

Note on Improvement of the Coconut by Cross-breeding*

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Introduction The coconut (*Cocos nucifera* Linn.) has been an important oil yielding crop of the Tropics from ancient times and it still figures prominent in the edible oil industry of the world despite competition from other sources of edible oil supply. Though some attention is being bestowed on the selection of seed material, nothing appreciable seems to have been done elsewhere to produce economic types by cross-breeding different varieties. This is probably due to the fact that it takes normally 8 to 10 years for a coconut tree to come to the flowering stage and many more years should elapse before its bearing capacity can be fully assessed. The added risk of finding the cross progenies unproductive or uneconomic after they have been maintained at considerable expenditure for several years might have also deterred the enthusiasm of the few workers on this crop who might have conceived the idea of cross-breeding in coconuts.

Breeding in Madras Breeding work on the coconut was started in Madras at the Coconut Research Station, Kasaragod, 12 years ago with the chief object of producing high yielding and early bearing types giving large quantity of high grade copra (dried kernels). Under different schemes of cross-breeding, attempts were made to combine the economic characters of the different eco-types of the ordinary Tall variety, such as high production of female flowers, high percentage of setting, thick kernels, large size of nuts etc., as also the earliness of the Dwarf variety with some of the desirable characters of the Tall variety. The hybrid trees in the scheme of hybridization of the Tall and the Dwarf varieties have come to the bearing stage and in this note an account of the hybrids and the parents is given.

Tall × Dwarf crosses The scheme of crossing between the ordinary Tall variety that is largely cultivated in India and the Dwarf variety which is only occasionally met with was first conceived and started by Dr. J. S. Patel in 1931. The work has been further extended and the study continued by planting the parents and the hybrid seedlings in an area of four acres at the Coconut Research Station, Nileshwar (Kasaragod taluk) in 1934 and subsequent years. Most of the hybrid trees and the selfed progenies of the Dwarf parent which is an early flowering variety have begun to yield since 1939. The hybrids are found to be economic types being very vigorous, early bearing and high yielding in character.

* Contribution No. 22 of the Oil Seeds Section of the Madras Department of Agriculture.

Characters of the parents *Ordinary Tall variety* It is a tall growing, hardy palm attaining a height of about 40 feet or more and living up to the age of about 80 or 90 years. It begins to yield under ordinary conditions in about 8 to 10 years after planting. Under rainfed conditions the yield goes up to 100 nuts per tree, per year, which give about 30 lb. of copra. The kernel is thick and copra is of good quality and contains about 72 per cent of oil by chemical extraction.

Dwarf variety It is a delicate palm of small stature attaining a height of about 15 feet and living up to an age of about 35 years. It is a very early bearing variety beginning to flower in about four years after planting. The yield is about 60 nuts per tree, per year giving 5 to 10 lb. of copra. The nuts are very small in size with thin kernel. The copra is of inferior quality being leathery. The percentage of oil in copra is about 70.

Characters of the Tall × Dwarf progenies *Vegetative growth* The progenies of the cross being derived from two distinct varieties, exhibit considerable hybrid vigour even from the first year of planting. They have greater rate of leaf production and number of leaves and rate of growth of the stem than either of the progenies of the Tall or the Dwarf parents planted along with them.

For instance, the hybrid tree (Fig. 3) had a trunk length of 1 ft. 1 in. with 27 leaves in the crown in 1941 while the pure Tall progeny (Fig. 1) of the female parent of the same age did not form any trunk and had only 11 leaves. The pure dwarf progeny (Fig. 2) of the male parent of the same age had 9 inches of trunk and 22 leaves in the crown.

