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DEEJAY COCONUT FARM PVT. LTD. (A Unit of Deejay Group)





Dedication.....

This guide is dedicated to the memory of my father, the Late Sri Francis Xavier Lobo, [1906 – 1975], the person who planted in me the seeds of excellence. Because of him I believe that "There is only one way to do a work – THE BEST WAY."

.....David J Lobo



A Message from Mr. David J Lobo

Dear Farmer,

Productivity is the only strategy for the farmer, businessman, or industry that ensures a secure future. Without productivity, which means good to best production from the assets on hand, one has to depend on subsidies, and good luck. To get the best productivity one must use the best of seed material and give the best of management. Productivity does not come easy, yet the rewards are great.

Understanding the coconut palm well will show you that good and excellent productivity is not that difficult. Giving the right management is not difficult. Understanding why, will help greatly. It appears that the coconut palm evolved among the islands of Indonesia, and spread around the world with in the equatorial band of approximately 15° Latitude, North and South of the equator. The Climate here is very warm and humid especially if near the sea. The Coconut Palm loves this climate best. This same belt has the maximum sunshine of any other part of the globe, as well as the longest day in the winter months. Light and warmth play a key role in the growth and productivity of the coconut palm.

Why is this so? Warmth and light are the key sources of energy for conversion of carbon and hydrogen into oil and fats. And do you know which seed or nut has possibly the highest percentage of oil in It? The Coconut. Oil in the copra of most talls is between 63 to 65%.

However the Laccadive Micro copra is 75% oil. This is a fantastic achievement by the coconut palm. It is quite unbelievable to think of any organic product with such a high level of oil. Oil has the highest calorific value of any of the Carbon, Hydrogen and Oxygen compounds. Sugars, carbohydrates and oils fall into this category. One gram of oil contains more than 8 calories of energy, compared to about 4 cal. For sugar and 2 calories for starches and carbohydrates. Through photosynthesis the palm converts light and heat energy into oil. So it is guite simple to understand that if you cut the light you will cut production. If you grow more than the optimum number of palms per hectare, production per palm will fall inversely proportionate to the number of palms. 525 palms per ha will probably yield less than 10 nuts per palm per annum compared to one third the number of palms [175 palms per hectare is optimum] planted in the same area, which could yield 250 plus nuts each per annum. With the former you spend three times more annually than the latter, and income with the latter is more than 8 times more than that of the former! One does not need to be a rocket scientist to understand this.

Light is the first, the cheapest and the most important requirement for the palm. Water is the next in order of importance. Do remember the palm evolved on sandy shores where the water table always gave it adequate moisture. Humidity, always being high near sea shores, did not require the coconut palm to evolve a water saving ability gene. Optimum water per plant is the next most important factor for maximum productivity.

Nutrients are the next most important factor. The hybrid palm in particular, is a heavy feeder, because it is a heavy producer. The biomass output of the hybrid is more than 4 times that of the ordinary Tall coconut palm. The same land cannot produce more than 4 times the output, without additional inputs. The Hybrid Palm cannot perform to its capacity, on starvation rations, especially when optimum rations are not that much more and productivity is substantially better.

Management must ensure adequate light for the palm, and that has to be done at the time of planting. The simple formula is – do not plant more than 70 palms per acre or 175 palms per ha.

The ongoing challenge of management to give optimum [not too much or too little] water and optimum nutrients [macro and micro] is 90% of the task. Disease control is the remaining challenge of management, which is less, if the palm is more virile and strong.

Do remember that the capacities built up within the palm for strength and maintaining optimum reserves happen in the first six years of the palm. The first three are most important, much more important than the next 3, for production will have commenced from the Deejay Hybrid. If your management practices have not been set into place from the very beginning in the first three Years, not only you may damage your coconut palms, but also the reserves and capacity of the palm are proportionately hurt.

The purpose of this booklet is to emphasize the importance of good management in the first three years of the life of a coconut seedling, which becomes a juvenile and then an high yielding adult palm. Look after it well for the first three years and there after it will look after you for a lifetime!

While managing your farm, please inform us of new ideas, improvements, experiments that can encourage and raise the standards of excellence in the farming community.



