ELITE COCONUT SEED GARDEN AND COMMERCIAL PRODUCTION OF HYBRIDS

CPCRI

CENTRAL PLANTATION CROPS RESEARCH INSTITUTE

(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)

KASARAGOD 671 124, KERALA, INDIA

ICAR

Technical Bulletin 22

Establishment of Elite Coconut Seed garden and Commercial Production of Hybrids

CPCRI

CENTRAL PLANTATION CROPS RESEARCH INSTITUTE

(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)

KASARAGOD 671 124, KERALA, INDIA

Published by:

M.K. Nair
Director
Central Plantation Crops Research Institute,
Kasaragod 671 124, Kerala, India.

Text by:

R.V Pillai

Edited by:

M.K. Nair
Rohini Iyer

Photographs by:

M. Narayanan

Cover design by:

M.B. Sukumaran

September, 1990.

Printed at:

Sharada Press, Mangalore.

ESTABLISHMENT OF ELITE COCONUT SEED GARDEN AND COMMERCIAL PRODUCTION OF HYBRIDS

Coconut palm is one of the major sources of edible oil and it yields more oil per unit area than any other oilseed crop excepting oil palm. Generally, tall palms are grown commercially. Eventhough some known tall cultivars are available for commercial cultivation in our country, there is always a great demand for superior planting materials produced at the Research Institutes and Agricultural Universities. Restricted availability of quality planting materials in coconut has largely contributed to the production constraints in developmental programmes of this crop. The major coconut producing states in our country are Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, Orissa, Maharashtra, Andaman and Nicobar Islands, Lakshadweep, Pondicherry, Goa, Daman & Diu and West Bengal. On a very limited scale coconut is grown in other States like Assam, Tripura, Gujarat, Manipur and very recently, the States of Bihar and Madhya Pradesh have taken up coconut cultivation (Table 1). The most common cultivar available is the local Tall of the respective region. A few Dwarf types are also grown for tender nut as well as for ornamental purposes.

Requirement of planting materials

The strategy for producing planting materials in coconut is based on (a) the area expansion in non-traditional areas, (b) new plantings in traditional areas other than Kerala, (c) regular under-planting in traditional areas, and (d) rehabilitation of root (wilt) affected areas, (under-planting and replanting) in Kerala. It has been estimated that an area of about 4 lakh ha is suitable for new planting in the country. To meet the demand of coconut by 2000 AD it is necessary to take new plantings at the rate of

Table 1. Area, Production and potential area of Coconut in different States* (1987–1988)

State&Union Territory	Area in '000 ha	Production in Million nuts	Potential area '000 ha
Andaman & Nicobar	22.8	80.0	10.0
Andhra Pradesh	48.9	480.0	50,0
Assam	9.1	79.9	100.0
Bihar	—	—	25.0
East Uttar Pradesh	—	—	2.0
Gujarat	—	—	5.0
Goa, Daman & Diu	23.2	106.3	1.0
Karnataka	212.2	1091.9	78.0
Kerala	864.6	3669.5	5.0
Lakshadweep	2.8	24.8	—
Madhya Pradesh	—	—	10.0
Maharashtra	7.8	88.9	20.0
Orissa	27.1	113.7	100.0
Pondicherry	1.7	22.7	1.0
Tamil Nadu	183.8	1552.8	75.0
Tripura	5.6	3.3	1.0
West Bengal	19.1	248.5	5.0

Source: Coconut Development Board, Cochin

30,000 ha annually as against the present rate of 13,500 ha. In order to meet this target, 6 million seedlings are required annually. In Kerala 0.41 million ha of coconut is under the grip of the slow debilitating root (wilt) disease. Rehabilitation, management and regular under-planting are the possible means to increase productivity in such areas. Besides, there is need for regular under-planting and replanting in the other areas of Kerala also and at the rate of 5% replacement, the requirement of Kerala alone would be 6 million seedlings annually. The demand for regular planting and under-planting in other states at a modest rate of 2% works out to 3 million seedlings annually. Hence the annual requirement for the country will be around 15 million seedlings (Proc. of Group Meeting on Strategy for Production of Planting Materials in Coconut, Cashew and Pepper, 1988, CPCRI, Kasaragod).

The present production of planting material in the country is estimated to be 10 million seedlings every year. Out of this, about 6 million seedlings are produced by various State Government nurseries from seednuts of mother palms selected from farmers' fields. The remaining 4 million seedlings are produced by private nurseries and coconut growers themselves. Out of this, about 0.3 million are T×D seedlings.

