

Hybridization Technique for the Production of Quality Planting Materials for the Coconut Root (Wilt) Disease Prevalent Tracts

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Coconut root (wilt) disease, reported over a century ago in Kerala, is contiguously prevalent in the southern districts, from Kollam to Kanyakumari, from Kanyakumari to Thrissur and in the northern tracts in some of the northern districts. Sparse occurrence of this disease has also been reported from the districts of Bangalore, Kanyakumari, Theni and the districts of Tamilnadu, including Kerala. The disease, spread over 1.1 lakh ha, is causing an annual loss of 968 million nuts. In the disease endemic tracts majority of palms are susceptible to the disease resulting in a loss in the yield of nuts, copra and oil quality.

One of the major constraints affecting coconut production, particularly in the root (wilt) prevalent tracts, is the lack of quality planting material. Due to the increased incidence of root (wilt) disease, a large number of palms are cut and removed. As a result, there is an increasingly high demand for quality planting materials.

In the heavily diseased tract, in the absence of heavily diseased palms, disease-free and high yielding West Tall (WCT), Chowghat Green Dwarf (CGD) and Chowghat Orange Dwarf (COD) palms are found, and these palms are identified as the base material for the production of quality planting material. The hybrids between Dwarf and Tall (Fig. 1) varieties show hybrid vigour for high, early bearing and yield. When

the dwarf is used as female and the tall as male, progenies are called D x T while the reciprocals are known as T x D. Progenies of selected Tall x Tall (T x T) also yield better when compared to unselected seedlings, in the diseased tracts. Dwarf varieties namely CGD and COD are also popular due to their early bearing, disease resistance / tolerance and high yield. They are also extensively used for tender nuts. Based on the available information, progenies produced in the following cross combinations can be used as good planting material for the disease endemic tracts.

1. WCT x WCT (*Inter se*)
2. CGD x WCT and its reciprocal
3. COD x WCT and its reciprocal
4. CGD *Inter se* / Self
5. COD *Inter se* / Self

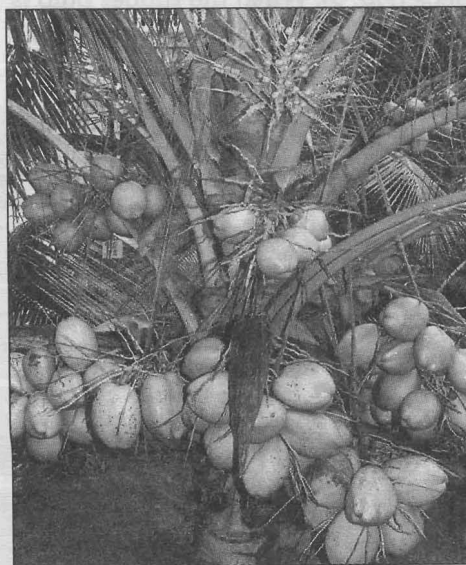


Fig. 1. A D x T palm

Inter se nuts are produced by crossing between two selected palms of the same variety while selfed nuts are produced by pollinating mother palms, using their own pollen. Farmers can choose one or the other of the above cross combinations according to the availability of the parental palms, convenience and requirements for the type of planting materials.

Floral Biology

For the production of hybrid coconut seedlings, it is essential to know the structure of inflorescence and the floral biology of the crop (Thampan, 1981). Coconut produces male and female flowers separately on the same inflorescence. Male flowers are located at the upper portion of the spikelets, while female flowers are found at the basal region (Fig. 2). Few male flowers



Fig. 2. Inflorescence showing male flowers at the upper portion and female flowers at the basal region



are often present along with the female flowers. The female flowers, known as 'buttons', develop finally into nuts whereas male flowers are shed after dehiscence of anthers. In the case of WCT, the male flowers open from top to bottom and are shed within 17-20 days of opening of inflorescence. The female flowers become receptive after all the male flowers are shed and the female phase lasts for about 3-5 days. In CGD, the male and female phases overlap, resulting in a greater chance for self-pollination. The transfer of pollen grains from anther to the stigma of the female flower is known as pollination. Coconut is essentially entomophyllous and agents like honeybees, ants, etc. facilitate natural pollination, apart from pollination by wind. Artificial pollination essentially means that the natural process of pollination is replaced by artificial methods.