COMMERCIAL HYBRID COCONUT MANAGEMENT MANUAL

PRE PLANTING PREPARATION:

PIT MARKING: Pit marking is very important to get right alignment of palms in rows for optimum utilization of the land space and to provide sufficient sunlight. This would also help cultivation of intercrops,

One of the two types of planting described below is followed:

- a. SQUARE METHOD: In this method coconut seedlings are planted in squares of 25 ft gap between seedling to seedling and row to row. In this method it is easy to plan drip design and easy to have inter cultivation. About 70 seedlings can be planted in 1 acre. (175 seedlings per hectare with 7.6 mtrs x 7.6 mtrs spacing).
- b. TRIANGLE METHOD: With this design, seedlings are planted in the shape of a triangle, each 25 ft apart (7.6mtrs) giving them enough light and space. This means that the seedlings are 25 ft apart, but the rows are approx. 23ft. apart (7 mtrs). In this method about 5 more seedlings can be planted in 1 acre [13 more per ha.] compared to the square method. Alittle compromise regarding movement, pathways and the drip system may happen. Do make a choice according to your situation. Remember that the principle is that the long leaves of each palm do not overlap and cut the light for each other. Also when the leaves do not touch the leaves of the next palm, rats and squirrels find it much more difficult if at all, to move from tree to tree on a continuous damage expedition.



Fig. (a) Triangle Method (b) Square Method

- 1. PIT SIZE: It is ideal to have a pit size of 3' X 3' X 3' in general soils and in rocky soil the suggested pit size is 4' X 4' X 4'.
- 2. PIT FILLING:

THE NEED AND IMPORTANCE OF PIT FILLING: After pit digging it is important to refill the pit with selected organic and other material to create congenial atmosphere for plant growth. It increases initial root formation and creates good aeration to the plant. This will also facilitate good absorption of initial nutrient requirement by young seedlings which will help in seedlings growth, quality, girth formation and early flowering.

When the coconut sprouts, the soot gets its mother feed from endosperm as initial feed. After transfer from the nursery to planting area, it will adjust to the shock and grow by still feeding on endosperm. The roots start developing and the nutritious compost and fillings in the pit give the seedling a very healthy and good start.

3. REQUIREMENT OF FILLING MATERIAL:

GREEN MANURE: The bottom of the pit should be filled with 15 to 20 kgs of Green /dry leaves.

TOP SOIL: One foot of the top soil of the land should be put on the green manure as it contains humus and nitrogen and is called "Basic Mother Feed".

FARM YARD MANURE: Add 10 to 20 kgs of fully decomposed FYM along with small quantity of pesticide powder such as Polydoil dust 10% to destroy grubs and larvae of beetles.

TANK SILT: If available it is better to add one or two baskets of sediment of tank silt.

<u>RED SOIL & SAND:</u> To provide required aeration in the pits mix red soil with sand and FYM in equal quantities of 10 to 20 kgs each per pit to get best results especially in clay soils.

VERMI COMPOST: Adding two kgs of Vermi compost per pit is recommended as this is the best organic fertilizer that exists and the verms in it helps in keeping the soil loose for longer times. This should be added in the soil area around the seedling at the time of planting.

NEEM CAKE: Add ½ kg Neem cake per pit to control termite and root nematodes.

<u>BIO-FERTILIZER</u>: After filling the pits the top layer should be mixed with100gms each of azosphyrillum, pseudomonas, pasphobacteria, tricoderma verdy per pit to multiply micro organism for generating digestible food for easy absorption by the plant.

4. FIRST TIME WATERING TO SET THE FILLING MATERIAL: After filling the above said filling material it is important to flood irrigate the pits to set the filling material and to help further decomposing of filled material to assist the seedlings growth in the initial stages.

5. PLANTING THE SEEDLING: The material in the pit should be about 6 inches below the surface of the land and the seedling should be planted at this level. However if the land is subject to flooding or worse - water logging for short periods - then the centre material in the pit should be raised up higher than the surface of the land, and the seedling is planted at a slightly higher level than the level of water logging. Bud rot could otherwise set in and destroy the seedling.