In order to bridge this gap in production and requirement, it is necessary to establish new seed gardens in Andhra Pradesh, Assam, Bihar, Madhya Pradesh, Maharashtra, Goa, Gujarat, Pondicherry, Tripura, West Bengal, Lakshadweep and Andamans. For these seed gardens, the parental materials have been identified (Table 2) and the approximate area to be brought under Elite seed garden is given in Table 3.

The first coconut hybrid was produced by crossing West Coast Tall with Chowghat Green Dwarf which is popularly known as T×D. The crossing was done in 1932 and the field planting of the first hybrid was done in 1934. Subsequent

Table 2. Parents suggested for different states for establishing Elite Seed Gardens*

State&Union Territory (1)	WCT (2)	LO (3)	AO (4)	ECT (5)	TT (6)	BEN (7)	COD (8)	MYD (9)	GB (10)	GD (11)
Andamans	–	✓	✓	✓	–	–	✓	✓	–	–
Andhra Pradesh	–	✓	✓	✓	–	–	✓	✓	✓	–
Assam	–	✓	✓	–	–	–	✓	✓	–	–
Bihar & Madhya Pradesh	✓	✓	✓	✓	–	–	✓	✓	✓	–
Gujarat	✓	✓	–	–	–	–	✓	✓	–	✓
Karnataka	✓	✓	–	–	✓	–	✓	✓	–	–
Kerala	✓	✓	✓	–	–	–	✓	✓	✓	–
Lakshadweep	✓	✓	–	–	–	–	✓	✓	–	–
Maharashtra & Goa	✓	✓	–	–	–	✓	✓	✓	✓	–
Orissa	✓	✓	✓	✓	–	–	✓	✓	✓	–
Pondicherry	–	✓	✓	✓	–	–	✓	✓	✓	–
Tamil Nadu	✓	✓	✓	✓	–	–	✓	✓	✓	–
Tripura	✓	✓	✓	–	–	–	✓	✓	✓	–
West Bengal	–	✓	✓	✓	–	–	✓	✓	✓	–

WCT = West Coast Tall.
ECT = East Coast Tall.
BEN = Benaulim
COD = Chowghat Orange Dwarf
LO = Laccadive Ordinary
AO = Andaman Ordinary
TT = Tiptur Tall
GB = Gangabondam
GD = Goodajali Dwarf

(Source: Proc. of Group Meeting on Strategy for Production of Planting materials in Coconut, Cashew and Pepper, 1988, CPCRI, Kasaragod).

Table 3. Projected Seed garden requirements of various states with suggested parents

State	Name of dwarf parent recommended	Area to be brought under (ha)	Name of tall parent recommended	Area to be brought under (ha)
(1)	(2)	(3)	(4)	(5)
Andamans	COD	15	ECT	10
	MYD	15	AO	25
Andhra Pradesh	COD	25	TT	20
	MYD	25	ECT	25
	GB	25	AO	25
Assam	COD	10	AO	10
	MYD	10	LO	10
Bihar	COD	30	WCT	10
	MYD	20	ECT	10
	GB	10	LO	10
Gujarat	COD	15	WCT	25
	MYD	10	LO	25
	GD	25		
Goa	COD	10	LO	10
	MYD	10		
	GB	10		
Karnataka	COD	140	WCT	60
	MYD	35	TT	60
			LO	60
Kerala	COD	880	WCT	290
	MYD	75	LO	200
	GB	100	AO	10
Maharashtra	COD	20	WCT	20
	MYD	20	LO	10
	GB	10	BEN	20
Manipur	COD	5	ECT	5
	MYD	5	WCT	5
	GB	5	AO	5
Orissa	COD	120	ECT	30
	MYD	20	LO	25
	GB	20	AO	25
Tamil Nadu	COD	80	ECT	20
	MYD	50	WCT	20
	GB	25	LO	30
Tripura	COD	5	WCT	5
	MYD	5	LO	5
	GB	5	AO	5
West Bengal	COD	30	LO	10
	MYD	20	AO	10
	GB	10	ECT	10

researches have shown that the reciprocal combination D×T (Dwarf female × Tall male) has higher production potential. Recently released hybrids, viz., Lakshaganga (LO × GB), and Chandra Laksha (LO × COD) are found to be more tolerant to drought conditions when compared to the WCT × COD (T×D) and Chandra Sankara (COD × WCT) hybrids.

