

GENETIC DIVERGENCE IN BANANA*

P. K. Valsalakumari, P. C. Sivaraman Nair and P. V. Prabhakaran
College of Horticulture, Vellanikkara 680654, Trichur, Kerala

The information about the extent of genetic divergence is critical for the improvement programme of any crop. Though clonally propagated, significant variation is observed among banana cultivars (Nayar *et al.*, 1979, Sreerangaswamy *et al.*, 1980). Hence an experiment was undertaken in the College of Horticulture, Kerala Agricultural University, Vellanikkara to estimate the genetic divergence among 62 cultivars of banana, considering 22 characters simultaneously.

Materials and Methods

Sixty two cultivars of banana belonging to different genomic groups were used for the study. They were raised in a randomised block design with three replications. There were four plants in each replication. Observations made on plant height, plant girth, leaves per plant, leaf area per plant, petiole length, planting to flowering interval, flowering to harvest interval, bunch weight, hand weight, number of hands, number of fingers, pedicel length, finger length, finger weight, finger volume, pulp peel ratio on volume basis, pulp peel ratio on weight basis, TSS, total sugars, non-reducing sugars, acidity and sugar/acid ratio.

After testing the significance of differences among the treatments through 'F' test and Wilk's test, the data were subjected to the analysis of genetic divergence using Mahalanobis D^2 statistics and grouping was done by Tocher's method as described by Rao (1952).

Results and Discussion

The computed D^2 values ranged from 226.74 to 38402.74 indicating wide divergence. The 62 cultivars could be grouped into eight clusters, one of which had a single entry (Table 1). The clustering pattern was not influenced by the genomic constitution. The same cluster included cultivars belonging to different genomic groups.

The intra and intercluster values (Table 2) showed that the intracluster distance was lesser than the intercluster distance suggesting that the clusters were homogeneous within themselves and heterogeneous among themselves. The intracluster D value was maximum in cluster 7(53.19) and minimum in cluster 5(30.55). The maximum divergence was observed between cluster 6 and cluster 8 (D value 161.79) and the minimum between cluster 1 and cluster 7 (D value 60.11). While selecting cultivars for hybridization purpose considerable care should be

*Part of Ph.D. thesis of the first author submitted to the Kerala Agricultural University, 1984.

taken to select particular clusters and to select particular cultivars from the selected clusters. The study showed that cultivars belonging to the same genomic group were highly variable since they belonged to different clusters.

The character pulp/peel ratio on volume basis (34.06%) followed by finger weight (20.57%) and total sugars (19.46%) contributed the maximum towards divergence. These characters along with length of petiole and finger volume contributed 74.09% of the total divergence.

Table 1

Distribution of cultivars in different clusters

Cluster	No. of No. cultivars	Cultivars included
I	19	Pacha Chingan (AAB), Mannan (AAB), Nendra Padathi (AAB), Krishna Vazhai (AB), Vannan (AB), Thiruvananthapuram (AAB), Manoranjithm (AA), Sugandhi (AAB), Karim Kadali (AAB), Virupakshi (AB), Chingan (AA), Charapadathi (AAB), Malakali (AAB), Pacha Nadan (AAB), China (AAB), Chinali (AAB), Agniswar (AB), Wather (AAA), Sirumalai (AB)
II	14	Kostha Bontha (AB), Jurmoney Kunthali (ABB), Karpooravally (ABB), Pey'Kunnan (ABB), Venneettu Mannan (ABB), Chirapunchi (ABB), Rasthali (AAB), Peyan (ABB), Adakka Kunnan (AB), Ney Poovan (AB), Valia Kunnan (AB), Dudhsagar (AAB), Thaen Kunnan (AB), Padali Moongil (AB)
III	13	Muthia (ABB), Pacha Bontha BatheeSa (ABB), Alukehel (ABB), Bluggoe (ABB), Kallu Monthan (ABB), Chetti (ABB), Ney Vannan (ABB), Walha (ABB), Malai Monthan (ABB), Kari Bontha (ABB), Hybrid Sawai (ABBB), Kapok (ABB), Ashy Batheesa (ABB)
IV	3	Palayankodan (AAB), Kullan (AAB), Sanna Chenkadali (AA),
V	2	Galanamalu (AAA), Red Banana (AAA)
VI	7	Bodies Altafort (AAAA), Harichal (AAA), Gros Michel (AAA), Sapumal Anamalu (AAA), Highgate (AAA), Pedda Pacha (AAA), Basrai (AAA)
VII	3	Namarai (AA), Tongat (AA), Eraichivazhai (AA),
VIII	1	Elavazhai (BB)