POST PLANTING MANAGEMENT:

1. First Month:

After placing the seedling in the pit, the first step is to compress the soil around the seedling, heap the soil around the nut and once again compress the soil by using the heel of the foot. Provide first watering of about 30 ltrs per plant. If there is the possibility of white ant attack then apply Sevidol 8G (5gram) around the plant. Spray Blue copper [fungicide] mixed in water (5 gram blue copper in 1 ltr water). This spray should not be done during hot sunlight. Before the second watering, once again compress the soil around the seedling, so that later settling of the soil will not leave the seedling exposed. Subsequent watering should be about 60 Itrs per plant once in two days in red soil, once in four days in clay soil and in sandy soil 30 ltrs. per day. In case of drip irrigation, it is essential to maintain at least two drip points per plant. After 20 days one manual weeding will need to be done. Provide shade if planting is done in the summer or when the sun is hot. To reduce shock and to avoid scorching by the sun, it is advisable to sow 200 gram of sun hemp seeds around the seedling in the basin. Being leguminous the soil is fertilized and when too tall the hemp should be cut and mulched in the same basin. Watering the plant should always be half a foot away from the seedling. In case of planting in coastal regions just before monsoon setting, it is advised to spray Blue Copper or Bordeaux mixture once in ten days during the monsoons to avoid fungus attack.

2. Second Month:

Check the soil moisture regularly and continue applying 30 ltrs of water per day per seedling subject to rainfall during the seasons. Close inspection of plant is required to identify any fungus attack. If any abnormality is noticed, then spray fungicide of Blue copper and pesticide of Monocrotophos on the seedlings once in a month up to eighth month in the ratio of 5ml per ltr of water. Manual tilting of the soil around the seedlings and removal of weeds is required to be done.

3. Third Month:

Continue watering and fungicide application as indicated for the second month.

4. Fourth Month:

Continue spraying of fungicides and soil tilting work for weed control. Hereafter increase the quantity of water from 30 ltrs to 40 ltrs per palm per day. It is important to maintain soil moisture at a minimum of 40 % and maximum 80% to develop the root zone and to absorb the nutrients effectively. At this stage apply first dose of fertilizer NPK by mixing Urea-850gms, DAP-220gms, MOP-350gms along with 10kgs of FYM and 1.25kgs of Neem cake per palm. NPK must be spread properly in the basin half feet away from Girth region and in one feet width of service area and apply water to wet the soil but do not flood the basin. In case of drip irrigation apply manure and fertilizers at the place where water is disbursed from the drip points. At this stage one can observe starting of leaf splitting, which means good management.

5. Fifth Month:

Continue spraying of pesticide, fungicide, weed control and tilting of soil around the basin and usual watering. This is the time to control the worms and Rhinoceros beetle attack on the young palms. To control this apply mixture of Sevidol or Phorate (Thimet 10G) + Neem cake + river sand in between leaf axil of 2 to 3 bottom leaves. Mixing ratio is 1kg of Phorate + 10kgs Neem cake + 5kgs fine river sand. Mix the quantity as per the requirement. Alternately naphthalene balls can be placed at the leaf axil and cover it with fine sand. For complete control of beetle attack, it is recommended to place pheromone traps near the borders of the land to avoid beetle entry into the planting area.

6. Sixth Month:

Continue monthly spray of pesticide, fungicide, and weed control around basin. If any leaf eating worms like the size of a finger, called Black Headed Caterpillar, normally found under the leaflets, then immediately spray Monocrotophos or any systemic pesticide to control worm attack on leaves. A good management will notice complete leaves splitting at this stage which implies symptoms of early flowering. At this stage measurement of girth, number of leaves, number of leaflets in one leaf, leaf length and height of the seedlings needs to be checked and recorded for each seedling. The ideal growth indicates a minimum of 30cm girth, about seven leaves, leaf length of above three feet and about six feet height of the plant.

7. Seventh Month:

At this stage extend the basin and water the seedling one foot away from the girth area. Between one and three feet from the girth is the ideal zone for applying water and manure to encourage spreading of root zone. Wet this part of the basin area fully to raise the moisture level which will help root spreading to absorb the nutrient from wider area to enhance seedling growth. Have a regular check on seedlings for possible pest attack. If beetle attack is noticed use iron hooks to remove them from axil area of the plant and immediately apply the medicine (mixture of 5gms of Blue copper plus 5ml of Monocrotophos) to control the rotting of wounded area. If any stunted growth is noticed in any seedling, then apply 100gms of Borax around the basin and apply water immediately to bring them back to the level of other plants.