In earlier years, these hybrids were produced by hand pollination. Since every female flower has to be pollinated by hand, it is a cumbersome and time-consuming method, especially when large scale production of hybrids is needed. At the Central Plantation Crops Research Institute, Kasaragod an easy and efficient technique for the production of coconut hybrids on commercial scale has been developed and standardized. (See page 9.. for details).

Varieties/cultivars/hybrids identified for different states

Among the tall cultivars, West Coast Tall, Chandra Kalpa (Laccadive Ordinary), Andaman Ordinary, and East Coast Tall have been recommended to different states as parents for D×T and T×D production and also as Tall cultivars for cultivation (Table 2). Tiptur Tall and Benaulim are recommended for Karnataka, Goa and Maharashtra States since these cultivars are very popular in these states. Among the dwarfs, Chowghat Orange Dwarf (COD) and Malayan Yellow Dwarf (MYD) are recommended for use in most of the states, as female parents in D×T combinations as well as for raising them as pollen parents in T×D hybrid seed production. Gangabondam has been recommended as male parent for production of hybrids in many states.

Keeping in view the requirements of the States, the extent of area required under seed garden in the country to produce elite planting materials in hybrid and Tall cultivars for different states have been worked out. This is presented in Table 3.

In order to establish these seed gardens in the country, selected seedlings of known mother palms from the established seed gardens should be used as parental materials. Some of the established seed gardens as well as centres suggested for collection of seednuts for parental material are listed in Table 4. Planting materials for seed gardens can be procured from these seed gardens.

Table 4. Parental sources available in the country

Name of State and Farm	Parents available from which material can be collected
Andhra Pradesh	
The East Coast Hybrid Centre, Ittikalagunta, Kunchanapalli,	GB
Tadepalligudam, E.G. Dist.	ECT
Karnataka	
Dharmaveera Horticultural Farm,	COD
Bellara, Tumkur Dist.	WCT
CPCRI, Kidu Farm, Nettana, D.K. Dist.	WCT, COD & GB
NRCC Seed Farm, Shantigodu, Puttur, D.K. Dist.	COD & AO
Kerala	
Central State Farm, Aralam, Kannur Dist.	COD, MYD, MOD, LO and WCT.
Seed Garden Complex, Munderi Farm,	COD, MYD, MOD,
Munderi, (Via) Nilambur	MGD, LO & WCT.
Orissa	
Bishwanahakani Seed Garden, Cuttack	COD, MYD & MGD
Tamil Nadu	
Navlok Seed Garden, Ranipet, NA Dist.	COD & ECT
Ettankulam Seed Garden, Tirunelveli Dist., Tirunelveli	COD, MYD & ECT

Age of the palm in no way contributes to the genetic potential possessed by the mother palm. However, it is desirable to select palms for collection of seednuts only after they attain stability in yield. Palms producing barren nuts (either empty or without a fully developed kernel) have to be discarded, even if they are heavy yielders. Trees growing under favourable situations-close to houses, cattle sheds, compost pits, tank and bunds, may be avoided since the performance of such trees cannot be considered being solely due to the inherent genetic potential.

Under the conditions prevailing in Kerala the ideal period for collection of seed nut is summer season from December to May. This may vary for the east coast situation depending on the rainfree period. Nuts produced during this period are comparatively bigger in size, have higher copra content and seedling recovery is also high. At the commencement of the monsoon the nuts stored can be sown in the nursery.

Preservation of seed coconuts

Preservation of seed coconut helps in proper drying of the husk, which in turn helps to retain the nut water. When the nuts are not stored properly, the water inside may be lost and such dried nuts do not germinate. Sand storage of nuts practised in most of the nurseries involves lot of labour and money. It has been proved that when the seednuts are stored in cool dry places in thatched sheds or under the shade of trees, practice of storing the nuts in the soil can be avoided. It may be necessary at times to sprinkle some water over the nuts so that the nut water inside does not dry up. It is preferable to store the nuts in separate lots based on their date of collection.

