

GENETIC DIVERGENCE IN COCONUT

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Most of the coconut palms cultivated in the world fall under Tall group. Tall coconut cultivars are more heterozygous due to their strict nature of cross-pollination. A wide range of characters were seen in this group, which were differing in most of the economic characters like nut weight, copra content, etc. Sankaran et al (1973) studied the genetic divergence in 9 F₁ families of Tall x Dwarf Green coconut hybrids for 13 characters and suggested that proper choice of Tall and Dwarf varieties of coconut would be helpful for the maximum exploitation of heterosis. Their study revealed that phenotypic uniformity could involve considerable genetic diversity.

The present study was taken up to estimate the genetic divergence among the Tall cultivars and to group them into clusters according to the magnitudes of genetic distances using Mahalanobis D² statistics, so that we can utilise genetically distant types for

maximum exploitation of hybrid vigour by crossing two Tall cultivars.

MATERIALS AND METHODS

One hundred and twenty palms belonging to twenty four cultivars of exotic and indigenous origin of the Tall group representing the wide spectrum of variability maintained in the germplasm collection of the Regional Agricultural Research Station, Pilicode were used for the study. All the selected palms belonged to 1924-25 plantation and have been receiving uniform management practices as suggested in the package of practices for coconut. They were observed for the following seventeen characters.

1. Girth of stem in cm at 1 m from the ground level
2. Number of leaves on the crown
3. Number of inflorescence

4. Number of rachis per inflorescence
5. Number of female flowers per rachis
6. Number of female flowers in an inflorescence
7. Number of bunches in different stages of development
8. Number of nuts per bunch
9. Percentage of setting
10. Total yield of nuts per year
11. Weight of unhusked nut (in kg)
12. Weight of husked nut (in kg)
13. Weight of meat per nut (in g)
14. Thickness of meat per nut (in mm)
15. Size of the embryo (in mm)
16. Copra content (in g)
17. Oil content (in %)

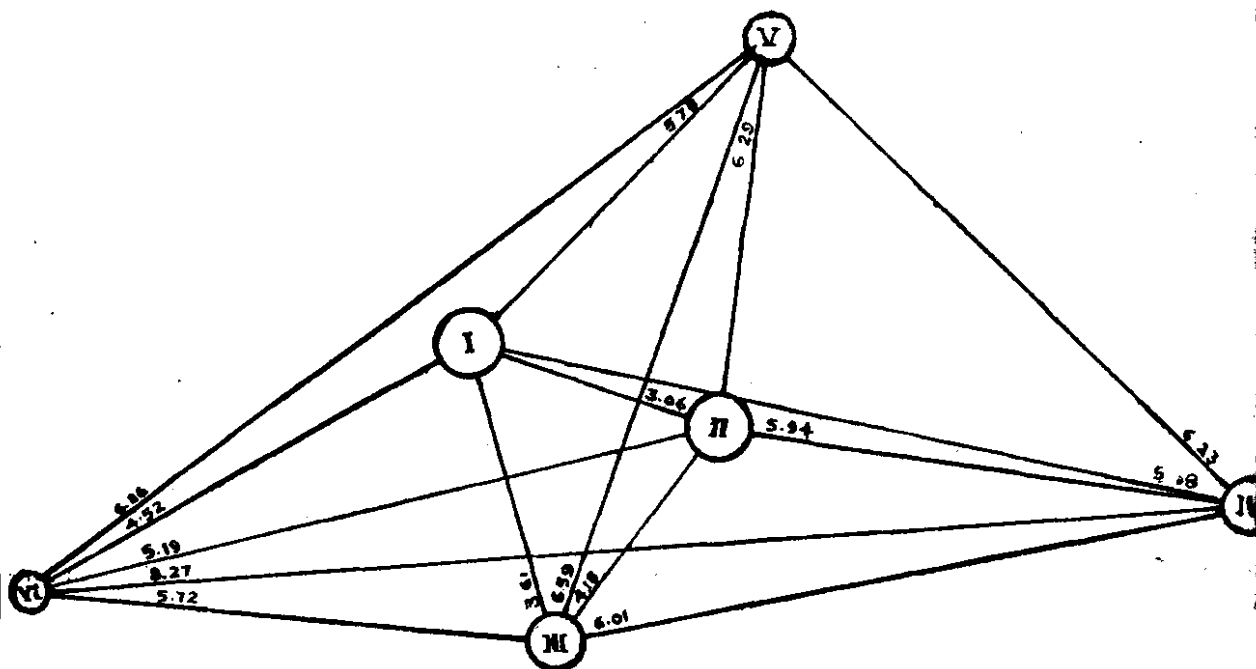


Fig. 1. CLUSTER DIAGRAM SHOWING THE DISTRIBUTION OF CLUSTERS.

