

# COCONUT NURSERY MANAGEMENT



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## **Introduction:**

Coconut (*Cocos nucifera* L.) is one of the most important and useful palms in the world. Though coconut provides livelihood for more than ten million farm families in the country, productivity of coconut plantations are found to be low. Prevalence of old and senile unproductive palms, poor genetic base of the existing palms under cultivation are some of the important reasons for low productivity. It is estimated that about 6.5 million coconut seedlings are produced in the country against the requirement of more than 10 million seedlings. The performance of the coconut palm can be judged only after 10-15 years of planting. The long life span and large capital outlay involved in establishing a coconut plantation, necessitates the selection of good quality seed nuts and seedlings, as a first step for the successful cultivation of the crop. If poor quality planting materials are used for planting, the new plantation can prove to be uneconomic, causing considerable loss of time and money to the grower. Therefore, selection of good quality seed nuts and seedlings is of great importance in the establishment of coconut plantations. Further, as coconut is cross pollinated, the palms do not breed true making the selection of seed nuts and seedlings more difficult and at the same time, important. It is possible to improve the quality of the planting materials through a series of selections at the various stages of seed and seedling production.

The various aspects of nursery techniques and selection procedures are discussed in the following pages.

## **Coconut Varieties**

Coconut palms are broadly classified into two groups viz., Talls and Dwarfs. West Coast Tall (WCT) and Chowghat Orange Dwarf (COD) are the most commonly grown tall and dwarf varieties in India.



**Tall Mother palm**

Traditionally tall varieties are commercially cultivated and they are usually known by the place where they are cultivated. They grow to a height of 15-18 metres and their economic life span extends up to 60 to 75 years. They can be usually detected by the presence of bole at the base of the palm. They come to flowering at six to seven years after planting and produce medium to large sized nuts with good quality of copra and oil content (about 67%). Some of the well known tall varieties are West Coast Tall, Chandra Kalpa, Kera Chandra, Kalpa Pratibha, Kalpa Dhenu, Kalpa Mitra, Pratap etc.

Dwarf varieties grow up to a height of five to seven metres and their economic life span extends up to 40 to 50 years. They are traditionally grown for ornamental and tender nut purpose. They are also extensively used in hybrid seed production.

Three colour forms of dwarf are known to exist viz. Green, Orange and Yellow. As a result, the dwarfs are usually known by the colour of the nut and the place where they are originally cultivated. Some of the well-known dwarf varieties are Chowghat Orange Dwarf, Chowghat Green Dwarf, Gangabondam Green Dwarf, Kalparaksha, Malayan Yellow Dwarf and Malayan Orange Dwarf.

Dwarf varieties are usually identified by the absence of bole at the base of the palm, even when surface planted. They have narrow stem, marked by short internodes and prominent leaf scars. They come to flowering three to four years



**Dwarf Mother palm**

after planting. They produce small sized nuts and copra with about 64% oil content.

Hybrids are produced by crosses between tall and dwarf. When the dwarf is used as the female and the tall as male, they are called D x T hybrid and the reciprocal is known as T x D hybrid. They show hybrid vigour for growth and yield. The coconut varieties and hybrids recommended and released by various agencies, for different coconut growing states are given below.

### Released varieties of Coconut

Name	Agency	Area for which r recommended	Nut yield	Copra (g/nut)	Oil content (%)
<b>Varieties</b>					
Chandrakalpa	CPCRI, Kasaragod	Kerala, Karnataka, TN	97	195	70
Kerachandra	CPCRI, Kasaragod	AP, Maharashtra,	110	198	66
Chowghat Orange Dwarf	CPCRI, Kasaragod	All coconut growing regions	Tender nut variety		
Kalpa Pratibha	CPCRI, Kasaragod	West Coast region and peninsular India	91	256	67
Kalpa Dhenu	CPCRI, Kasaragod	West Coast region and Andaman and Nicobar Islands	86	242	65.5
Kalpa Mitra	CPCRI, Kasaragod	West Coast region and West Bengal	80	241	66.5
Kalparaksha	CPCRI, Kasaragod	West Coast region and root (wilt) disease tracts of Kerala	65	215	65.5
Pratap	KKV, Dapoli	Konkan region	150	152	59