Raising of seedlings

The nursery site should preferably be located in a sandy area. When the soil is not sandy it may be necessary to remove the top soil to a depth of about 30 cm and to fill up the area with river sand. The beds may be of any convenient length. However, between beds a distance of 75 cm may be provided. Wherever there is drainage problem, it is necessary to raise the bed to 25 cm from ground level. If termite infection is suspected in the nursery area, the beds may be treated with BHC. A spacing of 30 cm between nuts and 40 cm between rows in a bed is recommended. The seed nuts may be placed in linear trenches of 15 cm wide and 15 cm deep in the prepared bed. Horizontal method of planting is desirable. However, when the seedlings are to be transported to a long distance it is preferable to plant the seednuts in the vertical method. The depth of planting should be so adjusted that the husk is just visible at the surface of the soil. At the time of planting discard those nuts which do not contain water or are otherwise damaged during storage.

Planting in the nursery may be commenced at the onset of monsoon. Before planting, ensure that irrigation facility is available for the nursery area. Each seednut sown in the nursery requires attention for proper germination and good growth. The nursery has to be protected from cattle, pests and diseases. Regular weeding and partial shading may have to be done for the nursery if it is raised in open areas. In summer months watering may be done once in 4 days and at any rate the soil around the nuts should have sufficient moisture to promote germination and good seedling growth. When the attack of termite is noticed the soil in the bed should be treated with 5% BHC/Aldrin immediately. The nursery beds should be kept completely free from weed growth.

Selection of seedlings

Selection of seedlings is of utmost importance. The parental palms which are being established in seed gardens should be capable of giving higher yield. Since coconut is highly heterozygous, all seedlings obtained from a single mother palm may not look alike. Hence, stringent selection criteria are to be adopted for selecting

Fig. 3. Female flowers at the base and male flowers towards the top of spikes.

Fig. 4. Emasculated inflorescence.

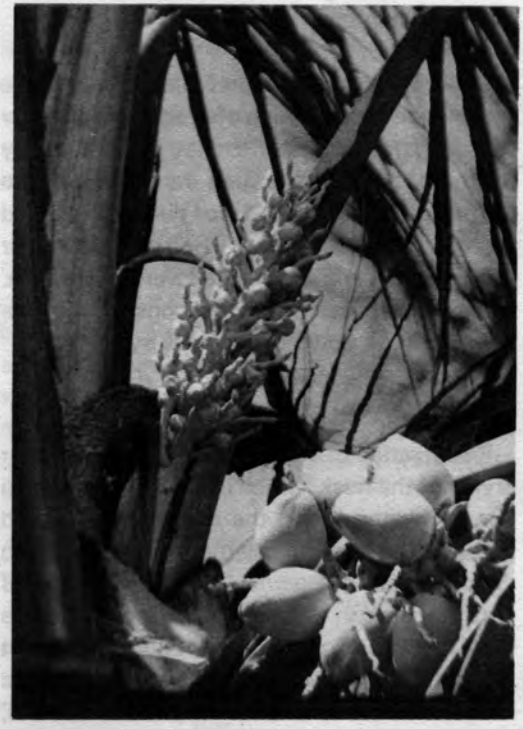


Fig. 5. Emasculation—modified method.

Fig. 7. Pollination with applicator.

Fig. 8. Pollination with modified applicator.

Fig. 9. High setting in assisted pollination.

superior seedlings for the seed garden like early germination, early splitting of the leaf into leaflets, more number of leaves, and greater girth at collar. A good one year-old seedling should have more than 6 leaves, 10-12 cm collar girth, and be in the 7th or 8th leaf stage. Splitting should start at least in the 8th leaf.

Systems of planting

For establishing seed gardens for hybrid seed production, the earlier method adopted was to plant Talls and Dwarfs in alternate rows so that by simple emasculation of the female parent both T×D and D×T hybrids could be produced either through natural crossing when pollinating agents are available, or through assisted pollination. The seed gardens established at Konark (Orissa), Navalok (Tamil Nadu), Dharmaveera and Kidu (Karnataka), have adopted this method. In this method the double hedge system (paired rows) of planting was adopted where, within rows 5 m and between rows 6 m spacing was used. From the second to third row the distance was 9 m and the planting pits are taken in a staggered fashion so that plants in rows 1, 3, 5 etc. come in one line when seen across, while those in 2, 4, 6 etc. come in one line (Fig. 1).

However, this system has certain limitations. In the first instance it is only possible to produce two types of hybrids under natural pollination. In case if we have to produce another hybrid combination all the palms in the second set have to be emasculated which is a laborious process. Thirdly, under natural pollination the recovery of hybrids is found to be low as compared to the assisted pollination method.