Selection of Mother Palms

The selection of the parental palms has great bearing on the quality of planting materials finally produced. Hence care should be taken while selecting the mother palms for artificial pollination. They should be high yielding (more than 80 nuts per palm per year in Tall varieties and 100 nuts per palm per year in Dwarf varieties),

regulars bearers and should be free from all pests and diseases. They should be more than 30 years old in the case of tall varieties and 15 years old in the case of dwarf varieties (CGD and COD). The mother palms should be surrounded by palms, of which, at least 80% of them are affected by root (wilt) disease, in a disease endemic area, to ensure that they could withstand the disease in spite of exposure for such a long period.

Equipments Required

1. Pollination Bag

It is essential to protect the receptive female flowers from pollinating agents. For this purpose the inflorescence should be covered and tied with a cotton cloth bag. Bags, measuring approximately 65 cm x 50 cm., having a transparent plastic window (to assess the stage of female flowers for pollination without untying the bag) are used (Fig. 3).

2. Applicator for Spraying Pollen Grains

Pollen applicator consists of a plastic squeeze bottle with a rubber tube at its mouth. Another rubber tube with rubber bulb at one end is connected to the bottle just below the neck (Fig. 3). When the rubber bulb is pressed, it injects air into the squeeze bottle and the pollen - chalk mixture inside the bottle is released as a cloud, into the pollination bag.

3. Dessicator

The viability of the pollen grains can be prolonged by conserving them under low humidity condition. To ensure this, dessicator with fused calcium chloride, as desiccant, is used.

The pollen, collected in small vials, should be plugged with cotton. They can be stored for 10-12 days with appreciable loss of viability (Fig. 3).

Collection of Male Flowers and Processing of Pollen

The male flowers on the top and middle portion of the spikelets produce more fertile pollen compared to those on the lower portion. Within 6-8 days after the opening of inflorescence, male flowers from the middle portion of the spikelet should be removed (Fig. 4). Maturity of the anthers is indicated by the bluish green tinge at the tip. These mature male flowers should be kept in between two sheets of thick paper and pressed gently, using wooden roller and dried by keeping at 40°C in an incubator, for 24 hours. In case

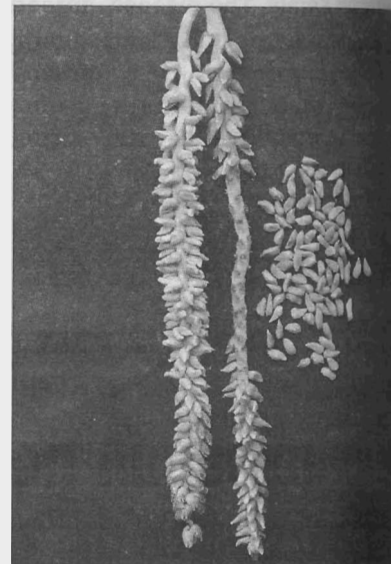


Fig. 4. Male flowers

incubator is not available, it can be sun-dried for 2 days. By sieving the dried flowers, we get the yellow coloured dust of pollen grains. One kilogram of fresh male flowers can yield 20g of pollen. Pollen may be preserved in small lots, in dessicator.

