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PHENOTYPIC AND GENOTYPIC CORRELATIONS OF
CERTAIN CHARACTERS WITH YIELD IN COCONUT

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0.5%

2 million
50000
0.50%

- 1. Hence *Q* in *Q* in *Q* in
better quality of
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- 2. Method palm in
Seedling selection
- 3. 43 progenies -
Yield

Seedling selection has been widely accepted as an effective method for increasing the yield of coconut. The work done so far does not commensurate with the importance of this study. Although Pieris (1934, 1937), Patel (1937, 1938), Narayana and John (1942), Liyanage (1953), Liyanage and Abeywardena (1957) and Satyabalan et al (1972) have worked out phenotypic correlations between various characters, results indicating the relationship of seedling characters with yield are lacking. The only reports on genetic correlation are those of Liyanage and Sakai (1960) and Liyanage (1957).

The present paper contains the results of the estimation of phenotypic and genotypic correlations of yield with four seedling characters and four adult palm characters.

Materials and Methods

Observations were made on 43 progenies of open pollinated nuts collected from eight high yielding West Coast Tall mother palms. The seedlings (one year old) were planted in 1953. The characters studied were (1) Time taken for germination, (2) Number of leaves of the seedling, (3) Girth at collar, (4) Height of the seedling, (5) Time taken for flowering (Time taken for the emergence of the first inflorescence), (6) Flowering leaf axil (the number of the leaf axil in which the first spathe appeared), (7) Spathe production, (8) Number of female flowers, and (9) Yield of nuts. Phenotypic correlations were worked out among all the characters and genotypic correlations of yield with all the eight characters were estimated. For working out the genetic correlations observations from only 32 palms (four seedlings per family) were used. The calculations were done as per the procedure adopted by Liyanage and Sakai (1960). For the yield, spathe production and female flowers, average over four years (1971-74) was taken.

Results and Discussion

Phenotypic correlations among all the characters except yield are presented in Table 1. The phenotypic and genotypic correlations of yield with these characters are given in Table 2.

It is generally recommended that only "vigorous seedlings" should be selected. The vigour is generally indicated by the vegetative characters relating to growth such as height, girth, number of leaves, number of leaflets and early splitting of leaf. While in some of the cases there is proved association of certain characters with yield, in certain cases the characters are just believed to be associated with future performance. In the present study, girth at collar was the only seedling character which showed significant phenotypic correlation with yield, correlation coefficients of yield with number of days taken for germination, height and number of leaves being insignificant. Liyanage (1955) reported a significant negative correlation of germination and yield. Previous workers except Liyanage and Abeywardena (1957) do not seem to have seriously attempted correlations between seedling characters and yield.

The adult palm characters like number of spathes and female flowers were very strongly and positively correlated. It was found that early flowering palms gave higher yield. Though Pieris (1934) reported that higher number of female flowers would yield higher number of nuts no such strong association could be located by Narayana and John (1942).

Correlation studies among the different characters indicated that time taken for germination and number of leaves are negatively correlated. Previous reports have not indicated this relationship (CCRS, 1961). Apart from the rate of leaf production, this could be due to the increased duration between germination and transplanting in the case of nuts germinating early. Nonsignificant correlations between girth and height, height and number of leaves, germination and girth and germination and height have been published in the annual reports of the erstwhile Central Coconut Research Station (CCRS, 1961, 1962). The present study confirms these findings. Other significant correlations observed are between production of spathe and female flowers, height and time taken for flowering, height and flowering leaf axil, as well as between the time taken for flowering and flowering leaf axil.

Information on genetic correlation between characters would be necessary to plan the selection programme, on a sound basis. Girth and number of leaves of the seedling as well as spathe production and female flowers were found to be positively correlated with yield. No previous reports are available on genetic correlations of these characters. Liyanage (1955) has recorded that the flowering time is negatively associated with yield. Similar results were obtained in the present investigation. This is a very advantageous relationship enabling simultaneous selection for earliness and high yield. As spathe production and female flowers are both phenotypically and genotypically related with yield, selection of palms for these yield attributes would be advantageous. While selecting for larger number of female flowers, one should give weightage to a proper distribution of the female flowers also, as it is known that better setting is obtained when there are only one or two female flowers per spike (Nambiar et al 1970).

