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NEED FOR SELECTION AMONG DWARF POLLEN PARENTS IN THE PRODUCTION OF 'TALL' × 'DWARF' COCONUT HYBRIDS

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Hybridization for the improvement of coconut was first attempted in India in early 1920 at the Agricultural Research Stations on the west coast of India. The first item taken up for investigation was a comparative study of the progenies obtained by self-, cross- and natural pollination from selected ordinary 'West Coast Tall' variety palms. The progenies had been planted at the Agricultural Research Station, Nileshwar, and have been under regular observation since then.

The scope of hybridization was subsequently enlarged as more and more facilities became available. The first achievement of note was the demonstration of the occurrence of hybrid vigour in the progenies of cross between 'Tall' (female) and 'Dwarf' (male) in the nursery (Patel, 1937). Studies of the performance of these progenies planted out in the field (John and Venkatarnarayana, 1943) showed that they gave high yields and combined in them the desirable nut and copra characters of the 'Tall' parent and the early-bearing nature of the 'Dwarf' parent. These observations had subsequently been confirmed by other workers form India and abroad (Liyanage, 1956; Memoirs of the Department of Agriculture, Madras, 1954).

The spectacular performance of the 'Tall' × 'Dwarf' hybrids attracted immediate attention and steps were taken to produce more and more hybrids for studying their performance in detail both at the Research Stations and in the growers' holdings, using mostly the 'Green Dwarf' as the male parent. In course of time, as results began to accumulate, unfavourable features such as alternate bearing, small-sized nuts, low copra content per nut and occurrence of barren nuts came to our notice. It became also evident that crosses between all 'Tall' and 'Dwarf' palms do not give vigorous progenies and that compatible combinations may have to be spotted out. Since the 'Tall' variety palms used as female parents had been selected in accordance with the criteria fixed for selection of mother palms, the unsatisfactory features met with in the hybrids were suspected to be the result of either incompatibility, or difference in dwarf pollen parents used in crosses, or to both. Thus the behaviour of pollen parents in crosses assumed importance and appeared to require urgent investigations. This paper presents a preliminary report of work done on this aspect.

MATERIAL AND METHODS

Among the 'Dwarf' variety three distinct forms are met with locally, viz. 'Dwarf Green', 'Dwarf Orange' and 'Dwarf Yellow'. Of these the first two are more common. The results of a comparative study of some of the characters of the above two dwarf forms made by Bhavani Shankar Rao and Koyamu (1955) are summarized on the next page.

	'Dwarf Green'	'Dwarf Orange'
Age at first flowering (years)	3	4
Girth of stem (cm)	50·8	53·3
Number of leaves on the crown	26	28
Length of leaf (cm)	24·4	26·16
Width of leaf (cm)	12·19	15·24
Length of petiole (cm)	7·62	9·9
Annual yield of nuts (average number)	66	90·8
Copra content per nut (g)	92·14	99·23
Calculated annual yield of copra per tree (kg)	6	9
Quality of copra	Poor	Poor

Variation in palm characters exists among the palms of the two dwarf varieties themselves as can be seen from the data summarized below for the two important nut characters of weight of husked nut and weight of copra per nut.

	Weight of husked nut (g)			Weight of copra per nut (g)			No. of palms on which the data are based
	Mean	Range	C.V.(%)	Mean	Range	C.V.(%)	
'Dwarf Green'	153·4	83·7–328·4	49·9	57·1	30·9–117·0	48·6	12
'Dwarf Orange'	513·1	425·0–636·9	11·7	160·3	137·2–177·7	10·7	12

For the hybridization work referred to in this paper the pollen was collected from 'Dwarf Green' and 'Dwarf Orange'. The bunches of each mother palm were pollinated by pollen of both the pollen parents on separate bunches. Hybrid seedlings raised from them were studied in the nursery before planting them out in the field in 1956. The hybrid palms have now reached the bearing stage enabling the study of nuts harvested from them for characters like weight of unhusked nut, weight of husked nut and weight of copra per nut. The nut and copra characters of the parents were also gathered for comparison.

RESULTS

Data gathered in the nursery on the seedling characters of hybrids utilizing both the dwarf types have been statistically scrutinized and the results obtained are presented in Table I.

The four seedling characters studied generally indicate the vigour of the seedlings in coconut. Hybrids raised utilizing 'Dwarf Orange' as the pollen parent sprouted earlier than the other group in which 'Dwarf Green' was used as the pollen parent. In respect of all the vegetative characters of seedlings studied, viz. girth at collar, height and number of leaves, 'Tall' × 'Dwarf Orange' hybrids were significantly

TABLE I. SEEDLING CHARACTERS OF COCONUT HYBRIDS

Particulars	'Tall' × 'Dwarf Green' T_1	'Tall' × 'Dwarf Orange' T_2	Differences whether statistically significant (P=0·05)	Conclusion
Mean number of days taken for germination	95·9	75·0	Yes	$T_2 < T_1$
Girth at collar (cm)	10·96	12·12	Yes	$T_2 > T_1$
Height (cm)	113·96	118·86	Yes	$T_2 > T_1$
Number of leaves produced in a year	6·70	7·60	Yes	$T_2 > T_1$

