GENETIC ANALYSIS OF YIELD ATTRIBUTES IN *COCOS NUCIFERA* L. VAR. WEST COAST TALL

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SUMMARY

The variance components analysis of characters influencing productivity in six yield groups of coconut in three sets of crosses has revealed that there is substantial additive genetic variation available for selection for yield and other associated characters like number of female flowers and percentage set as estimated by the relative sizes of $\sigma_a^2$, $\sigma_e^2$ and $\sigma_e^2$. The general combining ability of the higher yield groups is considerable for number of bunches, number of female flowers, yield of nuts but is limited for percentage set. The presence of interaction between yield groups and category of crosses and the extent of non-additive genetic variation as revealed by the magnitude of $\sigma_a^2$ indicate the necessity of maintaining substantial heterozygosity within each population. Since high yielders will be proportionally low in any unselected population, the limited diversity within these groups can be better utilized by interplanting them with similar phenotypes of diverse origin, to prevent inbreeding in their progenies and to maintain heterozygosity within the population.

The results have demonstrated the stability of the superiority of high yielding groups even in poor environment. In a more favourable environment with higher doses of fertilizer, the difference between the top two yield groups and the rest could possibly be larger. Therefore, choice of mother palms with high yield either for crossing purposes or for progeny testing appear to be reliable, provided that there is sufficient genetic diversity within the population.

INTRODUCTION

The selection of parents from a population for further propagation from certain outbreeding material like coconut is dependent on the parental performance and its progeny in controlled matings. Such an analysis will also permit the identification of genotypes with superior transmission of their traits to their progeny and the pattern of genetic variation which will enable a breeder to know the magnitude of genetic variation available for selection and the breeding procedure to be adopted (Charles, 1961; Liyanage, 1967). In a crop with a large generation interval like coconut, the relationship of early growth features with adult plant performance will help elimination of inferior genotypes at an early stage. The West Coast Tall variety grown extensively in Kerala and other coconut-growing areas of India is a locally adapted kind of material with considerable genetic variation for yield in the same location. Even under un-
irrigated conditions, palms yield up to 120 or more nuts per year, although the average yield in a plantation may not generally exceed 50 or 60 per tree/year. Therefore, a genetic analysis of seedling characters, yield of nuts and other characters associated with productivity has been undertaken in crosses between six yield groups under controlled matings. The results of such an investigation in this material with a stable yield level are reported in this paper.

MATERIAL AND METHODS

The material consists of 540 palms drawn from 108 parent palms with six levels of yield, namely:
1. over 120 nuts per year (G₁)
2. 101 to 120 nuts per year (G₂)
3. 81 to 100 nuts per year (G₃)
4. 61 to 80 nuts per year (G₄)
5. 41 to 60 nuts per year (G₅)
6. below 40 nuts per year (G₆)
chosen at random within each category. They will hereafter be referred to as G₁, G₂, G₃, G₄, G₅ and G₆ groups. Each of the group was crossed with:
a. Natural crossing, i.e. male parent not known
b. Pollen of the elite yielding group with a level of more than 100 nuts per palm per year
c. Pollen of the same group (inbred).
They will hereafter be referred to as a, b and c categories. The progenies of the 18 possible combinations were planted out in five replicates with an initial population of 540 seedlings in 1942. The data on yield and other related characters collected during the four years from 1965 to 1968 are analysed now, since this plantation has reached a stable yield level.

The crosses were made in 1940 at the Central Coconut Research Station, Kasaragod and the nuts were sown in the nursery in 1941 at the Central Coconut Research Station, Nileshwar. One-year-old seedlings were planted in the sandy loam soil of Central Coconut Research Station, Nileshwar in 1942. The quantity of manure of 0.34 kg of N, 0.2 kg of P₂O₅ and 0.68 kg of K₂O over a basal dressing of 25 kg of green leaf per adult palm is uniform for all palms. In summer the soil has a low moisture retentivity. The crop did not receive any supplementary irrigation during any stage of growth. The tract is also representative of the coastal region of coconut cultivation in West and South West India. The management was the same as practised by cultivators except for the afore-mentioned manurial schedule.

The characters that had been observed, were 1. Number of bunches emerged; 2. Number of female flowers produced; 3. Number of flowers set (number of nuts); 4. Percentage of flowers set; 5. Number of leaves in the crown; 6. Rate of production of leaves.

Observations were recorded every month concerning the emergence of leaves, emergence of bunches and the number of female flowers in each bunch. The number of flowers set i.e. the number of nuts harvested is recorded when harvesting the nuts.