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DISCRIMINANT FUNCTION ANALYSIS IN COCONUT SEEDLINGS*

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ABSTRACT

Data on 192 seedlings from 16 families of West Coast Tall variety was utilised for constructing a discriminant function for classifying seedlings into high/low yielders at the nursery stage using 11 seedling characters. Time taken for flowering was adopted to judge a palm as high/low yielding. The function based on this criterion was significant. Girth, number of leaves, weight of the seedling and number of thick roots were found to contribute maximum in discriminating between potentially high/low yielders.

INTRODUCTION

It has been widely accepted that seedling selection in coconut is an effective way to realise higher yield. The previous workers Liyanage (1953), Liyanage and Abeywardena (1957), Satyabalan, Jacob Mathew and Radhakrishnan (1972) have worked out phenotypic correlations between different characters. Nampoothiri, Satyabalan and Jacob Mathew (1975) worked out both phenotypic as well as genotypic correlations between seedling characters with adult palm yield. The above authors suggested various seedling characters based on which selection could be made. An index was worked out based on mean and CV for different seedling characters to evaluate various germplasm collections in the nursery. (Bhaskara Rao and Jacob Mathew, 1981). This method however cannot be used to select seedlings within the germplasm. Ramachander and Bavappa (1972) worked out selection indices for arecanut and reported that the index based on number of leaves, girth at collar and height at the time of planting gave a relative improvement of 352% over straight selection. However, it appears that there has not been any attempt in coconut so far to integrate all the important seedling characters which contribute to make a seedling a future high yielder. The present study makes an attempt in this direction by employing the technique of discriminant function to divide the population into two groups *viz.*, high/low yielders.

MATERIALS AND METHODS

The data used for this study belonged to an experiment laid out at Goa in 1970, with 16 families and four replications. The ultimate plot consisted of 3 seedlings from each family. Eleven seedling characters were recorded at the time of planting. They were; X_1–Girth(cm) X_2–Height(cm) X_3 – No. of leaves X_4– Length of petiole (cm) X_5–length of leaflet bearing portion(cm) X_6–No. of midribs(left) X_7–No. of midribs (right) X_8–Weight of seedling (Kg) X_9–No. of thick roots X_{10}–No. of thin roots and X_{11}–No. of days taken for germination. Time taken for first flowering for each palm was noted. Yield data were recorded. However, since

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the yield was low because of poor management conditions, it was not considered in the discriminant function analysis. Nampoothiri et al (1972) have shown that time taken for flowering is phenotypically and genotypically correlated with adult palm yield. Hence this character was considered for classifying the palms into high/low yielders. Palms which flowered after 72 months (n_1 = 116) were classified as low yielders and which took 72 months and below (n_2=46) were classified as high yielders. Discriminant functions were constructed by using the 11 characters mentioned above and time taken for flowering. It was also studied if a convenient subset of 11 characters would suffice in discrimination. Computations were done as per Goulden (1952).

RESULTS AND DISCUSSION

Construction of discriminant functions using multiple measurements is a powerful statistical technique to discriminate between two or more groups. The general problem consists of setting a function of the type

$$Z = \lambda_1 X_1 + \lambda_2 X_2 + \lambda_3 X_3 + \ldots\ldots + \lambda_P X_P \quad (1)$$

where $X_1, X_2, \ldots\ldots X_P$ are the variables measured and $\lambda 1, \lambda 2, \ldots\ldots \lambda P$ are the corresponding weights attached to each of the variables. Fisher (1938) demonstrated the method of calculating the coefficients of the above equation such that the ratio of variance between groups to that of within groups is maximum. The significance of the variance ratio suggests that the function worked out is able to discriminate between the populations.

The discriminant function based on the seedling character and months taken for flowering came out significant. The resulting function is after dividing all the coefficients by the smallest coefficients in the equation is

$$Z = -88.25X_1 + 5.69X_2 + 129.69X_3 - 12.95X_4 + 7.52X_5 - 31.23X_6 + 45.95X_7 + 81.35X_8 + 37.73X_9 + 2.82X_{10} - 1.00X_{11} \quad (2)$$

The absolute values of the coefficients give the relative importance of different characters in discrimination. The maximum value of the coefficient is for No. of leaves (X_3) followed by girth (X_1), weight of the seedling (X_8), No. of leaflets - Right (X_7) and No. of thick roots (X_9).

Based on the frequency distribution of Z values computed for the population, a seedling with a score of 800 and above is expected to be a palm which flowers before 72 months and consequently a future high yielder. However, the seedlings thus selected may contain about 10% of poor yielders also.

To use equation (2) may be cumbersome in practice. Hence fresh discriminant functions were worked out by eliminating the characters with low coefficients in (2), The function using five variables is

$$Z=-1.55X_1+3.93X_3+1.00X_7+2.66X_8+1.02X_9 \quad (3)$$

The function is found significant. As per this, seedling with a Z score of 30 and above is expected to be a future early flowering palm or in other words a future high yielder. It was observed that about 15% of the seedlings thus selected may be from the poor yielding group.

The function using four characters is

$$Z= -1.24X_1+3.18X_3+2.83X_8+1.00X_9 \quad (4)$$

The function is significant and thus it is worth noting that even with 4 seedling characters it is possible to discriminate

between the populations. A seedling with a Z score of 22 and above is expected to be a future good yielder. However, about 7% of the seedlings selected may be poor yielders.

The results obtained in this study confirm the importance of no. of leaves and girth in seedling selection reported by earlier workers. However the coefficient observed for girth was negative. A similar observation was made by Bhagavan and Nair (1986) in arecanut wherein they reported that girth at permanent mark had a high negative direct effect and its positive correlation with yield was largely due to highly positive indirect effect *via* palm height. Two other important characters identified in this study are weight of the seedling and no. of thick roots.

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