DM-3	TNAU	Tamil Nadu	77	191	66
R 1	TNAU	Tamil Nadu	126	131	64
Kamrupa	AAU	Assam	101	162	64
Kera Sagara	KAU	Kerala	99	203	67.8
<b>Hybrids</b>					
Chandra Sankara	CPCRI, Kasaragod	Kerala, Karnataka, Tamil Nadu	110	208	68
Kera Sankara	CPCRI, Kasaragod	Kerala, Karnataka, Maharashtra, AP	106	198	68
Chandra Laksha	CPCRI, Kasaragod	Kerala, Karnataka	109	195	69
Laksha Ganga	KAU	Kerala, Tamil Nadu	108	195	70
Kera Ganga	KAU	Kerala	100	201	69
Kera Sree	KAU	Kerala	112	216	66
Kera Sowbhagya	KAU	Kerala	130	195	65
Ananada Ganga	KAU	Kerala	95	216	68
Godavari Ganga	APAU	AP	140	150	68
VHC-1 Hybrid	TNAU	Tamil Nadu	98	135	70
VHC-2 Hybrid	TNAU	Tamil Nadu	107	152	69
VHC-3 Hybrid	TNAU	Tamil Nadu	156	161	64.5

### **Selection of Seed Centres and Seed Gardens**

In every country with a fairly long history of coconut cultivation, certain centres are well known for good quality seed nuts and seedlings. Seedlings, produced from such centres, are always in great demand by discerning farmers. Within the selected seed centres themselves, gardens consisting of a high proportion of high yielding palms are occasionally found. When seed nuts are selected from such high yielding seed gardens, there is a greater chance of female flowers being pollinated by pollen from nearby high yielding palms. Seedlings produced from

such high yielding parental palms, will usually be superior for high yield as compared to others. In Kerala, coconut growing tracts such as *Kuttiadi* in Kozhikode district and *Chavakkad* in Thrissur district are utilized for collection of seed nuts for the past several decades.



**Crown of a mother palm**

### **Selection of mother palms**

For production of quality planting materials, it is essential to have good quality mother palms of the desired varieties. In the absence of commercially viable vegetative propagation techniques, only seed propagation is possible. Therefore, mother palm selection is a key factor in planting material production of coconut. Trees growing near cattle sheds, wells and other favoured conditions should be avoided, as their true genetic potential may be masked because of favourable environment.

The important features of superior mother palms are:

- a) Regular bearer,
- b) straight stout trunk with even growth and closely spaced leaf scars,
- c) spherical or semi-spherical crown with short fronds,
- d) short and stout inflorescence stalk with bunches, preferably resting on the leaf petioles of the lower whorl,
- e) more than 30 leaves and 12 inflorescences carried evenly on the crown,
- f) inflorescence with 25 or more female flowers,
- g) consistent high nut yield (about 70 to 80 nuts/annum under rainfed conditions or 100-120 nuts under irrigated conditions),
- g) more than 150g copra per nut and
- h) absence of disease and pest incidence.

Mother palms should be aged 22 years or more since it will be necessary to observe their yield for at least 10 years after stabilization of yield. From young seed gardens, seed nuts can be collected irrespective of the age of the mother

palms, since only high yielding palms with known genetic potential are maintained in the seed gardens.

### **Strategy for root (wilt) diseased tracts**

In the root (wilt) disease prevalent tracts, in the midst of heavily diseased palms, high yielding, disease free West Coast Tall (WCT), Chowghat Green Dwarf (CGD) and Chowghat Orange Dwarf (COD) palms are found. Such palms can be selected as mother palms and open pollinated nuts of those palms can be used for large scale planting material production. The Healthy mother palm in the midst of heavily root (wilt) diseased palms. Seedlings produced from such palms are expected to be high yielding and disease-free, as they are produced from high yielding and disease-free mother palms. The selection criteria to be adopted for the mother palms are as follows.