Though opinions differ as to the relative efficacy of mother palm selection and seedling selection, there is no doubt about the necessity of spotting out superior seedlings in the early stages of growth in a heterozygous seed propagated perennial crop. Bavappa and Ramachander (1967) reported that selection of seedlings based on characters such as number of leaves at the time of planting, girth at collar one year after transplanting and number of nodes after two years of growth will be advantageous in improving the yield of arecanut. As early as in 1933, Smith stressed the importance of selection based on nursery results. In a coconut plantation planted in 1939 in Ceylon the palms of selected seedlings gave 11 more nuts and 10 per cent more copra than the unselected ones (Liyanage 1953). Dwyer (1938) found that some palms tend to produce much stronger seedlings than others. This was confirmed through the studies made by Ninan and Pankajakshan (1961) on the open pollinated progenies of certain high yielding West Coast Tall palms. Fremond et al (1966) emphasised that selection effected first in germinating beds, and then in the nursery plots, based on the vigour of the plants is of proven efficiency.

Based on the present study, seedling selection based on number of leaves and girth could be recommended. Time taken for first flowering, production of spathe and female flowers, are dependable adult palm characters for selection to improve the yield. High general combining ability reported for number of bunches and number of female flowers is of added advantage in selection (Nambiar and Nambiar, 1970).

① Seedling
no. of leaves
girth
② Adult
General
combining

It is quite evident that the work so far done is quite inadequate. As fixing up norms for selection of seedlings is very important in yield improvement an elaborate experiment consisting of about 4000 progenies from 190 West Coast Tall palms has been laid out. Additional criteria like leaf area and physiological characters have been included in this study.

Edl
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for comparison
fruit

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Table 1
Correlation coefficients (phenotypic) among seedling and adult palm characters

| Characters | Number of leaves | Girth at collar | Height | Time taken for flowering | Flowering leaf axil | Number of spathes | Number of female flowers |
|----------------------------|------------------|-----------------|---------|--------------------------|---------------------|-------------------|--------------------------|
| <u>Seedling</u> | | | | | | | |
| Time taken for germination | -0.4447** | -0.2411 | -0.2077 | -0.2794 | -0.2533 | 0.1471 | 0.0194 |
| Number of leaves | .. | 0.3959** | 0.0379 | -0.1358 | -0.1044 | 0.0941 | 0.2214 |
| Girth at collar | .. | .. | 0.0489 | -0.2123 | -0.2044 | 0.0609 | 0.2282 |
| Height | .. | .. | .. | 0.4200** | 0.3098* | 0.0795 | 0.1402 |
| <u>Adult palm</u> | | | | | | | |
| Time taken for flowering | .. | .. | .. | .. | 0.7958** | -0.1728 | -0.2227 |
| Flowering leaf axil | .. | .. | .. | .. | .. | 0.0765 | 0.0664 |
| Number of spathes | .. | .. | .. | .. | .. | .. | 0.6533** |

* Significant at P = 0.05

** Significant at P = 0.01

Table 2

Phenotypic and genotypic correlation of certain characters with yield

| Characters | Phenotypic correlation | Genotypic correlation |
|----------------------------|------------------------|-----------------------|
| <u>Seedling</u> | | |
| Time taken for germination | + 0.0447 | + 0.170 |
| Number of leaves | + 0.2632 | + 0.528** ✓ |
| Girth at collar | + 0.3565* | + 0.410* ✓ |
| Height | + 0.0173 | + 0.208 |
| <u>Adult Palm</u> | | |
| Time taken for flowering | - 0.4316** | - 0.471** ✓ |
| Flowering leaf axil | - 0.1244 | - 0.130 |
| Spathe production | + 0.5856** | + 0.689** ✓ |
| Female flowers | + 0.7251** | + 0.933** ✓ |

* Significant at P = 0.05

** Significant at P = 0.01