

Genetic Variability Studies in Banana-1. Mysore Subgroup (AAB)

S Uma, M Dayarani, HP Singh* and B Shyam

National Research Centre for Banana, 44, Ramalinga Nagar South Extension, Vayalur Road, Trichy-620 017 (Tamil Nadu)

Eleven accessions Mysore subgroup (AAB) of *Musa*, representing variability of different banana growing regions of the country were used in the present study, conducted at the National Research Centre on Banana (NRCB), Trichy, Tamil Nadu. This study revealed highly significant differences for most of the characters studied. Moderate GCV values were obtained for bunch weight, no. of leaves at harvest, total no. of fingers, no. of hands and no. of leaves at shooting. The characters bunch weight, breadth of leaf, no. of leaves at shooting, no. of leaves at harvest, no. of hands and total no. of fingers, showed high to moderate heritability and moderate GA. Among these traits, bunch weight should be emphasized during selection owing to its high genotypic coefficient of variability (GCV) values, heritability and genetic advance (GA).

Key words : Genomic Group, Germplasm, Heritability, *Musa*, Selection, Variability

Banana is the premier fruit crop in the country with the highest production of 13.2 million tonnes across the globe. Though the Indian sub-continent harbours more than 100 varieties, Mysore subgroup (AAB) dominates the banana industry with 18.42% area and a production of 16.19% only next to the Cavendish subgroup (AAA). Unlike the Cavendish cultivars, this bispecific subgroup has a wider adaptability and is grown up to an altitude of 1800 m above msl without any significant yield reduction.

Accordingly, great variation has been observed with respect to a number of characters attributing towards the yield. Apart from this, this subgroup exhibits high female fertility in terms of seed yield and a prolonged female phase unlike in other subgroups *i.e.* after completion of the female phase bearing fruits, there is a barren male phase. At the end of the male phase, a female phase bearing fruits reappears just above the male bud. These traits make Mysore subgroup, a potential parent in banana breeding programmes. So the present study was undertaken to collect all the variability present in Mysore subgroup across the country and to study their genetic variability by determining Phenotypic coefficient of variability (PCV), genotypic coefficient of variability (GCV), heritability (h^2) in broad sense and genetic advance (GA) in order to select suitable genotypes for utilization in *Musa* improvement programme.

Material and Methods

Eleven accessions of Mysore subgroup were collected from the secondary centres located in Karnataka, Kerala,

* Horticulture Commissioner, New Delhi.

Tamil Nadu, Andhra Pradesh, Bihar, Assam and Maharashtra. They were evaluated in Randomized Complete Block Design with a spacing of 2m x 2m and with four replications at NRCB farm, Trichy, situated at an altitude of 90 m above msl. A recommended dose of fertilizers of 250:50:300 of NPK was given and crop was raised under wetland system of cultivation. Observations were recorded on eleven quantitative traits.

Height and pseudostem girth of the plant were recorded at harvest, length and breadth were recorded for the fully opened third leaf. Phyllochron is a major parameter in broad leaved plants like banana directly contributing towards yield, so the number of photosynthetically active leaves was recorded at shooting and at harvesting stages to estimate the no. of leaves spent towards bunch maturation. Number of days taken from planting to bunch maturation was recorded as crop duration.

Bunches were harvested at 80% maturity when fruit skin turned pale green, bloom disappeared and stigmatic remnants dropped off from the fruit tip. The parameters like weight of the bunch, number of hands per bunch, number of fingers per hand and total number of fingers per bunch were recorded. Analysis of variance was carried out following the standard procedures. The PCV and GCV coefficients of variability were computed by the method suggested by Burton (1952), heritability (broad sense) and genetic advance were worked out as per the procedure adopted by Johnson *et al.*, (1955).

Results and Discussion

Range, mean and standard error for all the characters studied are presented in Table 1. Analysis of variance

and comparison of F-ratio revealed that highly significant differences were noticed for breadth of leaf, no. of leaves at shooting, number of leaves at harvest, crop duration, bunch weight, number of hands and total number of fingers (Table 2). This indicated the presence of high genetic variability among the accessions. Non-significant difference was noticed for the trait, plant height. Differences were significant for the remaining three characters viz., pseudostem girth, length of leaf and number of fingers/hand. Bunch weight ranged from 4.88 kg to 16.62 kg with a mean of 9.93 kg. The range of variation for number of hands was from 6.25 to 12.5 with a mean of 9.86. The average total number of fingers was 142.34 with a range of 102 to 179.75.