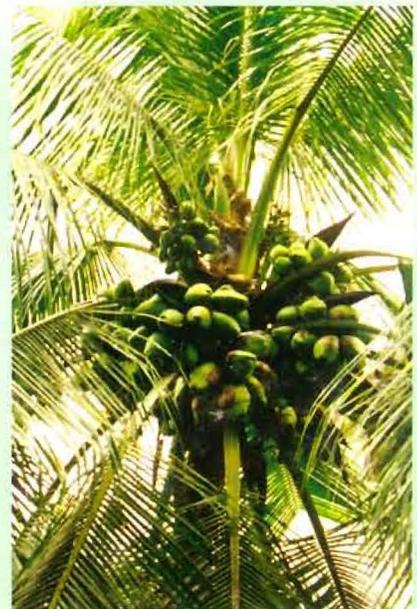
**Healthy mother palm in the midst of heavily root (wilt) diseased palms**

### **West Coast Tall (WCT) palms**

- i) Mother palms should yield more than 80 nuts or more per palm per year.
- ii) They should be regular bearers, absolutely free from pest and diseases
- iii) They should be more than 35 years of age and surrounded by palms of which at least 80% are affected by root (wilt) disease.

### **Chowghat Green Dwarf (CGD) and Chowghat Orange Dwarf (COD) palms**

CGD is becoming increasingly popular in the root (wilt) prevalent tracts because of its higher level of resistance to root (wilt) disease. COD is



**A high yielding CGD palm**

also found to be high yielding in the root (wilt) prevalent tracts. COD variety is known to give satisfactory yield even when the palms are diseased indicating some degree of tolerance to root (wilt) disease. This variety has been released by CPCRI for tender nut purpose. The mother palms of CGD and COD should meet the following criteria.

- i) Mother palms should be at least 15 years of age.
- ii) Mother palms should have typical characteristics of CGD/COD with regard to palm traits, crown, leaf and nuts.
- iii) Palms should yield 80 nuts or more per year and be free from pest and diseases.
- iv) Such palms should be surrounded by palms of which at least 80% are affected by root (wilt) disease.



**A high yielding COD palm**

### **Selection of seed nuts**

Seed nuts can be collected from selected mother palms commencing preferably from September to May.

**Maturity of seed nut:** The mature nuts should be harvested when at least one nut in the oldest bunch starts becoming dry. In Talls, it takes 11-12 months to become a mature seed nut whereas in dwarfs, nuts will mature in 10-11 months after emergence of the inflorescence. In general, dwarf palms are to be harvested once in four weeks and tall palms are to be harvested once in six to eight weeks. They produce a resonant and ringing sound when hit with the harvesting knife indicating that the husk is dry. Immature nuts will produce a dull sound. Rope harvest of seed nuts is recommended from the trees that are very tall and located in places where the underneath surface is hard.

**Storage of seed nuts:** Harvested seed nuts are stored in shade, to prevent drying of nut water, till their husks become completely dry. Seed nuts of the tall variety can be stored up to two months after harvest. The seed nuts of dwarfs should be

sown within 15 days of harvest. Nuts without the splashing sound indicate that the nut water has become dry and hence they should not be used for sowing.

### **Selection of site**

**Soil:** Coconut is adapted to a wide range of soil types from coarse sand to deep soils. However, well-drained friable sandy, sandy loam/loam soils are best suited for coconut nursery due to the relative ease in removing the seedlings from the nursery. In laterite soils, sand has to be applied to the nursery beds. Heavy/clayey soils and waterlogged soils are to be avoided. The ideal soil pH ranges from 5.5 to 7.0 and the seedlings are tolerant to a pH range from 4.5 to 8.5. Under irrigation, coconut seedlings tolerate saline and alkaline soils.

**Climate:** Coconut palms are cultivated in humid regions lying between latitude 27°N and 27°S. They are well adapted to full sunlight. However, the nursery area is to be preferably shaded to get good quality seedlings without sun scorch. The optimum temperature range for better growth of seedlings is from 21°C to 35°C. Though coconut can withstand temperatures beyond this range, the growth, development and yield of palms will be affected. Coconut palms are well adapted

to areas receiving an annual rainfall ranging from 600mm to 4000mm. Seedlings can be produced at an altitude ranging from sea level to an elevation 800m above mean sea level.



**Germinating seed nuts in nursery bed**

**Water Source:** A perennial source of water is required for maintenance of coconut palms and irrigation is essential for obtaining good coconut yield. Further, the nursery has to be irrigated regularly for production of planting materials. Sprinkler/micro jet sprinkler/hose irrigation systems are well suited for irrigating coconut nurseries.

