



Evaluation of Yield and Quality of Three Jackfruit (*Artocarpus heterophyllus* L.) Genotypes

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Abstract

Yield and quality performances of three jackfruit genotypes were studied at the Agricultural Research Station, Bangladesh Agricultural Research Institute, Pahartali, Chittagong during 2013-2014. Age, growth, maturity period, yield potential and also qualitative characteristics were compared among them. Based on overall performance with respect to bearing potential, maturity period, fruit and bulb characters, the genotypes AHPah-1 have been found promising for table purpose followed by AHPah-2 and AHPah-3. Minimum days (117) to 1st harvest were observed in AHPah-1. The number of fruits per plant was exceedingly higher (73) in AHPah-1 whereas minimum number (41) was found in AHPah-2. Maximum weight (8.40 kg) per fruit was observed in AHPah-2 and minimum was in AHPah-1 (3.40 kg). The highest single fruit length (37.25cm) was found in AHPah-2 and breadth (27.00cm) was produced by AHPah-3. Maximum number of bulbs (116) was produced in AHPah-1, whereas minimum (63.00) was in AHPah-3. Maximum weight of bulbs per fruit (4.24 kg) was produced in AHPah-2. Individual bulb weight was higher (54.42g) in AHPah-2 whereas, the lowest (16.71) was in AHPah-1. Edible portion was higher (69.27%) in AHPah-1 whereas, the lowest (53.43%) was in AHPah-3. The TSS was the highest (21.00%) in AHPah-1. The highest bulb length and breadth was found in AHPah-3. Highest seeds weight (639g) was produced in AHPah-2. Individual seed weight (8.19 g) was higher in AHPah-2. Therefore, the genotypes can be included in the variety development program after comparing with the already BARI released jackfruit variety.

Keywords: *Artocarpus heterophyllus*, genetic diversity, growth, yield and quality

1. Introduction

Jackfruit (*Artocarpus heterophyllus* Lam) is a national fruit of Bangladesh. *Artocarpus* is the third largest genus in the Moraceae family. It is distributed from Southeast Asia to Oceania. The species reportedly originated in the rainforests of

the Western Ghats of India (Popenoe, 1974) and in Malaysia (Hensleigh and Holaway, 1988). It was then spreaded to neighboring Sri Lanka, Southern China, Southeast Asia, and farther to tropical Africa, including Kenya, Uganda, Zanzibar, Mauritius, and Madagascar (Soepadmo, 1992). From the mid-seventeenth

century to the late nineteenth century, the species spreaded further to tropical and subtropical America (Brazil, Suriname, Jamaica, and Florida) and Australia (Popenoe, 1974). From these countries, the jackfruit might have dispersed even further, to other tropical and warm subtropical regions where it is now widely cultivated at low and medium elevations (Harlan, 1992).

The jackfruit is a multi-purpose species providing food, timber, fuel, fodder, and medicinal and industrial products. A mature tree produces up to 700 fruits per year, each weighing 0.5 to 50 kg. On an average, 50-80 tons of fruits can be harvested from a hectare of land. The tree is monoecious, producing male and female flowers. Stem of this plant is straight and rough whereas bark is green or black, 1.25 cm thick and exudes milky latex; leaves broad obovate, elliptic, decurrent, glabrous, entire; inflorescence solitary axillary, cauliferous and ramflours on short leafy shoots. It has also been reported that the evergreen leaves are oblong, oval or elliptic in shape, 10-15 cm in length, alternate, glossy and dark green in colour. The juvenile leaves are lobed.

In 2010, Bangladesh produced 1.5 million tons of fruits from 1,60,000 hectares of land, with about 30% of fruits being produce from jack plantations (Siddique and Azad, 2010). It is a cross-pollinated fruit tree and is mainly propagated by seeds. As a result, it exhibits a wide range of variation in morpho-agronomic characteristics. Narasimham (1990) and Hossain (1996) reported different types of jackfruit, which vary widely in size, shape, bearing habit and quality. Azad (1999) reported the genetic diversity of jackfruit using morpho agronomic characteristics and isozyme marker. The development of jackfruit varieties through hybridization is cumbersome and more time consuming. Therefore, selection of superior genotypes has been suggested for the improvement of jackfruit. The purpose of the present study was to identify jackfruit genotypes for higher yield and quality.