Emasculation

In WCT mother palms, after 14 days of opening of the inflorescence, the male flowers should be removed, &

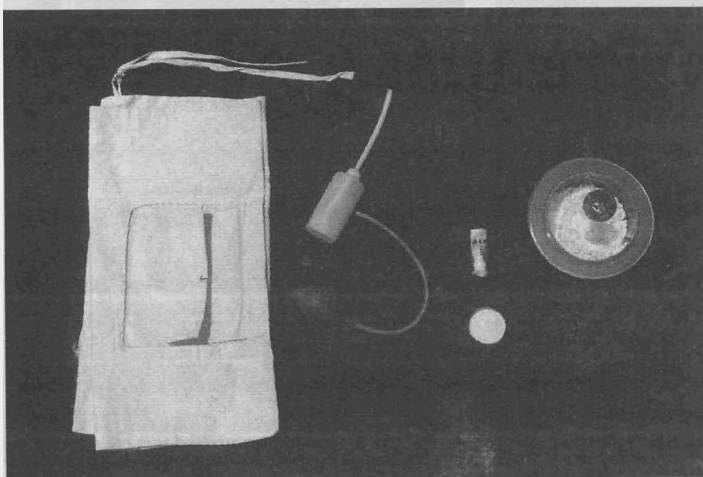


Fig. 3. Pollination bag and pollen applicator



is ing the spikelets 5 cm above the
be de flowers (Fig. 5.) Sometimes male
ut ers are seen in between female
ers and they should be removed by
d. A few days before the female
ers become receptive, the

female parents the following
precautions should be taken due to
difference in floral biology.

1. Emasculation should be carried out within 5-6 days of the opening of the inflorescence.
2. Pollination should be carried out within 10-15 days of the opening of the inflorescence, according to the receptivity of female flowers.
3. In situations where dwarf seedlings are preferred for planting, they can be easily produced by simple bagging of the inflorescence within 5 days of its opening and removing the bag after 4 to 5 days of fertilization. Brown colour of the stigma is an indication of the completion of the fertilization process.

Method of Artificial Pollination

The pollen grains and chalk-powder should be mixed in 1 : 9 ratio and filled upto two-third portion of the applicator, just before use. One gram of pollen will be sufficient to pollinate 20 to 25 palms. The receptivity of the female flowers (buttons) is marked by the honey like exudates from the ivory coloured stigma (Fig. 6), which can be seen through the transparent plastic window of the pollination bag. At this stage, a small hole should be made in

the plastic sheet. Insert the tube of the applicator through this hole and press the rubber bulb to spray the pollen-chalk mixture inside the bag (Fig. 7). Care should be taken to close the hole after spraying the pollen-chalk mixture, using adhesive tape.

All the female flowers do not attain receptivity on the same day, so the above process should be continued till all the buttons in the inflorescence become receptive. It should be kept in mind that the pollen from the same parent should be used for individual inflorescence and since the honey dries progressively during the morning hours, 7 A. M. to 11 A. M is the most preferred time for conducting artificial pollination.

On completion of the fertilization process the stigma turns brown and the secretion of honey stops. After 3-5 days, when all the buttons in an inflorescence attain this stage, the bag should be removed and the bunch should be labelled properly, to retrieve the details of the cross later at harvest.

As usual, 10 to 12 months after pollination, mature nuts can be harvested. Maturity can be checked by knocking on the nut and listening to the ringing sound which is quite unique. If the soil surface at the base of the tree is hard, the mature nuts for harvest can

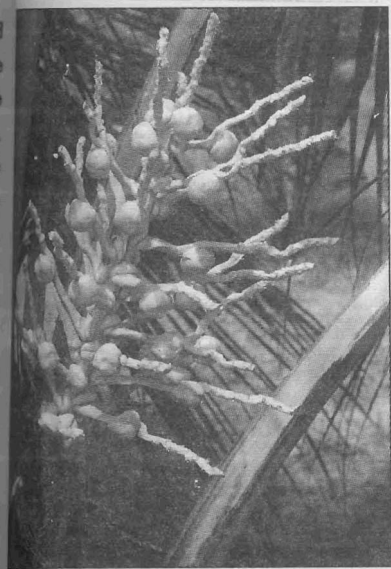


Fig. 5. Female flowers

inflorescence is covered and tied firmly
with the pollination bag. In WCT, the
buttons' or female flowers become
receptive approximately after 19-20
days of opening of the inflorescence
and pollination is carried out when
male flowers become receptive.
Receptivity of female flowers will last
one to three days.