**Nursery Structures:** Nursery can be raised in the interspaces of the coconut plantation. The nursery area is to be provided with shade using 50-75% shade net if the nursery area is in an open space. About 120m<sup>2</sup> area would be

required to sow 1000 nuts in flat or raised beds whereas larger area of 200m<sup>2</sup> would be required to maintain 1000 poly bag coconut seedlings.

**Skilled manpower:** Skilled climbers are required for harvesting mature seed nuts from the mother palms. Further, a trained nursery assistant is required for maintenance of the nursery and for identifying and lifting good quality seedlings from the nursery.

### **Seedling Production:**

**Time of sowing:** The time of sowing seed nuts in the nursery will vary depending on the location (agro-climatic zone) and the monsoon. Sowing of seed nuts coincident with commencement of the rainy season will reduce the frequency of irrigation required for getting good germination. The most appropriate time for



**Coconut seedlings in nursery bed**

sowing seed nuts in the West Coast region is May-June. However, seed nuts can be sown all round the year under favourable climatic conditions and good irrigation facilities.

**Nursery bed preparation:** Seedbeds should be prepared in an area having loose and well-drained soil. Raised beds of 10-20 cm height are made to provide good drainage. Seedbeds are generally of one metre

width and convenient length with 75cm space between beds.

The seedbeds should be drenched with Chlorpyrifos @ 0.05% before sowing of seed nuts, in areas having termite problem. To prevent bud rot in seedlings, the nursery can be drenched with 1% Bordeaux mixture, in bud rot endemic areas.

**Sowing of nuts:** The seed nuts are generally sown in the nursery beds with a spacing of 40cm between rows and 30cm between nuts. Generally four or five rows of seed nuts can be sown in one bed. The nuts may be planted either horizontally with the widest of the segments at the top or vertically with stalk-end up. The nuts are covered with soil, such that the top portion of husk alone is visible as it helps to prevent possible infection of the collar region of the emerging seedlings. Only

seed nuts with nut water should be selected for sowing. Some seed nuts, even though they are without nut water, may germinate. Such seed nuts may be soaked in water for 24 to 36 hours prior to sowing.

**Irrigation:** The seed beds should be irrigated regularly to ensure that the soil is moist. After sowing, the seed beds should be irrigated thoroughly to saturation levels and repeated as frequently as necessary. During summer months, the beds may be irrigated on alternate days. Irrigation can be provided through hose/micro sprinklers.

**Mulching:** The seed beds can be covered with suitable mulch (coconut leaves, straw or green leaves etc.) to conserve moisture and check the weed growth.

**Weeding:** The nursery should be kept free of weeds to allow good growth of the seedlings.

**Management:** A record should be maintained indicating the name of variety sown, date of sowing, number of nuts sown, seedbed number and date of harvest of seed nuts. A signboard should be placed preferably in front of each bed indicating the name of variety sown along with the date of sowing.

Seed nuts of tall varieties begin germination within 60-130 days after sowing and seed nuts of dwarf varieties usually germinate 30-95 days after sowing. Generally, germination is recorded till the fifth month of sowing and a good seed lot will give 80 to 90% germination. Seed nuts that do not germinate within 5 months after sowing as well as those with dead sprouts can be removed from the nursery. Such rejected seed nuts can be used for production of copra.

Chemical fertilizers need not be applied to the seedlings in the nursery since the seedlings are usually nourished by the endosperm. Moreover, application of chemical fertilizers can mask the true genetic potential of seedlings, making the selection of genetically superior seedlings difficult.

**Poly bag seedling production:** Poly bag nursery can be adopted for producing more vigorous seedlings with better root system. Compared to the nursery in the field, watering, weeding and roguing operations for the elimination of unwanted seedlings are easier in poly bag nursery. The seedlings can be raised in black polythene bags (500-gauge thickness) of 60 cm x 45 cm size for bigger nuts and

45 cm x 45 cm for smaller nuts. The bottom of the bags is to be provided with 8-10 holes for draining the excess water. To fill 100 bags, around 2-2.5m<sup>3</sup> of potting mixture will be required. The commonly recommended potting media are top soil mixed with sand in 3:1 ratio or fertile top soil, sand and well rotten and powdered cattle manure/vermicompost in the ratio of 3:1:1. Red earth, well rotten and powdered cattle manure/vermicompost and sand in 1:1:1 ratio can also be used. Fertilizers can be applied in the poly bags @ 20g ammonium sulphate and 25g muriate of potash per bag after two months of germination and 45g of ammonium sulphate and 45g of muriate of potash per bag after four months of germination. Seedlings are to be watered after application of fertilizers.



