

GENETIC DIVERGENCE IN DESSERT VARIETIES OF BANANA

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Multivariate analysis is found to be a **powerful** tool for quantifying the degree of divergence between **biological** populations. Chaudhary and Singh (1975) in barley varieties and Gupta and Singh (1970) in green gram studied the genetic divergence using D^2 statistic. Valsalakumary *et al.* (1985) studied the genetic divergence of 62 cultivars of banana using D^2 statistic. Banana being an important fruit crop in Kerala, high yielding, disease resistant and delicious banana varieties with keeping qualities are to be developed for the benefit of the banana cultivators. Hence the present study was undertaken to estimate the genetic diversity of 56 dessert varieties of banana, to find out the character which contributes maximum towards genetic divergence, to form clusters of banana varieties which are genetically diverse and to make a comparative study of the clusters formed through the D^2 analysis and through canonical analysis.

Materials and Methods

The study was based on the crop raised at the Banana Research Station, Kannara of the Kerala Agricultural University. Fifty six dessert varieties of banana were planted in randomised block design with three replications each containing three plants. Observations were recorded on 12 different morphological characters. The characters observed were height, girth, (eaves per plant, hand weight, fingers per bunch, finger length, finger thickness, hands per bunch, fingers per hand and peduncle length.

Genetic divergence was studied in this set of material using Mahalanobis D^2 statistic and canonical analysis, as described by Rao (1952). D^2 values based on uncorrelated variables were used to classify the 56 varieties. The constellation of groups were formed according to Tocher's method (Rao, 1952). The character which contributed maximum towards genetic diversity was found by ranking the D^2 values and through canonical analysis.

Results and Discussion

Analysis of variance carried out separately for each of the characters has shown highly significant differences among the varieties for all the 12 characters studied. Wilks' Λ criterion has also shown highly significant differences among the varieties for the aggregate effect of all characters ($x^2=4086.36$ for 12×55 d. f.). These differences suggest the existence of considerable divergence among the materials under study.

The computed D^2 values varied substantively showing high divergence among the different strains. Maximum divergence was observed between varieties Ayiramka Poovan and Chenkadali (12758.67). The minimum divergence was observed between varieties Thaenkunnan and Tongate, Pachanadan and Viroopakshy (10.33). On the basis of D^2 values all the 56 varieties were grouped into seven clusters out of which the first cluster included 13 varieties, the second and third cluster 17 and 20 varieties and the fourth and fifth clusters included two varieties and sixth and seventh clusters one variety each. Cluster means for the 12 characters are given in Table 1. The grouping of varieties is shown in Table 2. The intra and inter-cluster D values are presented in Table 3. The intra-cluster D values were least in cluster I and highest in cluster III while the divergence at inter-cluster level was maximum between cluster IV and VII.

The D^2 values were ranked by taking the varieties pairwise. From the ranks the character finger length showed the maximum variability followed by peduncle length. In the same manner, the minimum contribution of the variability was through the characters leaves per plant and girth.

Canonical analysis revealed that the first two canonical roots accounted for more than 90 percent of the genetic diversity present in the 56 varieties. The first two canonical vectors which correspond to the first two canonical roots are presented in Table 4. From the table of canonical vectors the characters finger length and

Table 1
Cluster means for the 12 characters

Character	Cluster						
	I	II	III	IV	V	VI	VII
1	295.33	259.33	237.83	228.18	329.00	277.00	300.00
2	74.79	67.06	65.37	62.67	82.17	74.67	65.67
3	30.67	29.31	29.42	26.00	29.17	29.33	31.00
4	768.49	931.05	1199.60	1809.84	3021.17	480.67	637.03
5	51.60	67.43	91.67	156.24	187.04	26.13	53.77
6	13.30	8.41	10.16	9.38	19.25	5.67	18.00
7	162.33	101.51	98.60	67.00	89.67	175.33	261.00
8	10.63	13.31	16.61	19.29	17.29	6.33	10.47
9	9.06	10.15	10.33	14.32	15.84	6.67	6.87
10	10.28	7.49	7.07	5.00	5.67	10.33	21.33
11	16.15	13.63	13.91	13.22	15.82	16.87	12.27
12	83.90	72.53	81.32	91.17	80.84	62.33	108.00

