against Fehling 'A' and Fehling 'B' solutions by using methylene blue as an indicator. Ascorbic acid content of the fruit was estimated by using 2, 6-dichlorophenol indophenol dye titration method and β-carotene content was determined by Acetone-Hexane solvent method according to A.O.A.C. method (2000). The sensory characteristics of jackfruit bulb were evaluated in terms of color/appearance, taste/flavor, and overall acceptability scores using a nine point Hedonic scale according to Larmond (1977) by a panel consisting of ten evaluators.

Data obtained was subjected to CRD statistical analysis Critical difference (CD) value at 5% level of probability was used to compare sixteen different treatments.

RESULTS

In the present experiment observations were taken on total soluble solids, titratable acidity, total sugar, reducing sugar, ascorbic acid content, β-carotene content, percent of dry matter including sensory value (organoleptic taste and overall acceptance). The result of the experiment is presented in the table 1 and explained as follows:

Total soluble solids (TSS)

It is clear from the table 1 that the total soluble solids of different jackfruit genotypes under the present experiment ranged from 17.35 to 28.12 °Brix. The significantly maximum TSS was recorded in Selection-8 and minimum in Selection-1. However, higher degree of TSS were also observed in Selection-6 (22.66 °Brix), Selection-15 (26.35 °Brix), Selection-12 (25.81 °Brix), Selection-3 (25.52 °Brix) and Selection-4 (25.23 °Brix).

Titratable acidity

The perusal of data presented in the table 1 shows that maximum amount of titratable acidity (0.93%) was observed in Selection-13 which was closely followed by Selection-14 (0.88%). But minimum amount of titratable acidity (0.42%) was recorded in Selection-6 which was statistically *at par* with Selection-7 (0.48%). However, lower amount of titratable acidity were recorded from the fruits of Selection-8 (0.56%), Selection-5 (0.59%) and Selection-9 (0.63%).

Total sugar

The amount of total sugar varied significantly as it is evident from the table 1. Significantly maximum total sugar (17.71%) was measured from Selection-6 followed by Selection-8 (17.02%), although it was minimum (12.86%) in Selection-13. Greater total sugar content was also measured in Selection-3 (16.86%), Selection-10 (16.17%) and Selection-12 (16.12%).

Reducing sugar

The observations on the reducing sugar content of jackfruit genotypes as presented in table 1 clearly denoted that significantly maximum amount of reducing sugar (8.29%) was recorded from Selection-6 followed by Selection-8 (8.03%) and Selection-10 (8.02%). The minimum reducing sugar was estimated in Selection-15 (6.67%) closely followed by Selection-14 (6.88%).

Sugar acid ratio

Findings of the present experiment as furnished in the table 1transparently encompass the significant variation in sugar acid ratio of the jackfruit genotypes selected under the study. Maximum sugar and acid ratio (19.73) was recorded in Selection-6. However, higher sugar and acid ratio was also recorded in Selection-7 (14.82) and Selection-8 (14.33). Lowest sugar and acid ratio was observed in Selection-13 (7.47) which was closely followed by Selection-14 (7.81), Selection-11 (8.51), Selection-4 (9.06), Selection-2 (9.31) and Selection-16 (9.45).

Ascorbic acid content

The cursory scan of the observations on the ascorbic acid content of jackfruit genotypes revealed that highest ascorbic acid content was observed in Selection-16 (10.12 mg/100g) which was statistically *at par* with Selection-8 (9.73 mg/100g). However, it was also higher in Selection-6 (9.65 mg/100g). Significantly lowest amount of ascorbic acid was recorded from Selection-10 (5.24 mg/100g) followed by Selection-11 (5.92 mg/100g), Selection-12 (6.27 mg/100g) and Selection-13 (6.29 mg/100g).

β-carotene content

It is evident from the data presented in table 1 that β-carotene content of the jackfruit genotypes varied significantly. Highest amount of β-carotene (496.7 µg/100g) was estimated in Selection-8. Some other genotypes were also in line of higher amount of β-carotene content like Selection-6 (463.5 µg/100g), Selection-7 (454.2 µg/100g), Selection-9 (412.8 µg/100g) and Selection-16 (402.5 µg/100g). Significantly minimum amount of β-carotene (311.2 µg/100g) was recorded in Selection-12.

Dry matter content

The perusal of the observations on dry matter content of fruits of different jackfruit genotypes revealed that maximum dry matter content (22.19 g/100g) was recorded in Selection-16, although it was statistically at par with Selection-4 (21.96 g/100g). However, higher dry matter content were also recorded in Selection-15 (21.22 g/100g), Selection-6 (21.02 g/100g) and Selection-8 (20.57 g/100g). Significantly lowest dry matter was estimated in Selection-1 (15.08 g/100g).

Sensory value:

With regard to the sensory value, the result of present experiment denoted that it ranged from 6.12 to 8.96. Maximum sensory value represented by Selection-8 which was statistically similar with Selection-6 (8.66). Higher sensory value were also estimated in Selection-7 (8.20), although minimum value was observed in Selection-11 (6.12) closely followed by Selection-9 (6.37) and Selection-13 (6.51).

DISCUSSION

Higher TSS in Selection-6, Selection-15, Selection12, Selection-3 and Selection-14 may be due to the genetic variation among the jackfruit genotypes and differences in growing conditions. Goswami *et al.* (2011) recorded 19.3 to 26.4 % TSS in 5 different jackfruit genotypes. Haque (1991) studied thirty two selected jackfruit genotypes and reported that total soluble solids in the pulps ranged from 14.0 to 21.5 %. Thus the findings of the Goswami *et al.* (2011) and Haque (1991) agreed with the present finding.