Table 1. Range, mean and standard error values of Mysore subgroup of genus *Musa*

Characters	Range	Mean	S.Em
Plant height (cm)	240.50-274.0	261.86	15.35
Girth (cm)	51.0-61.50	57.68	2.43
Leaf length (cm)	146.5-202.75	185.81	19.46
Leaf breadth (cm)	58.75-80.75	66.52	4.35
No. of leaves at shooting	8.25-13.0	11.77	1.10
No. of leaves at harvesting	3.75-8.25	6.25	1.04
Duration (days)	374.5-480.25	436.86	11.28
Bunch weight (kg)	4.88-16.62	9.93	1.38
No. of hands	6.25-12.50	9.86	1.24
No. of fingers/hand	13.0-18.25	15.72	1.37
Total no. of fingers	102-179.75	142.34	17.8

Phenotypic coefficient of variability (PCV), genotypic coefficient of variability (GCV), heritability (h^2) in broad sense and genetic advance (GA) as per cent over mean for various characters were studied (Table 3). In general, PCV values were relatively higher than GCV values indicating influence of environment on the expression of the character. The GCV helps in the measurement of the range of genetic diversity in a character and provide a means to compare the genetic variability in quantitative characters. Maximum GCV was observed for bunch weight (32.33) whereas least was for plant height (1.77) followed by pseudostem girth (4.2). Studies of Rajeevan

Table 3. Genetic parameters (PCV, GCV, h^2 and GA) of Mysore subgroup of *Musa*

Plant height	Phenotypic co-efficient of variability	Genotypic co-efficient of variability	Heritability (h^2)	Genetic advance (% over mean)
Plant height (cm)	8.48	1.77	4.4	0.76
Girth (cm)	7.30	4.20	33.1	4.97
Leaf length (cm)	17.73	9.73	30.1	11.0
Leaf breadth (cm)	12.79	8.82	47.5	12.52
No. of leaves at shooting	16.70	10.18	37.2	12.83
No. of leaves at harvesting	31.74	21.29	45.0	29.44
Duration (days)	9.48	8.75	85.2	16.62
Bunch weight (kg)	37.83	32.33	73.0	56.89
No. of hands	23.39	15.09	41.6	20.08
Fingers/hand	14.95	8.36	31.3	9.67
Total no. of fingers	23.36	15.15	42.1	20.25

and Geetha (1982) has also supported this view, emphasizing the importance of bunch weight. Moderate values of GCV were observed for leaves at harvest, number of hands and total number of fingers/bunch.

But heritability estimates in broad sense are not the true indicators of genetic potentiality of an accession. Still their scope is restricted as they are prone to changes with the change in environment. Hence, if heritability values are considered in conjunction with predicted genetic gain, the reliability of the parameter as a tool in selection programme will increase.

Values of genetic advance (% over mean) ranged from 0.76 (plant height) to 56.89 (bunch weight). Higher value was obtained for bunch weight followed by no. of leaves at harvest, total number of fingers and number of hands. Bunch weight with high values of GCV, heritability coupled with high genetic advance indicated that it is predominantly controlled by additive gene action, meaning simple selection can be effective in improving this character. This is supported by hypothesis proposed by Panse (1957) who suggested that characters showing high heritability and GA are governed by additive gene effects. Additive effect of bunch weight in banana was also observed by Rosamma (1982).

Table 2. Analysis of variance for different characters of *Musa* subgroup (Mysore)

Source	Degrees of freedom	Plant height	Girth	Length	Breadth	No. of Lvs. at shooting	No. of Lvs. at harvest.	Duration	Bunch weight	No. of hands	Fingers/hand	Total no. of fingers
Replication	3	604.2	122.2	1232.1	71.9	1.06	2.26	65.0	9.52	2.75	3.82	1007.50
Treatment	10	557.8 ^{NS}	353.07 [*]	2065.1 [*]	175.6 ^{**}	8.17 ^{**}	9.25 ^{**}	6095.0 ^{**}	45.04 ^{**}	11.97 ^{**}	1.07 [*]	2501.2 ^{**}
Error	30	471.4	11.86	758.0	37.9	2.42	2.16	254.5	3.81	3.10	3.80	639.90
S.Em.		15.35	2.43	19.46	4.35	1.10	1.04	11.28	1.38	1.24	1.37	17.80
CD at 5%		31.35	4.96	39.75	8.88	2.24	2.12	23.03	2.81	2.53	2.79	36.34
CD at 1%		42.21	6.68	109.30	11.96	3.02	2.86	31.02	3.79	3.41	3.76	48.95

Though the crop duration has shown a high heritability estimate of 85.2%, moderately low estimates of GCV and GA infer that this character is governed by non-additive gene action or the presence of high genotype-environment interaction and simple selection will not be effective for improvement of this character. Moderate estimates of GCV, heritability and GA were observed for leaves at harvest, number of hands, total no. of fingers, leaf breadth and leaves at shooting. This suggests that these characters are influenced by environmental factors to certain extent. But still the improvement in these parameters could be brought about by rigid selection in the collection. Parameters like plant height with lowest values of GCV, heritability and GA is highly influenced by the environment and should not be considered for selection.

Acknowledgements

The authors acknowledge the facilities provided by the Director, NRCB for conduct of this research.

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