A modified lay-out for the seed garden is given below. In this system, compact block of the cultivar is planted. In order to avoid the mixing up of pollen from one cultivar to the other few border rows are left all around. Another difference in this model is that, the tall parent is planted about two to three Km away from the dwarf population. Since most of the dwarfs now used as female parents in the D×T production are highly self-pollinated, contamination by the other cultivars is very minimal. In this layout, the desired D×T, T×D or T×T combination can be produced by adopting the assisted pollination method. Periodic inspection of the tall and dwarf cultivars planted in the seed garden may be undertaken and the off-type and poor yielders rogued out to ensure varietal purity and better progeny performance. The seedlings planted in

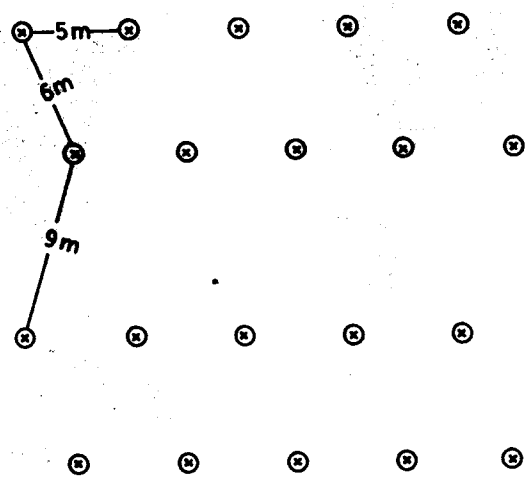
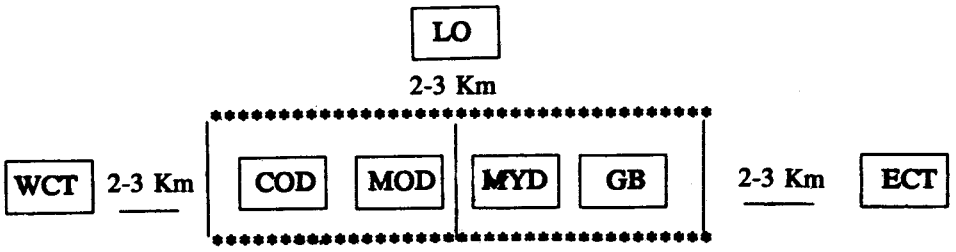


Fig. 1. Double hedge system of planting.



*Border rows

Fig. 2. Layout of seed garden blocks

the seed garden should be fertilized with the recommended doses of fertilizers and maintained properly so that they come to bearing within the shortest time possible. In dwarfs, under good management the plants come to flowering in 3 to 4 years and in talls, 5 to 6 years. Since the parentage of the progenies are known, and undesirable types removed then and there, the hybrids can be produced from these palms right from their initial flowering.

Operational strategy

It is advantageous to have the seed gardens scattered on different regions if suitable land is available so that the cost of transportation of the seed is minimized. Seeds from the sources indicated may be procured and seedlings of a given parent raised at the site of planting. If sufficient seeds are not available at a given time, it is better to phase out the planting of the seed garden so that quality materials alone are planted in the seed gardens. In the case of blocks of different dwarf cultivars planted in the same garden, three to four rows may be provided as border to minimize prevent contamination.

II. Commercial Production of Hybrids

Floral Biology: For effecient hybridization is essential to know the breeding behaviour of the crop. In coconut, a monoecious crop, both male and female flowers are present on the same inflorescence. On the same spikelet the male flowers are located at the distal end and the female flowers towards the base (Fig. 3). Few male flowers are also present among the female flowers. Eventhough the male and female flowers are present in the same inflorescence, in Talls they come to maturity at different periods. First the male flowers at the top attain maturity and gradually the lower ones. This takes about 17 to 24 days depending on the season. The female flowers become receptive (ready to receive pollen) only one or two days after all the male flowers are open and the female phase lasts 3 to 5 days. This helps to minimize the chances of self-pollination. In Dwarf cultivars, however, there is a chance for self-pollination as the female flowers come to receptivity before the male phase is completed. Sometimes the next inflorescence also opens, when the older inflorescence is still in the female phase, thereby increasing the chances for self-pollination. Therefore, while carrying out hybridization, one should take adequate care to avoid the possibilities of self-pollination.