Titratable acidity of the jackfruit genotypes under the present study ranged from 0.48 to 0.93 %. This variation might be due to the genetic differences and differences in agro climatic conditions. The present result corroborates the findings of Goswami *et al.* (2011) and Bhatia *et al.* (1955).

Total sugar content of different jackfruit genotypes ranged from 12.86 to 17.71 % while the range of reducing sugar was 6.67 to .29 %. The values were agreement with those reported by Haque (1993), Reddy *et al.* (2004) and Goswami *et al.* (2011). Sugar and acid ratio of Selection-6 was maximum due to the high reducing sugar content and lowest titratable acidity.

Ascorbic acid content of jackfruit genotypes in the present experiment ranged from 5.24 to 10.12 mg/100g pulp. However, β-carotene content ranged from 311.2 to 496.7 µg/100g. This variation might be attributed to variation in genetic makeup and varied soil and climatic condition of different jackfruit genotypes.

Maximum sensory value of Selection-8 and higher in Selection-6 might be due to good organoleptic taste and more overall acceptance resulted due to higher reducing sugar and sugar and acid ratio.

CONCLUSIONS

From the result of the present investigation it may be concluded that the quality parameters of different jackfruit genotypes under study varied significantly. On the basis of higher TSS, total sugar, reducing sugar, vitamins and sensory value Selection-6, Selection-7 and Selection-8 are superior. Among the selections Selection-6 is best due to higher TSS, maximum total sugar, reducing sugar, sugar acid ratio and higher sensory value. Selection-6 also possessed highest amount of β-carotene with fare amount of ascorbic acid.

REFERENCES

AOAC (2000) Official Method of Analysis of the Association of the Analytical Chemists. Inc. Virginia. USA.

Bhatia BS, Siddappa GS and Lal G (1955) Composition and nutritive value of jackfruit. Indian J. Agri. Sci. 25(4): 30-36.

Brukill HM (1997) The Useful Plants of West Tropical Africa. Vol. 4, 2nd Edn. Royal Botanic Gardens, Kew: 160-161.

Gomez AK & Gomez AA (1984) Statistical Procedure for Agricultural Research, 2nd edn (John Wiley and Sons, Singapore).

Haque MA (1991) Fruit characteristics of thirty two selected jackfruit trees of Bhaluka, Trishal and Kotwali thana of Mymensingh district. Proc. BAURES. Prog. 7:209-215.

Haque MA (1993) Collection and evaluation of different jackfruit clones of Bangladesh. Proc. BAURES. Prog. 7:209-215.

Larmond E (1977) Laboratory methods for sensory evaluation of foods. Ottawa: Canada Department of Agricultural Publication. 1637p.

Naik KC (1949) South Indian Fruits and Their Culture. P. Varadachery & Co. Madras: 300-302.

Rahman AKE, Huq MM, Mian AJ and Chesson A (1995) Microscopic and chemical changes occurring during the ripening of two forms jackfruit (*Artocarpus heterophyllus* L). Food Chem. 52: 405-410.

Ranganna S (2002) Handbook of Analysis of Quality Control for Fruit and Vegetable Products, 2nd edn (Tata McGraw Hill Publishing Company Limited. New Delhi), 11-216.

Reddy BMC, Patil P, Sashikumar S and Govindaraju LR (2004) Studies on Physicochemical Characteristics of jackfruit clones of South Karnataka. Karnataka J. Agri. Sci.17(2):279-282.

Sturrock D (1959) Fruits of Southern Florida. South Eastern Printing Co. Stuart. Fla. 114 p.

Table

Table 1: Quality evaluation of some jackfruit genotypes under Eastern and North Eastern India

Genotypes	TSS (°Brix)	Acidity (%)	Total sugar (%)	Reducing sugar (%)	Sugar acid ratio	Ascorbic acid (mg/100g)	β-arotene (µg/100g)	Dry matter (g/100g)	Sensory value
Selection -1	17.35	0.68	15.29	6.93	10.19	7.23	351.6	15.08	7.34
Selection -2	20.07	0.72	13.42	6.71	9.31	6.46	343.2	16.22	7.22
Selection -3	25.52	0.76	16.86	7.93	10.43	7.12	372.5	18.31	6.97
Selection -4	25.23	0.81	15.29	7.34	9.06	7.56	367.7	21.96	7.35
Selection -5	21.74	0.59	14.58	7.05	11.94	8.08	382.3	18.74	7.20
Selection -6	26.66	0.42	17.71	8.29	19.73	9.65	463.5	21.02	8.66
Selection -7	22.45	0.48	14.63	7.11	14.81	8.34	454.2	18.25	8.20
Selection -8	28.12	0.56	17.02	8.03	14.33	9.73	496.7	20.57	8.96
Selection -9	19.98	0.63	13.35	6.82	10.82	7.41	412.8	17.81	6.37
Selection -10	23.76	0.71	16.17	8.02	11.29	5.24	388.3	18.89	6.84
Selection -11	23.02	0.85	15.07	7.24	8.51	5.92	329.1	17.53	6.12
Selection -12	25.81	0.69	16.12	7.98	11.56	6.27	311.2	19.38	7.17
Selection -13	18.24	0.93	12.86	6.95	7.47	6.29	354.7	16.15	6.51
Selection -14	22.36	0.88	14.01	6.88	7.81	6.53	372.9	17.84	6.67
Selection -15	26.35	0.61	15.95	6.67	10.93	7.32	394.3	21.22	7.58
Selection -16	21.58	0.73	13.67	6.90	9.45	10.12	402.5	22.19	6.87
SE±m	0.96	0.04	0.31	0.13	1.15	0.20	11.2	0.35	0.28
CD (at 0.05)	0.58	0.06	0.52	0.22	2.56	0.43	23.6	0.63	0.46