8. Eighth Month:

Continue with recommended watering and spray of pesticide and check the seedlings daily against any beetle and pest attack. If required, apply phorate mixture and fungicide to control minor pest. Apply second dose of NPK fertilizer by mixing Urea-1000gms, DAP-425gms and MOP-700gms per palm in service area of the basin an irrigate immediately, after one week apply Calcium Nitrate of 150gms per palm. In case of drip irrigation increase the drip points from two to four per palm to cover all four sides of the basin area.

9. Ninth Month:

From this stage fungal problems are very minimal. Hence the use of fungicide can be reduced. But the use of pesticide spray should be continued to prevent pest attacks such as Leaf eating caterpillar

and scales. Sufficient moisture levels in the basin need to be maintained regularly.

10. Tenth Month:

As this is important growing stage of the seedling it is essential to ensure that the basin area moisture of minimum 40% to a maximum of 80% is maintained regularly. Regular check of the seedling is required against pest and beetle attack. If required Increase pheromone traps to trap beetles but ensure that these pheromone traps are kept on the border of the land to avoid entry of beetles to the middle of the land.

11. Eleventh Month:

Basin management through weed control, soil tilting is required to be done. Check for pest and decease attack. Look out for uneven growth in plants to provide extra dose of fertilizers for generating even growth throughout the garden.

12. Twelth Month:

Third dose of fertilizer application is due in this month. Apply NPK of Urea-200gms, DAP-225gms, MOP-400gms per palm by spreading in the service area of the basin and irrigate the basin immediately. Do keep in mind that in case of drip irrigation, manure and fertilizers need to be applied at the point where water discharge from drip points takes place. Plant growth measurement also needs to be checked at this stage. Ideal growth parameters under good management are, tree height of 12.5 ft, girth of 2.9ft, leaf length of 9.5ft and number of leaves of about 15 with about 140 leaflets.

13 Thirteenth Month:

Ensure normal maintenance of basin area and watch out for any abnormalities in tree growth. Look out for slug caterpillar attack of leaflets from this month to twentieth month. If found any attack, spray with 1:5 ratio of Helthane or Matasystax pesticide mixture.

14. Fourteenth Month:

Ensure soil tilting in basin area and check for any insects attack to the plants.

15. Fifteenth Month:

Extend basin area to five feet radius from girth and ensure that water and manure application is done two feet away from the girth. Apply fourth dose of PK fertilizer by mixing DAP-2000gms, MOP-2500gms mixed with 15kgs of FYM and 1.250kgs of Neem cake per palm properly mixed with the soil in the basin and irrigate immediately. After one week mix micronutrients of Boron 300 gms, MgSo4 500 gms and calcium nitrate of 200 gms per palm properly mixed with soil in the basin and irrigate properly.

16. Sixteenth Month:

At this stage the trunk formation starts. Beetle attraction is more at this point of time. Hence it is important that extra care is taken to eliminate beetle attack by applying Sevidol or Phorate (Thimet 10G) + Neem cake + river sand mixture in the middle part of the stem in three or four axils. Effective water management is important to avoid water stress.

17. Seventeenth Month:

Continue basin management by tilting the soil and weed control. Apply water to completely cover the service area of the basin to help the tree absorb more nutrients from this area for better growth. Increase irrigation to a level of an average of 75 ltrs of water per day per palm.

18. Eighteenth Month:

At this stage apply fifth dose of NPK fertilizer by mixing Urea-400gms, DAP-200gms, MOP-500gms per palm by spreading it in basin area and irrigate the basins. Check the tree against pest and disease attacks, if required spray pesticide (Monocrotophos 1:5 ratio).

19. Nineteenth Month:

At this age some trees are ready to flower. Concentrate on water management and Basin weed control. Check the trees for any beetle or scales attack. To control scales spray Monocrotophos or any other systemic pesticide (1:5 ratio).