2. Materials and Methods

The experiment was conducted at the Agricultural Research Station, Bangladesh Agricultural Research Institute, Pahartali, Chittagong during 2013-2014. Three jackfruits genotypes, namely AHPah-1, AHPah-2 and AHPah-3 were included in the study. The experiment was laid out in a randomized complete block design with five replications.

The trees were 12-15 years old and were fertilized twice in a year in October and May as per schedule described by Mandal *et al.* (2011) @ 7500-1200-1250-800-500 g of cowdung, urea, TSP, MoP and zypsum per plant, respectively. Diazinon 60 EC @ 2 ml along with Ridomil MZ-75 @ 2.5 ml per litre of water was sprayed with the help of a power sprayer before the flower initiation to control soft rot disease and fruit borer insect. Weeding, irrigation and other interculture operations were done as per recommendation by Mandal *et al.* (2011).

Girth of the trunk was measured at a height of 15 cm from ground level and tree volume was calculated following Castle (1983) with some modifications, such as $\pi/6 \times \text{height} \times (2r)^2$ where, $2r = (\text{East} - \text{West} + \text{North} - \text{South canopy spread})/2$. Data on plant age, base girth, plant height, canopy (North-south and east-west spread), flowering, fruits number and weight per plant, fruit size, single fruit weight, fruit shape and colour, bulb number and weight per fruit, bulb size, TSS, edible portion and seeds number and weight per fruit, seed colour, size and organoleptic characteristics were recorded. Data were analyzed statistically and the means were separated by Least Significant Difference (LSD) following MSTATC software.

3. Results and Discussion

Growth parameters of three accessions are presented in Table 1. The tallest plant height (8.85 m) was found in AHPah-1 which closely followed by AHPah-2 (8.80 m). The maximum base girth (115 cm) was obtained from AHPah-2

followed by AHPah-1 (110 cm). The minimum base girth (95 cm) was found in AHPah-3. Maximum tree volume (483.53 m³) was found in AHPah-2. Date (24/10/2013) of blossoming of 1st male flower observed in AHPah-2. Date (10/12/2013) of blossoming of 1st female flower was observed in AHPah-2 (Table 1).

The days to 1st harvest were observed in AHPah-1 that was minimum days (117) from the genotypes. Maximum days (169) to 1st harvest were recorded in AHPah-2. Maximum weight per fruit was observed in AHPah-2 and minimum was in AHPah-1 (Table 2). Maximum number of fruits per plant (73) was produced by the AHPah-1 where minimum number (41) found in AHPah-2. Maximum yield of fruits per plant (344.40 kg) was produced by the AHPah-2 where minimum yield (248.78 kg) found in AHPah-1. The colour of the fruits was greenish yellow on AHPah-1, brownish yellow on

AHPah-2 and light yellow on AHPah-3. Fruits shape was oval to oblong. The highest single fruit length (37.25cm) was produced by AHPah-2 and breadth (27.00cm) in AHPah-3. Maximum weight of rind and rachis was obtained in AHPah-2. Rind thickness was height (1.00 cm) in AHPah-2 (Table 2).

Maximum number of bulbs (116) was produced in AHPah-1 where minimum (63.00) in AHPah-3. Maximum weight of bulbs per fruit (4.24 kg) was produced in AHPah-2. Bulb colours of the fruits were bright yellow to deep yellow. Individual bulb weight was higher (54.42 g) in AHPah-2 whereas, lowest (16.71) in AHPah-1. Texture was soft to medium in different varieties. Edible portion was higher (69.27%) in AHPah-1 where lowest (53.43%) in AHPah-3. TSS was highest (21.00%) in AHPah-1 (Table 3). Highest bulb length and breadth was produced in AHPah-3 (Table 2).

