

Production of Natural Cross Dwarf (NCD) hybrids in Coconut by Controlled Natural Pollination of Dwarf Varieties in Farmers' Plots

Pramod. P. V., R. V. Nair, R. J. Thomas, C. Mathews and Seema Pillai

Central Plantation Crops Research Institute, Regional Station, Kayamkulam,
Krishnapuram P. O., Kerala - 690 533

Coconut is one of the most important plantation crops of Kerala. It also plays an important role in the agrarian economy of many other states in India. The most extensively cultivated coconut varieties in India are tall types. Generally dwarfs are also grown to a limited extent mostly for tender nut and ornamental purposes. This article illustrates a method to utilize such commonly found dwarfs for the production of DxT hybrids through controlled natural pollination.

The tall cultivars are highly cross-pollinated and exhibit high degree of variability with respect to crown shape, colour, shape and size of fruits and copra content. The nuts are generally medium to big in size with good quantity of copra and high oil content (68-70%).

Chowghat Orange Dwarf (COD) and Chowghat Green Dwarf (CGD) are the most popular dwarf varieties of Kerala, which are distinguished by its fruit colour, which are orange or green, respectively. Dwarf varieties are usually characterized by thin trunk without the swollen base or 'bole', which is noticed in the tall palms. They are early bearing and produce large number of nuts with usually alternate bearing habits. They also have a short life span of 35 to 40 years, small size of nuts and leathery copra with an oil content of 66 percentage.

Dwarfs are usually self-pollinated with a high degree of uniformity with respect to shape, colour and size of fruits. Self-pollination takes place as a

result of overlapping of male and female phase in contrast to the tall varieties, which have a distinct male and female phase with an interval of 3 to 4 days. Because of their inbred nature, dwarfs are highly valued as parental material for the production of hybrids by the breeders all over the world.

Hybrids of coconut are grown through out the world for their earliness in flowering (3 to 4 years after planting), high nut yield, good quantity and quality of copra and oil (65-68%). Besides, hybrids produced from CGD and COD generally show tolerance to root (wilt) disease. There are two types of hybrids viz. DxT and TxD. In DxT hybrids, dwarf palms are the female parents and in TxD hybrids, tall palms are the female parent. DxT hybrids are more popular because of the ease with which they can be produced in large scale.

Coconut farmers often observe in their nurseries natural cross hybrids among the seedlings raised from nuts

of dwarf varieties. Almost 3-5% of the seed nuts naturally collected from CGD produce hybrid seedlings and it may reach up to 20 per cent in COD. Such hybrid seedlings can be detected in the seedling stage by virtue of their petiole colour, increased length and width of leaves and leaflets and dark green colour, compared to the dwarf seedlings. Such Natural Cross Dwarfs (NCD) are extremely popular among coconut farmers, not only because of their high yield but also the easiness with which they can be produced in their own garden.

One of the major constraints affecting coconut production in most of the coconut growing countries is the non-availability of quality planting materials. Farmers through out the world traditionally prefer hybrids but the production level cannot meet even a small fraction of the actual demand. The prospect of producing hybrids to meet their increasing demands in the foreseeable future is also not very bright. Viewed in this background,

Table 1. Distinguishing characters of pure CGD and COD palms

Chowghat Green Dwarf	Chowghat Orange Dwarf
<ul style="list-style-type: none"> ■ Narrow stem without boles and marked by prominent leaf scars but leaf scars are not prominent ■ Petioles and nuts are green in colour ■ Tender nuts are oval in shape with a beak and ring at the bottom when mature ■ Unfertilized female flowers are retained in the inflorescence 	<ul style="list-style-type: none"> ■ Stem broader than CGD but less than tall varieties without boles ■ Petioles and nuts are orange in colour ■ Tender and mature nuts are round or oval in shape ■ Unfertilized female flowers are shed



there is an urgent need to encourage coconut farmers for producing NCD hybrids in their own gardens by utilizing the dwarf palms available in the farmers' field.

For the production of hybrids from natural cross dwarfs, Chowghat Orange Dwarf (Fig. 1) and Chowghat Green Dwarf (Fig. 2) mother palms can be selected in the farmers' plot itself. Preferably the selected dwarf palms should be surrounded by healthy and high yielding tall palms, so that the mother palms can be naturally pollinated with tall palms.

Controlled Natural Pollination

Dwarf varieties usually initiate flowering 3 to 4 years after planting. Palms can be selected for pollination usually after two to three years of flowering, when they start to give regular nut yield with proper sized nuts. Mother palms should be preferably free from disease and insect pests.