20. Twentieth Month:

This month, wet the basin fully and tilt the basin soil. Make bund of 1 foot height around the basin and dump all greens in to the basin to increase humus level around the basin. Spray pesticide to control minor pests like leaf eating caterpillar and leaf blight etc. Release parasite to control caterpillar though bio control method or spray Monocrotophos or Metasistax (1:5 ratio).

21. Twenty First Month:

At this age apply sixth dose of NPK fertilizer by mixing Urea-2000gms, DAP-1500gms, MOP-2500gms by properly spreading in the basin and mixing it with soil. Apply irrigation immediately. After one week mix Boron 300 gms MgSo4 1000 gms and Calcium nitrate 250gms per palm properly mixed with soil in the basin and irrigate properly.

22. Twenty Second Month:

At this stage extend basin up to 2mtrs radius (6 feet from girth). In this 6 feet, 2 feet radius from the girth should be left idle and other 4 feet radius is used as service area to apply manure and water.

23.Twenty Third Month:

At this stage all trees are ready to start flowering, Hence good care of tree is required by applying regular watering in the service area of the basin. Ensure that water and manure is not applied in the 2 feet area from the girth to encourage root spread to the service area and to enable the tree to get sufficient nutrients from wider area. Apply required quantity of mixture of Phorate-1 kg Neem cake- 10 kg River sand 5 kg into the leaf axils to avoid beetle attack and spray pesticides like Monocrotophos 1:5 ratio or Nimicidin 5ml + garlic extract 5ml + soap liquid 2ml mixed in one ltr of water to control Eriophid - mite, and Libid attack in young spathes.

24.Twenty Fourth Month:

From this age trees are treated as adult trees and coconut yields start stabilizing. Hence full dose of manure and watering would be required for the trees. Apply seventh dose of manure Urea-500gms, DAP-1000gms, MOP-1000gms. After one week apply 250 gms of calcium nitrate per palm and irrigate immediately. If abnormal shredding of buttons is noticed, then go for foliar spray of 1:5 ratio of Plonofix or 10 grms Borax mixed in 1ltr of water.

After twenty four months, for ideal performance, apply an average of 100 ltrs of water per day per palm and fertilizer of 2.5kgs of nitrogen, 2kgs of phosphate, 3.5kgs of muriate of potash and a minimum of 50kgs FYM, 2kgs of neem cake in a year. These fertilizers to be divided into four doses and applied every quarter for continuous nutrition availability to the plant. In addition to this, apply 250gms each of azosphyrillum, pseudomonas, and pasphobacteria once in six months to improve soil fertility though bio methods.

Micronutrients:

Requirement of micronutrient for coconut cultivation is based on the soil texture and inadequacy of micronutrient in the soil. Micronutrient is essential to convert major nutrient into digestible form. It also helps in producing quality nuts and good button setting and helps photosynthesis activity. Following are the micronutrients generally applied for coconut cultivation. It is suggested to get the soil tested before deciding on the quantity of usage.

1. Magnesium Sulphate (MgSo4):

This helps in production of good starch and to avoid lethal yellowing disease in coconut trees.

Recommended dose:

If yellowing of leaves is found or lack of spathe production or shorter leaves apply 250gms of Magnesium Sulphate once in every six months for adult trees and to solve stunted growth problem in seedlings upto 10 months apply 100gms once in six months through soil application.

2. Borax:

This helps in reduction of abnormal shredding of buttons and fused leaves and uneven size of nuts.

Recommended dose:

For soil application, 200gms of borax per tree per year is required to be applied in two split doses (once in 45 days).

3. Zinc :

This helps in good button setting, kernel & oil formation, good leaf formation in coconut trees.

Recommended dose:

Apply 200gms per year per tree for soil application.

<u>Suggestion:</u> Regular application of organic manures such as FYM, Vermi compost, Greens etc. reduces the need for usage of inorganic micronutrients.

To improve soil texture, it is recommended to grow Sun hemp / Cow pea / Calopogonium in the basin area once a year and mulch it with soil to minimize adverse effect of water quality. This would make the soil loose to improve aeration to the root zone resulting in good absorption of micro nutrients.