Emasculation: The first step in hybridization is removal of male flowers from the inflorescence of the female parent to avoid self-pollination. This is called emasculation. A coconut inflorescence has hundreds of male flowers and few female flowers. All the male flowers are to be removed, well before the female flowers come to receptivity. To avoid any chance of contamination it is better to do the emasculation as soon as the inflorescence opens on the first day itself. This can be done either by:

1. Removing individual male flowers by hand (Fig. 4).

2. By cutting the spikelets (with knife or secateurs about 4 to 5 cm away from the uppermost female flower and removing the remaining male flowers by hand (Fig. 5).

The second method is safe, convenient and fast. However, care should be taken to remove by hand all the male flowers, including those located in between the female flowers. To ensure that proper emasculation is carried out, the bunch should be inspected atleast once before the first female flower comes to receptivity.

Pollen collection and processing: In coconut inflorescence, the male flowers on the top and middle spikelets produce more fertile pollen compared to those on the lower spikelets. Therefore, collection of pollen from male flowers of lower spikelets is to be avoided. Maturity of the male flowers is indicated by the appearance of a bluish green tinge at the tip of the anthers. Collection of the pollen from an inflorescence between 6 to 8 days after opening is recommended. The method for pollen collection is as follows:

1. Cut the portion of spikelets containing mature male flowers;
2. Separate the male flowers from spikelets;
3. Place the male flowers between folds of thick paper and gently crush them with the help of a rolling pin (crushing is done only for separating the perianth parts and should not damage/break the anthers);
4. Keep the crushed male flowers in oven at 39°C (± 1°C) for 24 hr.
5. Sieve to separate pollen from debris (use 0.2 mm mesh sieve).
6. Test germination on sugar, gelatin and agar medium (sucrose 800 mg; gelatin 200 mg, agar 200 mg in 10 ml water). Only pollen with atleast 50% germination should be used for pollination.
7. Collect pollen in glass vials and store in a desiccator over fused calcium chloride. Pollen so stored can be used for 10 to [illegible] days.
8. When longer duration of storage is required, seal the glass vials and store them in deep freezer (−20°C). This pollen can be used upto 3 months.
9. Dilute the pollen with neutral talc powder in 1:9 proportion before use. If pollen is available in large quantity the ratio can be 1:7 or 1:8. When the pollen stored in deep freezer is to be used, first allow it to thaw at room temperature before diluting.

A pollen drying equipment called "Fluid-Bed-Drier" is available, which processes pollen within 4 hr and thus can be used on the same day. The instrument is used for drying pollen by exposing the fresh male flowers to hot air. The air temperature and the speed can be regulated. At 40°C temperature the pollen can be dried in about 4 hr. This is especially useful in seed gardens where a large quantity of pollen is required every day. The pollen processing procedure is the same as detailed earlier except that at step 4 the crushed male flowers are fed to the "Fluid-Bed-Drier" instead of keeping in the oven.

Pollination: Unlike emasculation and pollen processing, the pollination technique to be used in a garden depends on the type of plantation. When the female parents are scattered in a garden and are interplanted with different types of tall cultivars, "controlled hand pollination" technique is to be used. This method involves bagging of emasculated bunches for the entire period of female phase and pollinating with desired pollen. The same procedure is also to be followed in the production of T×D hybrids. However, this method is not amenable for commercial production of hybrids as it is tedious and time-consuming.

The plantations of pure blocks of Dwarfs and Dwarfs interplanted with a single Tall cultivar are suitable for commercial production of coconut hybrids. The former is more suitable than latter. When the Talls and Dwarfs are interplanted, only a single combination of hybrid can be produced in that garden without bagging. In this case all the inflorescences in Dwarf palms are to be emasculated so that only the pollen from Tall is available in the garden. All the nuts collected from the Dwarfs after emasculation will be hybrid nuts. However, to increase the setting percentage, assisted pollination with the Tall pollen is advisable. In the plantations of pure blocks of Dwarfs more flexibility is possible. Depending on the need, by changing the pollen in the assisted pollination technique, different combinations of hybrids can be produced. However, assisted pollination is mandatory in the pure blocks of Dwarfs while it is optional in blocks interplanted with talls. As the procedure is simple, it is very easy to produce a large number of hybrids from this (pure blocks of Dwarfs) type of gardens.