Knowledge of floral biology is essential for NCD hybrid production. In coconut, male and female flowers are produced in the same inflorescence with male flowers in the upper portion

of the spikelet and female flowers in the basal portion (Fig. 3). In dwarf varieties, male and female phases overlap, resulting in high degree of self-pollination.

Transfer of pollen grains from anther to the stigma is generally known as pollination. Cross-pollination is the process of transfer of pollen from male parent to the stigma of the female parent. In nature, pollination in coconut occurs through honeybees, ants, etc. or through wind.

Recovery of NCD hybrids can be increased by just carrying out emasculation of dwarf mother palms and allowing them for natural cross-pollination. The removal of stamen or all male flowers from an inflorescence is known as emasculation (Fig. 4). An effective emasculation technique prevents self-pollination in coconut and emasculation is usually practised by removing male flowers by hand. For the production of Dx T hybrids, inflorescence of the dwarf mother palm should be emasculated within 2 to 3 days of its opening, by cutting and removing all the spikes together with the male flowers borne on it using a knife / secature. Spikes are removed

roughly 5 cm above the female flowers. One or two male flowers, situated at the bottom of the female flowers, must also be removed by hand. The female flowers, popularly called as buttons, become receipt from fifth day of opening of inflorescence and may extend up to 15th day in dwarf varieties. Pollination will usually be completed within 17th day after emasculation in dwarf varieties. The emasculation should preferably be conducted during October to May, because of the more number of female flowers and high setting percentage. The period during June to August can be avoided because of the lesser number of female flowers and lower setting percentage.

Mature nuts can be harvested usually 10 to 11 months after pollination. They should be sown in nursery beds after the husk is properly dry but before the nut water gets dried up. The harvested nuts may be stored in shady place. Farmers can compare the seedlings raised from NCD nuts with that of true CGD/COD by raising seedlings from 10-15 nuts of the dwarf mother palms.

The sites selected for the nursery should be easily accessible and have well-drained, loose and friable soil with good irrigation facilities. Seedbed should be of 1.5 meter width and of convenient length at spacing of 40x30 cm. Seed nuts can be sown horizontally in 20-25 cm. deep trenches on the seedbeds prepared.

Selection of hybrid seedlings

DxT hybrid seedlings can be selected based on the exclusive characteristics of the male parent (West Coast Tall) viz., colour of petiole, length and breadth of leaves and leaflets, etc. One-year-old seedlings usually show hybrid vigour for collar girth, number of leaves, length and breadth of leaves and leaflets, etc. Colour of petiole is one of the most commonly used



Fig. 1. Chowghat Orange Dwarf palm

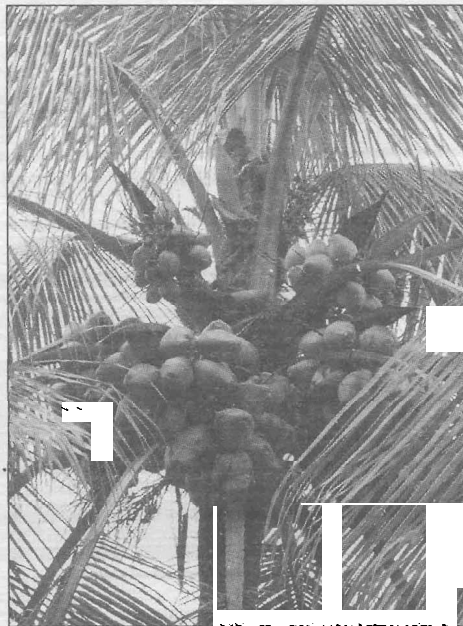


Fig. 2. Chowghat Green Dwarf palm

Table 2. Colour of petiole in NCD hybrids

Dwarfs (Female parents) ▼	West coast tall (Male parent) ▼	
	Green nut type	Orange/Yellow nut type
Chowghat Orange Dwarf	Green/Bronze	Bronze
Chowghat Green Dwarf	Green	Bronze

Orange Dwarf is used as the mother palm, hybrid seedlings show a distinct bronze petiole colour (a limited number of green petiole types are also present). In the case of Chowghat Green Dwarf, cross-pollinated with West Coast Tall palms producing green coloured nuts, it is more difficult to identify the true hybrids since nuts produced both by cross-pollination and self-pollination will produce seedlings with green petiole. In this case, one-year old hybrid seedlings can be identified by their hybrid vigour, increased height of plant, long and broad leaves and leaflets and broader collar girth, etc., which are distinct from CGD mother palms. When green dwarfs pollinated with the pollen grains of orange / yellow coloured tall palms, it will be easy for identification of NCDs.

