Evaluation of clones of banana *Musa* spp. 'Rasthali'(AAB group)

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Abstract

Seven Rasthali clones were evaluated at BRS, Kannara from May 2017 to July 2018 with the objective to characterize the various clones of Rasthali with respect to clonal characteristics, biometric characters, yield potential and fruit quality. Among the clones,Venneer Poovan recorded highest plant height (335.42cm), plant girth (60.18cm), highest total leaf area per plant (12.26m^2) and higher crop duration (434.92 days). Highest bunch weight per plant, number of hands per bunch and number of fingers per hand were recorded in Venneer Poovan, Valiya Poovan and Marthaman. Maximum fruit weight was recorded in Valiya Poovan (92.60g). Quality parameters like TSS, total sugars and sugar - acid ratio were higher in Marthaman. Percentage of disease incidence was higher in Cheriya Poovan and lowest in Marthaman. Based on yield, quality parameters and disease resistance, Marthaman was found to be the best.

Key words: Clonal variation, Growth and yield attributes, Quality, Rasthali.

Introduction

Banana is one of the most important fruit crops grown in our country. India is the largest producer of banana, contributing 17.8 per cent of the global production (FAO, 2016). The crop is grown in an area of 8,58,000 ha with an annual production of 2,91,63,000 MT and productivity of 33.98 t/ha (AGRISTAT, 2017) in India. Bananas and plantains are deeply linked with the traditional culture of Kerala and the state is known for having one of the largest biodiversity of *Musa* spp. More than ten varieties are grown in the state and many of them are under domestic cultivation, of which, Rasthali (AAB group) is one among the choicest banana cultivars for table purpose. The vast difference in agro climatic conditions under which the variety is grown is likely to generate many clones. Therefore, the cultivar grown in different parts of Kerala exhibits variation in both vegetative and reproductive characters. Considering the yield potential and local preferences, farmers select and cultivate definite types, which perform better in that region. But many cultivar types cannot be easily identified if they are closely related to a particular cultivar. However, there are no reports about a particular Rasthali clone with good yield and fruit quality along with resistance to Panama wilt. Hence, the present investigation was undertaken to evaluate Rasthali clones and identify desirable clones for cultivation.

Materials and Methods

The present study was carried out in Banana Research Station, Kannara, Thrissur during 2017-18. A total of seven Rasthali clones identified from Thrissur, Palakkad and Ernakulam districts were planted and maintained at BRS, Kannara. The seven clones of Rasthali banana were planted in Randomized Block Design (RBD) with three replications as per Panse and Sukhatme (1985) at a spacing of 2.1m x 2.1m with four observational plants per replication. Cultural practices as per the Package of Practice Recommendations of Kerala Agricultural University were followed (KAU,

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2016). The seven clones of Rasthali banana (all having 3x ploidy and AAB genomic composition) were: Venneer Poovan, Valiya Poovan, Cheriya Poovan, Andhra Poovan, Marthaman, Pullani collection and Madakkathara collection. The qualitative and quantitative observations on plant, bunch and fruit were taken based on IPGRI plant descriptor. The TSS of fruit was estimated by hand refractometer (0-32 °B range) and titratable acidity was recorded by titrating 10 ml of juice against N/10 sodium hydroxide using phenolphthalein indicator and expressed in terms of percentage of citric acid (AOAC, 1998). Total sugar content of the sample was estimated by the procedure proposed by Ranganna (1997) and sugar- acid ratio was determined after estimating the quantity of total sugars and titratable acidity. Percentage of Sigatoka leaf spot for each replication and severity index of Panama wilt was determined by method suggested by Carlier et al. (2006) Biometric data were collected and statistically analyzed following Fischer (1960).

Result and Discussion

According to Stover and Simmonds (1987), clonal variations were more expressed in qualitative characters like plant pigmentation, male bud type, bunch shape, fruit fullness, fruit curvature and fruit apex. The results of present study also revealed variations in qualitative characters among clones. Good amount of variations could be observed in pseudostem colour, wax on leaf sheath, blotches at petiole base, colour of blotches, male bud shape and bract colour. All the clones studied were having cracks in fruit peel, and fruit fall from hands was deciduous (Table 1). Similar findings were reported by Jacob (1952) in Rasthali.

Observation on growth and yield characters are presented in Table 2. The mean plant height and girth ranged from 335.42 cm (Venneer Poovan) to 248.13cm (Madakkathara collection) and 60.18 cm (Venneer Poovan) to 45.50 cm (Madakkathara collection) respectively. According to Rajeevan (1985), significant variation existed in height and plant girth of different accessions of Palayankodan. Leaf area is an important parameter determining the efficiency of photosynthesis, which in turn, contributes to yield and returns. Venneer Poovan ($12.26m^2$) recorded higher leaf area and also yielded high. Venneer Poovan which had highest leaf area had longest crop duration. Similarly, Madakkathara collection ($7.35m^2$) had lowest crop duration and it has been reported that the plants which had longer crop duration, possessed higher leaf area (Shanmugavelu et al., 1992), thus confirming to the findings of the present work.