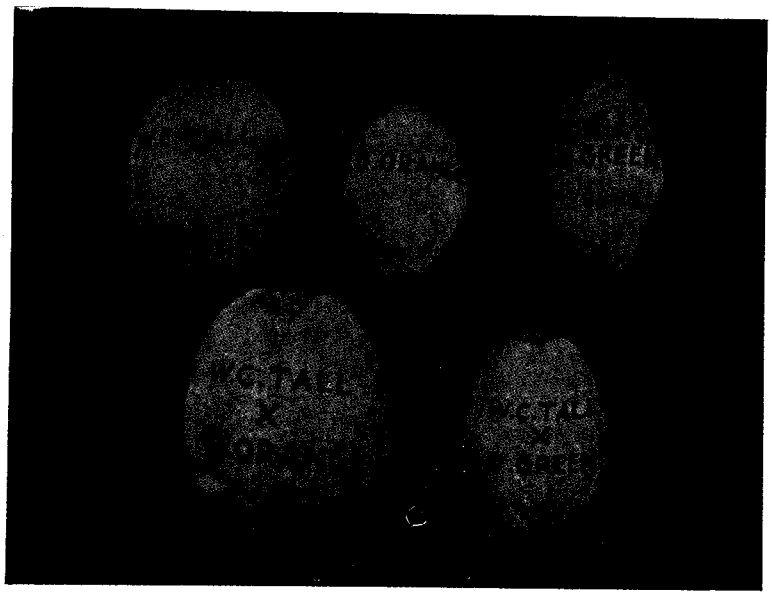

FIG. 1. UNHUSKED NUT OF PARENTS AND HYBRIDS.

superior to the 'Tall' × 'Dwarf Green' hybrids. Thus in the seedling stage the hybrids in which 'Dwarf Orange' was used as the pollen parent were very vigorous in growth and were far superior in all the growth characters to those in which 'Dwarf Green' was used.

In the adult palm stage also, differences have been noticed in the nut and copra characters of these two groups of hybrids. The nuts of hybrids in which 'Dwarf Orange' was used as the pollen parent were big with less fibre content (thin-husked) and had more copra content per nut. In the other group in which 'Dwarf Green' was used as the pollen parent, the nuts tended to become more fibrous, smaller in size and with less copra content per nut (Table II). As the hybrids are very young their normal yield capacity cannot be assessed now. At present the mean annual

yield of both the groups is almost the same, the yield varying between 40 and 45 nuts per palm per year.

FIG. 2. NUTS OF PARENTS AND HYBRIDS SPLIT OPEN TO SHOW THE INTERNAL CHARACTERS.

DISCUSSION

This study has indicated the need for selection among dwarf pollen parents in the production of 'Tall' × 'Dwarf' hybrids. It is evident from the data that 'Dwarf Orange' is to be preferred to 'Dwarf Green' as pollen parent for producing vigorous and promising 'Tall' × 'Dwarf' hybrids. The nut and copra characters of the hybrids of the 'Tall' palms with 'Dwarf Orange' as pollen parent are far superior to those obtained using 'Dwarf Green' as the pollen parent.

The study has also indicated the need for selection of pollen parents in the 'Dwarf Orange' type itself. In this study Palm No. XI/71 ('Orange Dwarf') is found to have better combining ability than the other two pollen parents used. Nuts obtained from hybrids raised with XI/71 as pollen parent have more copra content per nut than those in which IX E/56 was used as the pollen parent. Though the number of progenies studied in each combination is low, it definitely indicates the need for selection of 'Dwarf' pollen parents for production of promising 'Tall' × 'Dwarf' hybrids. Selection of 'Dwarf' pollen parent based on a study of nut and copra characters and using them as male parent in crosses is likely to go a long way in ensuring satisfactory performance of 'Tall' × 'Dwarf' hybrids.

SUMMARY

A study of 'Tall' × 'Dwarf Green' and 'Tall' × 'Dwarf Orange' hybrid seedlings obtained from the same female parents of the 'Tall' variety in the nursery

TABLE II. NUT AND COPRA CHARACTERS OF PARENTS AND HYBRIDS

Parents			Hybrids				
Tree No.	Mean weight of husked nut (g)	Mean copra content per nut (g)	Details of cross	Mean weight of husked nut (g)	Mean copra content per nut (g)	Percentage increase or decrease in husked nut over that of the female parent	Percentage increase or decrease in copra content per nut over that of the female parent
I/76	436·3	137·5	I/76♀ × IX E/56♂	513·8	171·1	+17·8	+24·4
VIII/23	489·6	165·2	I/76♀ × IX E/34♂	482·4	153·8	+10·6	+11·9
XI/71 (' Dwarf Orange ')	636·9	177·7	I/76♀ × IX E/23♂	306·2	112·9	−29·8	−17·9
IX E/56 (' Dwarf Orange ')	425·0	137·2	VIII/23♀ × XI/71♂	745·3	232·3	+52·2	+40·6
IX E/23 (' Dwarf Green ')	328·2	108·2	VIII/23♀ × IX E/56♂	587·3	187·1	+20·0	+13·2
IX E/34 (' Dwarf Green ')	282·5	117·0	VIII/23♀ × IX E/23♂	389·3	136·4	−20·5	−17·4

for the four seedling characters indicating the vigour of the seedling (viz. number of days for sprouting of the hybrid nut, girth at collar of the seedling, height of the seedling and number of leaves produced at a particular period) has shown that 'Tall' × 'Dwarf Orange' hybrids are significantly superior to 'Tall' × 'Dwarf Green' hybrids in these characters. Similarly nut and copra characters of hybrids of the 'Tall' variety with 'Dwarf Orange' as the pollen parent are found to be far superior to those obtained using 'Dwarf Green' as the pollen parent. The nuts obtained from hybrids raised with 'Dwarf Orange' as the pollen parent are large-sized with less fibre content and have more copra content per nut. The study also has indicated the need for selection of male parents even in 'Dwarf Orange' type on the basis of nut and copra characters as the combinations of certain palms with better nut and copra characters have given more satisfactory performance than others.

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