The analysis of the data was done in TDC 316 (ECIL) Computer at the Computer Centre, Kerala University, Trivandrum. The data on all the 17 characters recorded were subjected to statistical analysis for the estimation of genetic divergence using Mahalanobis D^2 statistics. The calculation of Mahalanobis D^2 and the grouping of the cultivars into clusters were done following Tocher's method (Rao, 1952).

RESULTS AND DISCUSSION

The analysis of variance of 24 cultivars showed significant differences between cultivars for

each of the 14 characters out of 17 characters studied. All the 24 cultivars were grouped into six distinct clusters (Table 2). It includes both exotic and indigenous cultivars. The distribution of cultivars into various clusters showed no regularity. Cluster I and Cluster II contained six cultivars, III and IV four cultivars each, Cluster V three and Cluster VI only one. Such irregular pattern of distribution has been reported by Mehndiratta and Singh (1971), and Bavappa et al (1973) in coconut.

The intra and inter cluster D values of six clusters have been

worked out and given in Table 2. From the table it could be observed that the average intra cluster distances in the six clusters range from 0.00 (Cluster VI) to 5.71 (Cluster V), the other clusters possessing values in between two extremes. Cluster VI was found to show the maximum average inter cluster distance with any other cluster and it was found to be the cluster showing maximum distance in two out of total possible five combinations it could make. The cultivar in Cluster VI will be showing maximum genetic distance with other cultivars especially between cultivars included in Cluster I

is interesting to note that the exotic cultivars included in present study (Fiji, S. S. Apri, S. S. Green, Philippines, Java, Guinea and Cochin China) grouped to three different clusters (III and IV). The two cultivars, Laccadive Ordinary and Laccadive Small were found to be in two distinct clusters viz., I and VI, thereby indicating that cultivars of the same region could be grouped into different clusters. Several workers have emphasized that geographical diversity need not be directly related to genetic diversity (Singh and Gupta, 1968).

Maximum genetic divergence was observed between Clusters IV and VI and minimum between Clusters I and II. Rest of the clusters were found to occupy intermediary positions with regard to their genetic distances. Thus it is to be concluded that Clusters I and II are genetically closer while Clusters IV and VI are wider.

Although the cultivars under study is from the same group of coconut viz., Tall, there is a large amount of genetic diversity among them. The present study has shown multivariate analysis could help to detect the

diverse lines in genetically heterozygous but phenotypically similar population like coconut and choose the divergent parents for specific cross to exploit hybrid vigour.

Based on the nut shape and kernel thickness, Haris (1982) has classified the coconut palms into two categories namely Niu-Kafa and Niu-Via type. The clusters showing maximum diversity (Clusters IV and VI) came under the above two groups of Haris. It is indicated that palms introduced from Philippines and Indonesian Island (Niu-Via type) are in the

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same cluster (Cluster IV) which showed maximum diversity with Cluster VI which is in Niu-Kafa type. Hence it is clearly stressed that there is wide range of genetic variation between Clusters IV and VI.

Rank totals of D^2 values presented in Table 3 gave interesting information. Characters like number of female flowers in an inflorescence, copra content and weight of meat per nut have contributed maximum towards total divergence, whereas traits like weight of husked nut, weight of unhusked nut, thickness of meat and girth of the stem at 1 m from the ground level have contributed minimum to total divergence. A cluster diagram

showing all the six clusters and their inter cluster distances has been furnished in Fig. 1.

SUMMARY

Genetic divergence study was undertaken with 24 cultivars of coconut maintained in the germplasm collection of the Regional Agricultural Research Station, Pilicode, during 1981-82. It included 120 palms of the same age group representing seven exotic and 17 indigenous cultivars of the Tall group. The study was conducted to estimate the genetic distances among the cultivars and to group them into clusters according to their genetic distances following the Mahalanobis D^2 statistics. The 24 culti-

vars fell into six distinct clusters based on the genetic distances among them. Cultivars of same place of origin fell into different clusters while those of diverse origin fell into the same cluster. The study revealed that there is wide genetic divergence among the cultivars and it is a maximum between the cultivars of Clusters IV and VI.

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REFERENCES

- Bavappa, K. V. A., Sukumaran, C. K. and Mathew, J (1973) A study of F_1 hybrids of Tall x Dwarf and its bearing on the genetic of dwarfness. *J. Plant Crops.*, 1 (Suppl)
- Haris, H. C. (1982). Coconut varieties. *Indian Cocon. J.* 12 (1) : 3-10.
- Mehndiratta, P. D. and Singh, K. B. (1971). Genetic diversity in respect of grain yield and its components in cowpea germplasm from the Punjab. *Indian J. Genet.* 31 (2) : 383-392.
- Rao, C. R. (1952). Advanced statistical methods in Biometric Research. John Wiley and Sons, New York.
- Singh, R. B. and Gupta, M. P. (1968). Multivariate analysis of divergence in upland cowpea. *Indian J. Genet.* 28 (2) : 151-157.