Table 1. Morphological/ fruit characters of Rasthali clones as per IPGRI plant descriptor

Rasthali clones	Pseudostem colour	Wax on leaf sheath	Blotches at the petiole base and colour of blotches	Male bud shape and bract colour	Cracks in fruit peel	Fruit fall from hands
Venneer Poovan	Green yellow	Very little/ no visible sign of wax	Sparse blotching Orange-red to red	Intermediate,	Cracked	Deciduous
Valiya Poovan	Medium green	Very little/ no visible sign of wax	Small blotches, brown colour	Intermediate, red to purple	Cracked	Deciduous
Cheriya Poovan	Medium green	Very few wax	Small blotches, dark brown	Like a top, red to purple	Cracked	Deciduous
Andhra Poovan	Medium green	Very few wax	Small blotches, brown colour	Like a top, red to purple	Cracked	Deciduous
Marthaman	Medium green	Very few wax	Small blotches, brown colour	Like a top, red to purple	Cracked	Deciduous
Pullani collection	Medium green	Very few wax	Small blotches, brown colour	Like a top, red to purple	Cracked	Deciduous
Madakkathara collection	Medium green	Very few wax	Small blotches, brown colour	Like a top, red to purple	Cracked	Deciduous

Table 2. Growth and yield attributes of Rasthali clones

Rasthali clones	Plant height (cm)	Plant girth (cm)	Total leaf area/plant (m^2)	Total crop duration (days)	Bunch weight (kg)	No. of hands /bunch	No. of fingers /middle hand	Fruit weight (g)
Venneer Poovan	335.42[a]	60.18[a]	12.26[a]	434.92[a]	9.90[a]	8.44[a]	15.83[a]	60.87[c]
Valiya Poovan	293.47[bc]	49.27[cd]	9.77[abc]	375.92[cd]	9.103[ab]	7.17[bc]	13.50[c]	92.60[a]
Cheriya Poovan	284.50[c]	48.96[cd]	8.69[bc]	379.42[c]	7.97[bc]	8.17[ab]	15.00[ab]	72.62[bc]
Andhra Poovan	305.83[b]	54.00[bc]	11.51[ab]	409.08[b]	6.60[c]	6.05[c]	14.50[bc]	42.36[d]
Marthaman	328.59[a]	59.45[ab]	7.39[c]	366.33[de]	8.30[abc]	7.22[bc]	15.50[ab]	83.90[ab]
Pullani collection	288.53[c]	48.10[cd]	7.72[c]	361.25[e]	6.65[c]	6.39[c]	13.50[c]	71.52[bc]
Madakkathara collection	248.13[d]	45.50[d]	7.35[c]	347.75[f]	7.60[b]	6.09[c]	13.50[c]	85.37[ab]
CD (0.05)	15.87	6.14	2.89	10.28	1.88	1.21	1.17	16.71
CV (%)	2.99	6.61	17.59	1.52	13.23	9.65	4.52	12.92

Mean value of total crop duration ranged from 434.92 days (Venneer Poovan) to 347.75 days (Madakkathara collection). Similar studies were reported from BRS, Kannara (KAU,1989) in Nendran clones in which crop duration varied in the range of 332.3 days to 359.3 days among clones. Joseph (2017) reported variation in crop duration among Nendran ecotypes, and in the same study clones Myndoli and Mettupalayam Nendran with maximum crop duration produced heaviest bunches.

Venneer Poovan recorded highest bunch weight followed by Valiya Poovan and Marthaman. Among the clones, Andhra Poovan recorded the lowest bunch weight. Similar findings were reported in Rasthali, Palayankodan and Nendran ecotypes. Frison and Foure (1999) found that Ayiramkai is a natural mutant of Rasthali with far better yield of 28 kg compared to 8-14 kg in Rasthali with the same quality. Similarly, Rajeevan (1985) reported variation in bunch weight of Palayankodan accessions and Joseph (2017) evaluated ten Nendran clones and among the clones Mettupalayam Nendran recorded highest bunch weight (17.94kg), and Kaliethan (8.13kg) and Perumatti Nendran (8.27kg) recorded lower bunch weights. Mean value of number of hands per bunch ranged from 8.44 to 6.05, and number of fingers per hand ranged from 15.83 to13.50.Venneer Poovan (8.44) recorded the highest number of hands per bunch and fingers per hands (15.83), while lowest number hands per bunch was recorded in Andhra Poovan (6.05) and lowest number of fingers per hand was found in Valiya Poovan collection from Madakkathara and Pullani (13.50 in each). Experiment in similar lines with Palayankodan clones (Rajamanickam and Rajamohan, 2010) revealed that the number of hands per bunch ranged from 3.67 to 12.10 among the accessions. Mettupalayam Nendran recorded highest (6.83) number of hands per bunch, whereas Zanzibar recorded lowest (2.08) among Nendran ecotypes (Joseph, 2017). Jacob (1952) found that Ayiramkai Rasthali, a mutant of Rasthali produced 500 fruits per bunch as compared to Rasthali (71-120). Highest fruit weight was recorded in Valiya Poovan (92.60g) and lowest in Andhra Poovan (42.36g).Variation of 8.14g to 10.52g in fruit weight was observed in Palayankodan ecotypes by Rajamanickam and Rajmohan (2010).