When dwarf varieties are used as



Fig. 6. Receptive female flowers



Fig. 7. Artificial pollination



be brought down using a rope, to avoid the breaking of nuts. Farmers can produce higher yielding disease resistant/tolerant planting material suitable for root (wilt) diseased tracts, from these mature seed nuts.

For the production of quality planting materials for root (wilt) prevalent tracts, CPCRI (RS), Kayangulam have already established five nucleus seed gardens (Nair *et al.*, 2000). 5486 artificially pollinated seedlings produced as described above, have been planted, commencing from 1992 onwards. These seed

gardens are located at CPCRI (RC) Kannara, Thrissur dist.. (1190 seedlings), Coconut Development Board Farm, Neriamangalam, Ernakulam dist. (647 seedlings), District Agricultural Farm, Mavelikkara, Alappuzha dist. (1095 seedlings) and State Coconut Nursery, Karunagappally, Kollam dist. (402 seedlings), besides the nucleus seed garden at CPCRI (RS) Kayangulam (2152 seedlings). Large-scale production of quality planting materials from the above seed gardens are expected to commence in the near future.

References

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- Nair, R. V., Jacob, P. M., Koshiy, J., Sasikala, M. and Namport, K.U.K. 2000. Breeding for resistance/tolerance to coconut root (wilt) disease. Paper presented in the International Conference on Plantation Crops (PLACROYSM XIV), 12th - 14th December, 2000, Hyderabad, India.

USING COCONUTS TO BUILD A DREAM FARM

"When German Eckard Rempe and his Filipino wife, Perla Espino, were scouting for farmland to facilitate their transition from artificial plant exporters to organic farmers, they couldn't have known that they would build their dream out of San Benito in Lipa, Batangas Philippines. The farm site was deep in the heartland of the fiercely proved and clannish Batanguenos. It became more and more apparent to Mr. Rempe, the former church deacon turned wholistic wellness advocate, that he had found his land of contradiction in San Benito out of which his vision of an honest-to-goodness health farm would rise from the ashes of a diseased humanity - and coconut industry. To generate new jobs and support the neighboring barangays, the Rempes founded the San Benito Virgin Coconut Oil project wherein the coconut tree of life philosophy found fruition. San Benito virgin coconut oil improves on the old-fashioned method with a more efficient and hygienic mechanized system that reduces contamination caused by manual handling and completes production within a day. To ensure pharmaceutical quality and increased output, an Australian chemist developed the labour-intensive, village-level technology wherein freshly harvested coconut meat as raw material is cold-pressed within hours through a mechanical expeller that does not require heat and additives to produce metric tons, virgin coconut oil goes through a faster yet hygienic process to turn out a few precious liters a day. What comes out is virgin coconut oil that is non-hydrogenated, non-refined, non-bleached and non-deodorized. The oil is clearer, more nutritious (no nutrient is lost to heat), all-natural, preservatives and cholesterol-free, with the distinct aroma and flavor retained. It improves on the traditional uses of coconut oil many times over. The income from the project is plowed back to the communities to sustain a school and earmarked for school libraries and sanitary facilities. The coconut farm was primarily intended to complement an integrated venture. From virgin coconut oil to buko juice, from organic soaps to therapeutic edible oils, Eckard envisioned a wholistic health farm not just for growing coconuts but for nurturing wellness in the best possible environment that natural resources can nurture. Planned with German meticulousness, the health facility, which integrates alternative and conventional medicine the natural way, has been two years in the making and is not without its trials, community and investment-wise. As the dream is about to be completed, the Rempes realize that the greater passion lies in educating the people it touches - from the impoverished farmer to the spa habitué - on how to work with nature to achieve a state of well-being".

- The Cocomunity