1. Height, 2. girth 3. leaves per plant, 4. hand weight, 5. finger weight, 6. bunch weight 7. fingers per bunch, 8. finger length 9. finger thickness, 10. hands per bunch, 11, fingers per hand, and 12. peduncle

Table 2
Grouping of varieties into different clusters

Cluster No.	No. of varieties included	Varieties included in cluster
I	13	Thaenkunnan, Tongate, Marthman, Adukkann, Ambala Kadali, Rasthali, KNR 2/75, Krishna Vazhai, Chirapunchi, Njali Poovan, Pey Kunnan, Poocha Kunnan, Vadakkan Kadali.
II	17	Pachanadan, Viroopakshy, Charapadathi, Valiya Kunnan, Thiruvananthapuram, KNR 1/7 Chakara Kadali, Nendra Kunnan, Sirumali, Redja Prebon, Poovan, Mons Marie, High Gate, Kodupilla Kunnan, Chingan, Pilian.
III	20	Giant Cavandish, Mauritius, Lacatan, Vamanakeli Gros Michel, Chinali, Mauritius, Amrit Sagar Sapumal Anamelu, Kanni Kadali, Pirija, Pacha Chingan, Nendra Padaathi Lady's Finger Prinkchel, Peddapacha Arathi, Harichal, Sikuzani, Redrajah, Robusta.
IV	2	Wathur, Saina.
V	2	Chenkadali, Red Banana.
VI	1	Adukka Kunnan
VII	1	Ayiramka Poovan.

Table 3
Average intra and inter cluster D values of 7 clusters

Cluster No.	I	II	III	IV	V	VI	VII
I	15.54	29.67	51.80	77.16	77.81	32.09	34.80
II		15.91	29.09	53.57	57.42	56.22	54.50
III			17.50	34.41	49.66	79.70	79.06
IV				16.25	37.03	105.92	106.94
V					17.25	101.21	105.14
VI						0.00	23.78
VII							0.00

peduncle length respectively accounted for the maximum variability. Leaves per plant and girth showed the minimum variability.

A scatter diagram showing the positions of the 56 varieties on the basis of mean values of canonical varieties was prepared. From the scatter diagram it was clear that the seven clusters formed on the basis of D^2 values were fully in agreement with the points shown in the scatter diagram.

Table 4

The first two canonical vectors based on the first two canonical roots

No	Character	Vector 1	Vector 2
1	Height	-0.0494	0.2148
2	Girth	-0.0080	0.0570
3	Leaves per plant	0.0028	-0.0501
4	Hand weight	0.2456	0.5856
5	Finger weight	-0.0549	-0.2625
6	Bunch weight	-0.2390	0.4216
7	Fingers per bunch	-0.1643	-0.1227
8	Finger length	0.7084	-0.1992
9	Finger thickness	0.1130	0.3654
10	Hands per bunch	-0.2266	-0.0451
11	Fingers per hand	-0.2567	-0.0557
12	Peduncle length	0.4670	-0.4112

Summary

Fifty six dessert varieties of banana grown at the Banana Research Station, Kannara were observed for 12 different morphological characters and the data were subjected to analysis of variance. Significant differences were recorded among all the varieties with regard to different morphological characters.

By using D^2 analysis the varieties were grouped into seven clusters which were homogeneous within and heterogeneous between. The same clustering pattern was obtained in the canonical analysis. The characters which were contributing maximum towards divergence were finger length and peduncle length. The characters which were contributing minimum towards divergence were leaves per plant and girth. The same results were obtained through both the methods.

References

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