For effective and speedy pollination, a simple device has been developed. It consists of a polythene squeeze bottle, a rubber tube and a bamboo pole. The squeeze bottle is tied at the end of a bamboo pole (or aluminium rod) of 2 to 3 m length. A rubber tube with a rubber bulb at one end is connected to the bottle just below the neck (Fig. 6). When the rubber bulb is pressed, it injects air into the squeeze bottle and in turn, the pollen-talc mixture present inside the bottle is released as a cloud. When the receptive female flowers are to be pollinated, the nozzle of the bottle is placed near the inflorescence and the rubber bulb is pressed. The pollen-talc mixture released will cover the inflorescence effecting pollination (Figs. 7 & 8). The process is repeated on the 1st, 3rd and 5th day, starting from the day when the first female flower comes to receptivity as indicated by the drop of nectar secretion at the stigmatic end. When the stigma turns brown & black, the female flower is no longer receptive. By this method, most of the

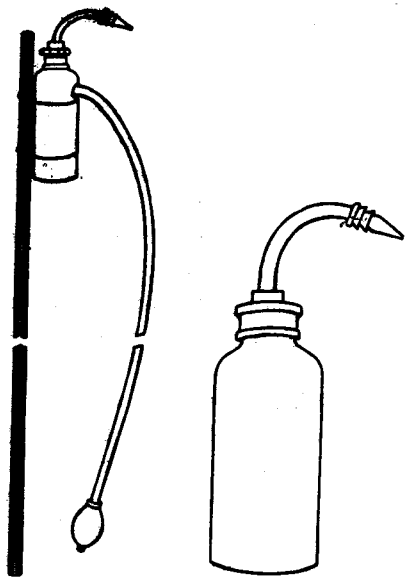


Fig. 6. Pollen applicators

Dwarf palms can be pollinated from the ground itself. The reach of the pollen applicator is about five meters. Even the few Dwarf palms which are taller can be reached with the help of a small ladder. As the laborious process of tree climbing can be avoided, a single pollinator can attend to about 150 trees in a day. The setting percentage is very high (40%) (Fig. 9) when compared to that in nature (20-25%).

Some Useful Estimations

1. 1 kg of fresh mature male flowers after processing give 18 to 20 g of pollen.

2. 20 g of pollen when mixed with neutral talc (1:9) is sufficient to pollinate 45 to 50 palms.

3. In an year, about 30 to 40 hybrid nuts can be produced from one Dwarf palm @ 5/6 bunches with 6 to 7 nuts.

4. One person can emasculate about 50 to 60 Dwarf palms in a day and a pollinator

can pollinate about 150 Dwarfs or 30 Talls a day.

5. One emasculator can look after 1 ha of seed garden while one pollinator can manage pollinations in 2 ha.

Note: It is estimated that on a single day only a quarter of the total palms in the garden need to be either emasculated and/or pollinated.

Important Do's and Don'ts

1. Do the emasculation properly by ensuring that all the male flowers including those which lie in between the female flowers are removed. Even if a bunch is not to be pollinated don't leave it without emasculation. It will contaminate other bunches. Each and every inflorescence in a seed garden (Dwarf block) should be emasculated.

2. Collect the male flowers only from top and middle spikelets. Don't collect from basal spikelets. Use pollen only if its germination is over 50%. Never use the pollen without checking the viability.

3. Clean all the equipments used for collection of pollen properly before and after use to avoid contamination in the pollen.

4. Pollen-talc mixture should be prepared just before use. Never store the mixture for the next day. Clean the applicator after use and keep dry.

5. Use only a single type of pollen in one squeeze bottle. Keep a label tied to the nozzle for identification. It is better to store different pollen in different desiccators.

6. Pollinate bunches only after inspecting the accuracy of emasculation. Don't pollinate if the few male flowers left over by oversight have already opened when the female flowers are in receptive condition.

7. In a seed garden, it is always better to use a single type of pollen for all the trees at a given time. When another combination of hybrid is also to be produced in the same garden, give atleast a gap of two days before the second pollen is used for pollination.

8. It is advantageous to tag the bunches with date of pollination. This will help in identification of the pollen batch used.

9. Keep a register for all details like palm number, bunch number, date of pollination, number of female flowers, number of nuts harvested, and the recovery of hybrids palm-wise. This will help in identifying and eliminating poor palms from being used for crossing.

10. Identify hybrids based on the standards of selection, i.e., colour of petiole, girth at collar, number of leaves, splitting of leaves, etc.