Table 2

Average intracluster (diagonal) and intercluster (above diagonal) distance (D values)

Cluster No.	1	2	3	4	5	6	7	8
1	45.11	69.01	63.04	82.75	105.29	69.44	60.11	152.21
2		50.22	75.64	79.94	98.50	87.31	73.99	112.06
3			50.68	105.56	97.16	69.78	94.80	149.98
4				40.13	106.03	95.92	65.30	149.26
5					30.55	81.38	107.72	153.50
6						48.22	78.15	161.79
7							53.19	143.28
8								0

Table 3

Contribution of characters towards divergence

Character	Per cent contribution
Plant height (cm)	2.75
Plant girth (cm)	1.43
Leaves per plant	0.00
Leaf area per plant (m ²)	0.00
Petiole length (cm)	7.93
Planting to flowering interval (days)	2.27
Flowering to harvest interval (days)	0.58
Bunch weight (kg)	0.42
Hand weight (g)	0.79
Number of hands	0.05
Number of fingers	0.11
Pedicle length (cm)	0.16
Finger length (cm)	0.37
Finger weight (g)	20.57
Finger volume (cc)	4.81
Pulp/peel ratio on volume basis	34.06
Pulp/peel ratio on weight basis	3.54
TSS (%)	0.00
Total sugars (%)	19.46
Non-reducing sugars (%)	0.37
Acidity (%)	0.00
Sugar/acid ratio	0.32

Summary

On the basis of multivariate analysis 62 cultivars of banana belonging to different genomic groups were grouped into 8 clusters considering 22 characters simultaneously. The characters pulp/peel ratio on volume basis followed by the weight of fruit contributed the maximum towards divergence.

സംഗ്രഹം

വെള്ളാനിക്കുറയിലെ ഹോർട്ടികൾച്ചർ കോളേജിൽ വാഴയിലെ ജനിതക വ്യത്യാസം നിർണ്ണയിക്കുന്നതിനു നടത്തിയ പരീക്ഷണങ്ങളിൽ 22 സ്വഭാവങ്ങൾ ഉപയോഗിച്ച് 62 ഇനം വാഴകളെ 8 കൂട്ടങ്ങളായി തിരിച്ചു. പഴത്തിന്റെ വ്യാപ്തത്തിൽ പൾപ്പിന്റെയും തൊലിയുടെയും അനുപാതവും, പഴത്തിന്റെ തൂക്കവും ജനിതക വ്യത്യാസത്തിന്റെ ഏറ്റവും കൂടുതൽ ശതമാനം സംഭാവന ചെയ്യുന്നതായി കണ്ടു.

References

Nayar, N, K., Lyla, K. R. and Valsamma Mathew 1979. Genetic variability in dessert type banana. *Indian J. agric. Sci.* 49:414-416

Rao, C. R. 1952. *Advanced Statistical Methods in Biometrical Research*, 1st ed. John Wiley and Sons, New York, pp. 246-250

Sreerangaswamy, S. R., Sambamurthy, S. and Murugesam, M. 1980. Genetic analysis in **banana**. *Proc. nat. Seminar Banana Prod. Tech.* Tamil Nadu Agric. Univ., Coimbatore, India, pp. 50-56