



ISSN (E): 2277- 7695

ISSN (P): 2349-8242

NAAS Rating: 5.03

TPI 2018; 7(8): 12-14

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www.thepharmajournal.com

Received: 07-06-2018

Accepted: 10-07-2018

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Assessment of genetic diversity of culinary banana based on morphological Characters

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Abstract

A field experiment was conducted in All India coordinate Banana research project. For Assessing comparative performance, genetic variability, character association, direct and indirect effects of different characters on yield and genetic divergence in best known 13 genotypes of Bantala banana following Randomized block design with five replications. Plant morphology and quantitative yield parameter were recorded maximum in Pseudostem girth, total number of leaves, average number of hands, finger and bunch weight was recorded in Bantala Sambalpuri (Patiapalli). Least pseudostem height, girth, bunch weight were recorded in Dakhinishagar.

Keywords: Banana, genotypes, agro climate, pseudostem girth, bunch weight

Introduction

Banana (*Musa* spp.) is one of the most important fruit crops of world as well as in India. Banana is a cheap source of energy like vitamins A, C, B6 & other minerals with traces of fat. At present, banana production in India is 29163 million tonnes from an area 858 ha (NHB, 2016-17). In odisha total area under banana cultivation is about 26000 ha and production is about 4 million tonnes. Like pineapple, banana is also a short duration fruit crop and provides considerable scope for production per unit area (Randhawa *et al.*, 1973) [14].

Bantala is the major culinary variety under cultivation in odisha (Pillay and Tripathy, 2007) [13]. India has a rich genetic diversity of banana with more than 90 distinct clones. Plantains are mostly ABB group and mostly originated in India, particularly in south India through somatic mutation. Odisha harbour more diversity in cooking banana varieties but proper varietal identification and characterization of the varieties is essential for proper maintenance and breeding proposes. Approximately 18 number of culinary Bantala varieties available because of its high sterility (i.e. Seedlessness) and polyploidy of edible varieties (Stover and Simmonds, 1987), classical breeding is different (Ganry, 1990) [8] and have resulted in increasing efforts to genetically improve the crop.

In this study we investigated the genomic relationship among the different population of the culinary banana and their relationship with the aim to provide insight to facilitate conservation management of natural population. Hence with a view to find out suitability of this banana sub-clones under odisha condition, the present experiment was under taken with the following objectives: To study the morphological characteristic between different culinary bananas.

Materials and methods

The experiments entitled "Assessment of genetic diversity of culinary banana based on morphological and molecular markers" was carried on AICRP, (Banana) in Horticulture Research Station. Two aspect namely morphological characterization and molecular characterisation of culinary banana. The details of experimental area with materials used and methods adopted during the course of investigation.

Soil sample (0-15 cm depth) was collected from experimental plot prior to land preparation and analysis were carried out. From the weather data it is observed that the average maximum and minimum temperature were 38.8 degree Celsius and 15 degree Celsius respectively during the crop growth period June of the year. Average humidity was 91.2 % at morning and 57.8% in the afternoon with total rainfall of 1120.9 mm and sunshine hour of 4.75 during cropping season.

Disease free sword suckers of 3 months old were collected with and average weight of one kg and treated with furadan at the rate 3gm per suckers at the time of planting.

No of days require to shooting was recorded and expressed in days. The height of plant was recorded by measuring the distance between the base of the pseudostem and the junction of the leaves at the top. (Point from which new leave emerged and expressed in cm. the girth of the pseudostem was measured in cm above leaving 15cm from the ground level. the no of functional leaves present in the pseudostem at the time of shooting watch counted and recorded. The length of third leaf from the base of the leaf to the apex of lamina was measured and breadth was measured at middle of the lamina. Thus, the leaf area was derived by multiplying length with average breadth with the factor 0.8. The number of hands per bunch was counted and average number of hands per bunch were recorded for each treatment. The number of fingers per bunch was counted and average number of fingers per bunch per treatment was recorded. The number of suckers arising from the base of the plant was counted from time to time and recorded. Total bunch was weighted and expressed in kg.

The experiment was conducted in a Randomized Block Design (RBD) with 5 replication and 13 treatments. The analysis of variance was done on the basis of the following model ($Y_{ij} = M + g_i + r_j + e_{ij}$). The GCV and PCV were calculated by using the formula given by Burton (1952), GA expressed as percentage of mean = $GA / \text{Mean} \times 100$.

Result and Discussion

Presence of genetic variability is a prime requirement in any crop improvement programme. Morphologically studied in different varieties of culinary banana was statistically analyzed and presented in table. It was revealed that statistical variation was observed among the locally the locally named culinary bananas. Maximum days required to shooting was recorded in Mendhi banana (349.0) followed by Bantala 2 (344.0). Maximum pseudostem height was recorded in BS-1 (353 cm) followed by Bantala 1 (296.0cm) and girth of pseudostem was highest in Sambalpuri (Budhapali) (70.8cm) followed by Bantala Sambalpuri (Patiapali) (70.6cm). similarly number of leaves at time of harvest and it was found that maximum in case of Manji Bantala (110.4) followed by

Bantala Sambalpuri (Budhapali) (10.0) and was Bantala (10.4). When length of 3rd leaf was compared it was found highest in Manji Banatala (3.2m) followed by mehndi Bantala (3.2m) with leaf breadth maximum in Bantala Sambalpuri (patiapali), Batisha bantala, and Paunsia Batisha Banatala (0.61m). Similarly the area of leaf was found maximum in case of Manji Banatala (1.55 m²) followed by Bantala 1 (1.39 m²). such type of varietal variation in banana have been reported by Ahemed et.al. (1974) ^[1], Shaikh et.al. (1985) ^[16] and Medhi (1994) ^[12].