From the Table, it is clear that the hybrid seedlings show characters close to seedlings of tall variety (male parent) and distinct from the CGD variety.

Steps in production of NCD hybrids

Based on the above descriptions of colour of leaf petiole, farmers can identify one-year-old hybrid seedlings in nursery. Adoption of this simple technique and planting hybrid seedlings will increase the productivity of coconut palms and help farmers to increase their income.

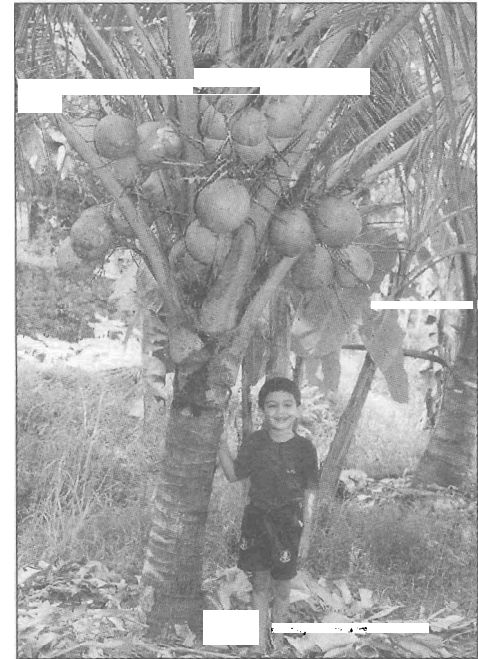


Fig. 5. A NCD hybrid in full bearing stage (5yrs after planting) in a farmer's plot

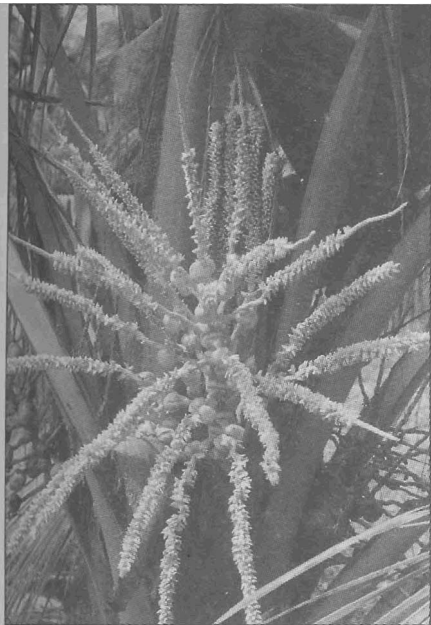
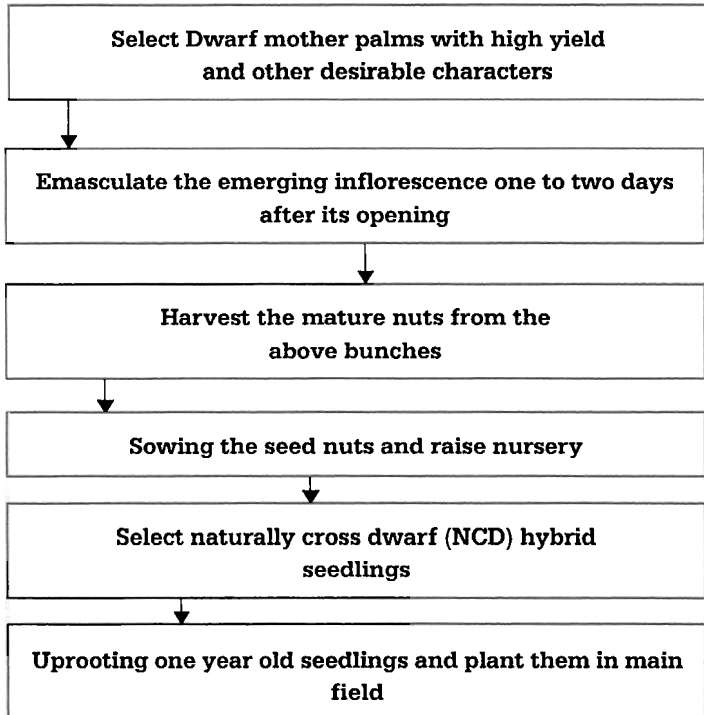


Fig. 3. Coconut inflorescence

distinguishing characteristics and farmers usually identify NCD hybrids based on the colour of petiole and collar girth. WCT palms are of different types based on the colour of petioles and colour of nuts, which ranges from green, yellow, orange or red. Colour of petiole in NCD hybrids produced by WCT palms of different colours are given in Table 2. When Chowghat



Fig. 4. Emasculated inflorescence