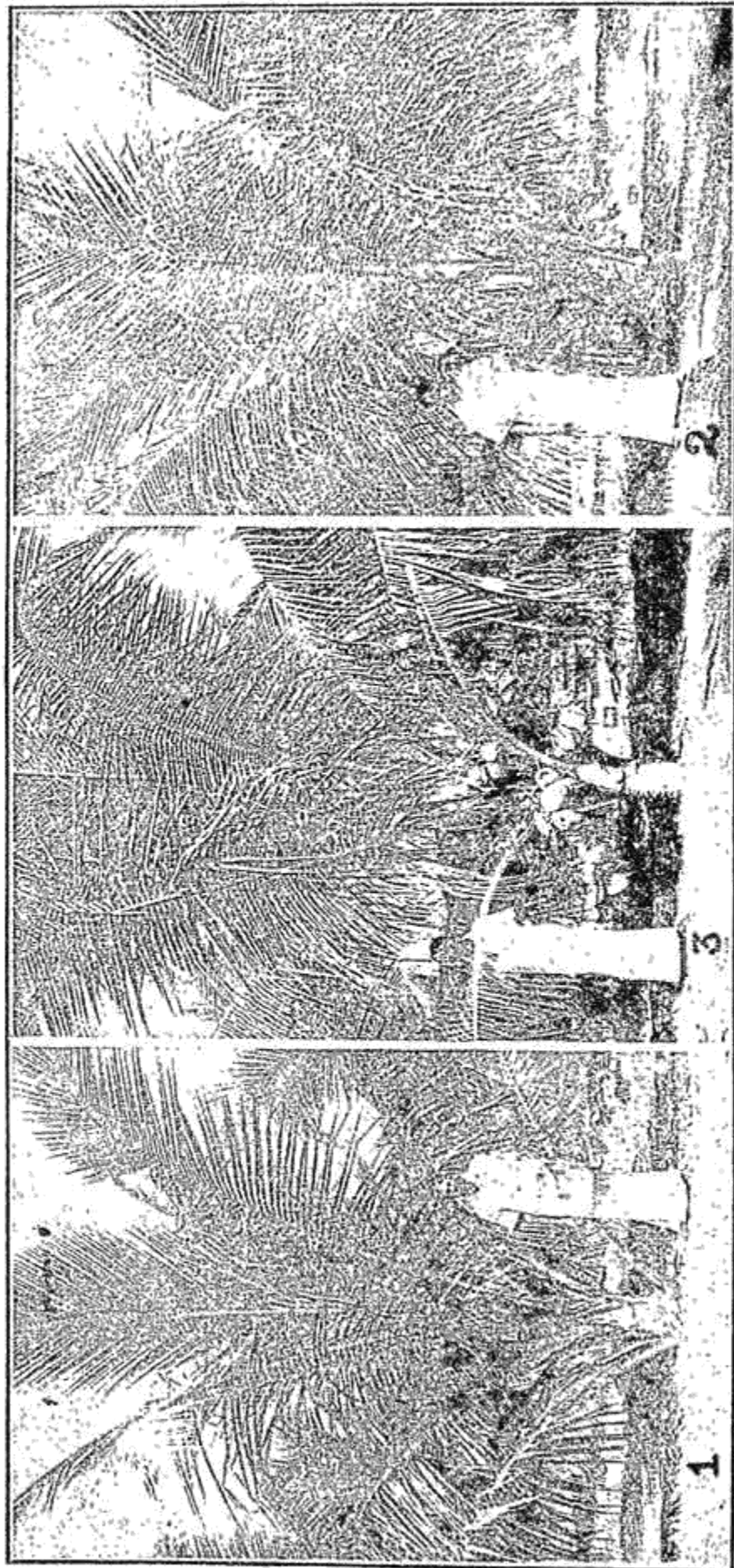
Flowering The hybrid flowered early like the Dwarf at about 50 months after planting while the Tall did not flower even after 63 months and is not likely to flower for another two or three years.

Usually in the coconut, during the early years of flowering the number of female flowers produced and the setting percentage are very low, and increase with age. But in the hybrid, the total number of female flowers produced in a year was as high as 433 which is much higher than those produced either by the Tall or the Dwarf parents even in their prime of life.

Fruiting The hybrid progenies gave a definitely higher initial setting percentage and produced more nuts. These were like the nuts of the Tall variety in size, thickness of kernel, quality and out-turn of copra. The yield of nuts was more than double that of the Dwarf progeny of the same age. In one particular cross the hybrid yielded as many as 90 nuts in one year, about three years after first flowering. This should be considered very satisfactory even when compared with the production of the high yielding Tall variety.

The following table gives the characters of the hybrid, and the selfed progenies of the parents.

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The Tall Variety

The Hybrid

The Dwarf Variety

Characters of selfed progenies of parents and hybrid
(63 months old).

Characters	Selfed progeny of ♀ parent Tall Fig. 1	Selfed progeny of ♂ parents Dwarf Fig. 3	Hybrid Fig. 2
Height of trunk above ground level	No trunk } formed }	0'-9"	1'-1"
Girth of trunk at base		2'-1"	2'-11"
No. of leaves in the crown	11	22	27
Mean length of leaf	12'-8"	10'-10"	13'-0"
No. of leaves produced in a year in 1941	9	14	14
Age at first flowering	Not flowered	49 months	50 months
No. of female flowers produced in a year	...	375	433
Setting per cent	...	5.6	11.7
Yield of nuts per year	...	20	51
Copra content per nut	...	20.69 gms.	165.0 gms.
Quality of copra	...	poor	good
Percentage of oil	...	70	70

(Note—The readings for items 7 to 12 for the Tall parent tree used for the crossing and which is about 50 years old are—No. of female flowers produced in a year—236; setting percent—34.7; Yield of nuts per year—81.8; copra content per nut—206.6 gms; quality of copra—good; percentage of oil—71.)

The above table gives a comparative idea of the characters of the three classes of progenies at the same age viz., 63 months after planting under rainfed conditions.

Conclusion The trials and the work done during the last 10 years with Tall × Dwarf hybrids have definitely shown that there is hybrid vigour in the progeny and that they combine the very desirable early flowering nature of the Dwarf parent with the economic nut characters of the Tall parent. One of the urgent requirements of the coconut grower is to get early bearing economic types in place of the late bearing Tall type which he is at present cultivating. It may be now said with some confidence that the Tall × Dwarf crosses have met this long-felt want and have opened a new field in the improvement of the coconut. Cross-breeding work is on hand to produce these hybrid seedlings for distribution among coconut planters.