Observations on quality attributes are presented in Table 3. Titratable acidity varied in the range of 0.42 per cent (Cheriya Poovan) to 0.24 per cent (Marthaman). TSS, total sugars and sugar- acid ratio was highest in Marthaman followed by Valiya Poovan while, Cheriya Poovan recorded lowest TSS, total sugars and sugar-acid ratio. Studies in similar lines with banana clones indicated a variation in TSS of 22°Brix in Mottapoovan and 30°Brix in Kudapanilla Kunnan (Rajamony et al. 1994). Similarly, Ram et al. (1994) conducted an experiment with different banana cultivars for finding quality differences among cultivars and observed variations in the range of 15.1 to 16.15

Table 3. Quality attributes of Rasthali clones

Rasthali clones	TSS (°Brix)	Titratable acidity (%)	Total sugars (%)	Sugar- acid ratio	Pulp- peel ratio	Fruit peel thickness (mm)	Shelf life (days)
Venneer Poovan	23.97^{bc}	0.32^{bcd}	20.16^{b}	64.89^{bc}	3.92^{a}	1.53^{de}	6.56^{ab}
Valiya Poovan	24.97^{b}	0.27^{cd}	20.59^{b}	75.17^{ab}	3.48^{bc}	1.60^{cd}	4.83^{d}
Cheriya Poovan	20.23^{e}	0.42^{a}	16.29^{e}	39.35^{d}	3.47^{c}	1.77^{abc}	5.87^{bc}
Andhra Poovan	22.37^{d}	0.38^{ab}	17.07^{d}	44.44^{d}	2.96^{d}	1.91^{a}	6.96^{a}
Marthaman	26.83^{a}	0.24^{d}	22.88^{a}	83.42^{a}	3.83^{a}	1.42^{e}	5.13^{cd}
Pullani collection	21.73^{d}	0.40^{ab}	18.69^{c}	46.41^{d}	3.40^{c}	1.85^{ab}	5.89^{bc}
Madakkathara collection	23.80^{c}	0.34^{abc}	18.35^{c}	55.69^{cd}	3.79^{ab}	1.67^{bcd}	5.32^{cd}
CD (0.05)	1.11	0.090	0.75	16.75	0.32	0.18	0.81
CV (%)	2.67	16.05	2.19	16.11	5.10	6.02	7.86

per cent, 0.22 to 0.37 per cent and 14.1 to 14.3 per cent for TSS, titratable acidity and total sugars respectively. The highest pulp-peel ratio of ripe fruits was found in Venneer Poovan (3.92), followed by Marthaman (3.83), and lowest ratio was seen in Andhra Poovan (2.96). Highest shelf life was observed in Andhra Poovan and this might be due to variation in the fruit peel thickness among different clones.

Observation on incidence of diseases are presented in Table 4. Even though Rasthali is a cultivar susceptible to most of the diseases especially Panama wilt, the disease incidence was comparatively less in the evaluated clones. Among these Cheriya Poovan recorded more incidence of Sigatoka leaf spot and higher severity index for Panama wilt, and Marthaman and Andhra Poovan recorded lowest incidence of Sigatoka and Panama wilt respectively.

From the present study, it was concluded that based on yield, quality parameters and disease resistance, Marthaman was found to be the best among the seven clones identified from Thrissur, Palakkad and Ernakulam districts. Fruit fall from hands is a general problem in Rasthali clones; none of the clones included in the present study had shown resistance to fruit fall.

Table 4. Incidence of diseases in Rasthali clones

Rasthali clones	Percentage of Sigatoka leaf spot incidence	Severity index of Panama wilt incidence
Venneer Poovan	29.00	1.67
Valiya Poovan	29.53	1.33
Cheriya Poovan	45.00	2.56
Andhra Poovan	22.33	1.00
Marthaman	16.66	1.16
Pullani collection	29.00	1.83
Madakkathara collection	35.40	2.23
CD (0.05)	9.96	0.49
CV (%)	18.39	16.5

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