**Poly bag coconut nursery**

In order to produce poly bag seedlings, the seed nuts are initially sown very closely and allowed to germinate in a pre nursery bed. The germinated nuts are picked out from nursery once weeks, until 80% of nuts have germinated or up to 5 months from sowing, whichever is earlier. The germinated nuts are placed in half filled poly bags with the sprout positioned upwards in the centre of the bag and sufficient potting mixture is added to fill the bags up to two-third portion and the sides slightly pressed to keep the nut firm.



**Bud rot affected seedling**

### **Important diseases/pests and their management**

There are no serious pest and diseases in coconut nurseries. However, bud rot affected seedlings are to be avoided for planting.

**Bud rot:** The fungus, *Phytophthora palmivora*, causes this disease. The symptoms are yellowing and withering of the spindle leaf followed by drying and death of the seedlings. The spindle of the

affected seedlings will easily come out with a gentle pull and rotting can be seen in the lower end of the detached leaf. The affected portion emits a foul smell. Though it is not a major problem in coconut nurseries, the affected seedlings are to be removed and the surrounding seedlings treated with 1% Bordeaux mixture.

**Scale insect (*Aspidiotus destructor*):** The characteristic symptom is yellowing of leaves and presence of scale insect underneath the leaves. Though the insects do not pose serious threat to the seedlings, this can be controlled by drenching the nursery with Dimethoate @ 0.05% to ensure good quality and healthy foliage of seedlings.



**Termite affected seedling**

**Termite:** Drying of the sprouts and leaves are the symptoms of termite damage in the nursery. Drenching the nursery with Chlorpyrifos @ 0.05% will control the termites.

**White grub (*Leucopholis coneophora*):** This occurs mainly in sandy soils. The characteristic symptom is yellowing of leaves followed by drying of leaves and death of the seedlings due to severe root damage. This can be controlled by application of Phorate 10 G @ 15g/seedling.



**Good quality seedling**

### **Selection of seedlings**

Selection of seedlings is an important step for ensuring high yield. Only seedlings with good quality should be selected through rigorous selection. One year old good seedlings will have a minimum of six leaves with a short petiole, dark green and broad leaves and large number of roots. They will have a collar girth of 10cm. Seedlings which show early splitting of leaves may be preferred for planting.

The colour of the petiole and vigour of the

seedlings can be used as a selection criterion for dwarfs and hybrids. The Dwarfs should exhibit the petiole colour of the mother palm. Hybrids usually exhibit hybrid vigour at the seedling stage itself and the petiole colour of hybrid seedlings may range from green/brown/intermediate shades of the parents. Generally, 65% of good quality seedlings can be expected from a well managed nursery.

It is advisable to raise a few seedlings of the parental varieties, wherever possible, side by side with progeny seedlings to compare during selection of true to type dwarf and hybrid seedlings. Seedlings of dwarf varieties can be easily identified by their early germination, short height, short and sturdy leaves with short and narrow leaflets. Different dwarf varieties are easily recognized by their colour of petiole and leaves. Seedlings of tall varieties usually grow tall with long leaves and long and broad leaflets.

Since early germination is one of the criteria for the selection of seedlings, the storing and sowing of seed nuts should be in lots according to the harvest and should not be bulked.

### **Removal and transportation of seedlings**

Seedlings should be removed from the nursery by lifting with a spade. Seedlings should never be lifted from the soil by pulling the leaves or petiole. The seedlings should be planted as early as possible after removal from the nursery. The seedlings can be kept for about four weeks under careful storage after removal from the nursery. In such cases, the seedlings should be kept under shade and also watered.

Seedlings can be compactly packed and transported. For very long distance transportation, special care should be taken to pack the seedlings in moss/coir pith/other moisture retaining material. Poly bag seedlings can be transported as such and planted directly in the field, after cutting and removal of the base of the poly bag to facilitate growth of roots.



For further details on informations covered in this bulletin and also to obtain advice on the problems faced by the farmers in coconut nursery management, they are welcome to visit CPCRI, Kasaragod or write to :

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