Table 1. Plants characteristics, date of blossoming of 1st male and female flowers of the three jackfruit genotypes

Genotypes	Plant height (m)	Base girth (cm)	Tree volume (m ³)	Date of blossoming of 1 st male flower	Date of blossoming of 1 st female flower
AHPah-1	8.85	110	271.04	18/12/2013	19/01/2014
AHPah -2	8.80	115	483.53	24/10/2013	10/12/2013
AHPah -3	6.80	95	308.82	25/11/2013	11/12/2013
CV (%)	1.91	2.23	0.33	-	-
Level of significance	**	**	**	-	-

Table 2a. Fruits characteristics of the three jackfruit genotypes

Genotypes	Days to 1st harvest	Weight of fruit (kg)	Fruits no./ plant	Fruits yield/ plant (kg)	Fruit size (cm)		Wt. of rind and rachis(kg)	Rind thickness (cm)
					Length	Breadth		
AHPah -1	117 c	3.408 c	73	248.78 c	20.50c	19.00 c	1.466 c	0.80 b
AHPah -2	169 a	8.400 a	41	344.40 a	37.25a	25.50 b	4.234 a	1.00 a
AHPah -3	160 b	5.880 b	56	329.28 b	32.75b	27.00 a	3.250 b	0.73 b
CV (%)	1.02	1.49	-	1.66	0.44	0.99	3.65	8.27
Level of significance	**	**	-	**	**	*	**	*

*Means significant at 5% level of probability and **Means significant at 1% level of probability

Table 2b. Fruits characteristics of the three jackfruit genotypes

Genotypes	Wt. of bulbs/ Fruit (kg)	No. of bulbs /fruit	Edible Portion (%) (Bulb+Seed)	Individual bulb wt. (g)	Bulb size	
					Bulb Length (cm)	Bulb breadth (cm)
AHPah -1	1.94 c	116 a	69.27 a	16.71 c	5.30 c	3.40 c
AHPah -2	4.24 a	78 b	58.11 b	54.42 a	7.19 b	3.77 b
AHPah -3	2.76 b	63 c	53.43 c	43.68 b	7.35 a	4.69 a
CV (%)	1.94	2.35	2.43	3.03	0.94	1.17
Level of significance	**	**	**	**	**	**

**Means significant at 1% level of probability

Table 3. Qualitative characteristics of the three jackfruit genotypes

Genotypes	Fruit colour	Fruit shape	Bulb colour	Bulb firmness	Juciness	Bulb taste	Bulb texture	TSS (%)	Seed colour
AHPah -1	Greenish yellow	Oval	Deep yellow	Soft	Abundant	Very sweet	Soft	21.00 a	Brownish
AHPah -2	Brownish yellow	Oval to oblong	yellow	Medium	Much	Sweet	Slightly hard	20.25 b	Brownish
AHPah -3	Light yellow	oblong	bright yellow	Medium	Much	Sweet	Slightly hard	18.33 c	Brownish
CV (%)	-	-	-	-	-	-	-	0.78	-
Level of significance	-	-	-	-	-	-	-	**	-

**Means significant at 1% level of probability

Table 4. Seed and attachment of stalk with bulb characteristics of the three jackfruit genotypes

Genotypes	No. of seeds/fruit	Wt. of seeds/fruit (g)	Individual seed wt. (g)	Seed length (cm)	Seed breadth (cm)	Attachment of stalk with bulb
AHPah -1	116 a	416 b	3.57 c	2.56 c	1.84 b	Not attachment
AHPah -2	78 b	639 a	8.19 a	3.40 a	2.08 a	Not attachment
AHPah -3	64 c	376 c	5.94 b	3.14 b	1.90 b	Not attachment
CV (%)	2.35	0.62	2.54	1.58	2.19	-
Level of significance	**	**	**	**	**	-

**Means significant at 1% level of probability

AHPah-1 was produced maximum number of seeds (116) per fruit. Highest seeds weight (639 g) was produced in AHPah-2. Individual seed weight (8.19 g) was higher in AHPah-2. Seed colour was brownish. Highest single seed length (3.40 cm) and breadth (2.08 cm) obtained in AHPah-2. Bulbs were not attached with stalk (Table 4).

4. Conclusions

Considering the above results, it can be concluded that the genotype AHPah -1 bears the maximum fruits and the other characteristics such as fruit colour, bulb colour, firmness, juciness, taste, texture were better than other genotypes. Therefore, the germplasm can be included in the variety development program after comparing with the already BARI released jackfruit variety.

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