From table it was revealed that highest number of hands per bunch was found in case of Mendhi Bantala (15.6) followed by Bantala Sambalpuri (Patiapali) (11.8) and lowest in case of Gaja Banatala (5.4). Number of fingers per bunch was found highest in case of Paunsia Batisha Banatala (215.0) followed by Banatala Sambalpuri (Budhapalli) (210.0) with lowest in Dakhinisagar (48.2) followed by Gaja Banatala (52.0). In case of number of suckers appeared at time of harvest, maximum number of suckers found in case of Banatala Sambalpuri (Patiapali) (10.2) and followed by Sambalpuri (Budhapalli) (9.6) and lowest in Paunsia Bantala (4.4). highest bunch weight was found in Bantala Sambalpuri (Patiapali) (18.6kg) followed by Banatala Sambalpuri (Budhapalli) (18.4kg) with lowest in case of Dakhinisagar (7.4kg). The results in respect of higher bunch weight reported in Bantala Sambalpuri (Patiapali) may be due to more number of hands and fingers per bunch. The results obtained in respect on yield and yield attributing are in agreement with the results of Syamal and Mishra (1989), Upadhyay and tripathi (1985) ^[19], sharma (1976), Chattopadhyay and Raha (1986) ^[5].

Conclusion

Performance of the thirteen culinary banana genotypes indicated that Bantala Sambalpuri (Patiapali) was promising with respect to yield performance associated with high pseudostem girth, number of hands per bunch, bunch weight and number of suckers produced per plant. It is evident from the data from the table that there was a significant varietal differences in respect of growth and yield attributes.

Table 1: Comparative yield characters of culinary banana

Bantala genotypes	No of handa per bunch	No. of fingers per bunch	Bunch weight
Gaja Bantala	5.40	52.00	9.00
Bantala 1	6.80	82.40	16.80
Bantala 2	7.20	72.20	11.40
Batisha Bantala	11.00	186.00	13.60
Dakhinisagar	5.60	48.20	7.40
Paunsia Batisha Bantala	11.20	215.00	10.0
Bantala Sambalpuri (Budhapalli)	10.40	210.0	18.40
Bantala Sambalpuri (Patiapalli)	11.80	198.00	18.60
Banua Bantala	8.80	86.40	10.20
Manji Bantala	6.80	157.00	8.40
Paunsia Bantala	6.80	68.20	9.40
BS – 1	6.60	75.60	13.80
Mendhi Bantala	15.60	95.00	14.40
GM	8.769	118.923	12.415
CD (0.5)	2.419	28.976	3.205

Table 2: Vegetative characters in different culinary banana varieties

Bantala genotypes	Number of days to shooting	Pseudostem height (cm)	Pseudostem girth at shooting time (cm)	No of leaves at time of harvest	Leaf length (m)	Leaf breadth (m)	Leaf area (cm ²)	No. of suckers per plant
Gaja Bantala	283.600	274.00	56.60	7.00	2.50	0.60	1.00	7.00
Bantala 1	308.00	296.000	60.00	9.00	3.11	0.56	1.39	7.60
Bantala 2	344.000	260.00	68.40	10.00	2.50	0.56	1.11	6.20
Batisha Bantala	309.00	294.000	66.00	8.40	2.50	0.61	1.24	8.00
Dakhinisagar	299.00	151.00	48.60	6.60	2.50	0.55	1.11	5.60
Paunsia Batisha Bantala	288.80	292.00	61.40	6.80	2.50	0.61	1.22	7.40
Bantala Sambalpuri (Budhapalli)	328.00	295000	70.80	10.00	2.40	0.51	1.01	9.60
Bantala Sambalpuri (Patiapalli)	307.00	292.00	70.60	9.60	2.50	0.61	1.22	10.20
Banua Bantala	252.40	219.00	47.00	7.60	3.00	0.48	1.14	8.60
Manji Bantala	303.00	286.00	63.00	10.40	3.70	0.52	1.55	7.80
Paunsia Bantala	274.00	276.00	64.00	7.00	3.00	0.53	1.30	4.40
BS – 1	281.60	353.00	63.60	7.80	2.50	0.55	1.11	7.80
Mendhi Bantala	349.0	270.00	62.80	6.60	3.20	0.47	1.20	7.80
GM	302.108	273.692	61.754	8.215	2.766	0.554	1.204	7.538
CD (0.5)	16.157	25.30	6.104	2.3200	0.167	0.018	0.171	1.123

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