ORGANIC FARMING:

Organic farming is being practiced for all crops and some farmers are following this for coconut as well. However, the results of yields under organic farming for coconuts have not been verified and established as on date. Hence it is recommended to follow the above stated method of mixing organic and inorganic fertilizers to reap optimum yields and at the same time improving the soil texture.

PEST MANAGEMENT:

RHINOCEROS BEETLE





Symptoms

The adult beetle bores into the unopened fronds and spathes. This beetle attacks tender stems of young plants, if not prevented in time, it can cause mortality of the plant. Attacked fronds in grown up trees, when fully opened, show characteristic geometric cuts.

Control measures

Hook out the beetle from the attacked palms using a beetle hook. As a prophylactic measure, fill up the top most three leaf axils in grown up trees or in between the leaf axil of 2 to 3 bottom leaves in young plants with Sevidol 8G(25g) + fine sand (200g) or Phorate (Thimet 10G) + Neem cake + river sand thrice -- in April, September and December.

Alternately:

Place 10.5g naphthalene balls in the leaf axils and cover them with fine sand. To be practiced once in 45 days.

Use pheromone traps for attracting the beetle and kill the trapped beetle. Care should be taken to ensure that these traps are placed on the boundaries of the land to avoid beetle entering the middle of the land.

Spraying 0.01% Carbaryl (50WP) in the breeding sites of the beetle helps destroy the larva. Biological control also is possible through the virus Baculovirus Oryctus, by releasing 10 - 15 virus infected beetles in 1 ha. or mix metarihzam bio bacteria in the ratio of 5gms in one ltr of water and spray to control the grubs of the beetle.

RED PALM WEEVIL





Symptoms

Presence of holes on the stem, oozing out of viscous brown fluid and extrusion of chewed up fibers through the hole are signs of the Red Palm Weevil. Some times the gnawing sound produced by the feeding grubs will be audible. In the advanced stage of infestation yellowing of the inner whorl of leaves occur. The crown falls or dries up and the palm will die.

Control measures

Practice clean cultivation by cutting and removing palms already damaged and by removing decaying stumps in the garden. Such palms should be split open and the different stages of pest inside burned off.

Avoid injury to the trunk as the pest lays eggs in these wounds. Wounds if any, should be pasted with a mixture of carbaryl / thiodan and soil. While cutting leaves, retain at least 1m of the petiole stem.

Use pheromone traps for attracting weevils and kill the trapped insects. Use fungicides if leaf rot / bud rot is noticed as the weevil lays eggs in such palms. Inject attacked palms with 0.1% Roger (3ml / Itr water) or 1% Carbaryl (20gms/litre). Plug the holes in the damaged region and pour insecticide suspension into a slanting hole made above the damaged portion using a funnel. Then plug this hole. If needed repeat after one week.





Symptoms

Eriophid mites are very minute in size and are not visible to the naked eye. The size of this mite measures in at 200-250 microns in length and 20-30 microns in width. The life cycle of this mite is completed in 10-12 days. It remains underneath the periyanth (cap) and cause injury by feeding on the soft paranchymatic tissues. Though the mites are microscopic their damage is enormous and hundreds of mites could be seen in each infested button and tender nut. Visible symptoms are brown discoloration noticed in patches of the husk. In case of a severe attack the button sheds, resulting in very poor setting percentage. In other cases the nuts are deformed and undersized with poor development of kernel and husk. The mites are spread by the wind and their multiplication is at a high rate. Though this pest was noticed only in a limited area during 1998, it has become a major pest of coconut farming in India.

Control measures

Being a micro pest living under the periyanth, the control measurers at field level are not easy. However by adopting the following integrated plant protection measurers the mite population could be reduced considerably.

Adoption of phytosanitary measures in coconut gardens such as cleaning the crown of the palm, keeping the plantation clean and burning of all immature nuts fallen due to mite infestation will help control spreading of this problem.

Spraying of biopesticides on the bunches is beneficial to control mite attack as indicated below:

2% Neem oil + garlic emulsion (20ml Neem oil + 20g garlic + 5g bar soap in 1 litre water). Emulsion has to be prepared on the same day of application.

Other Neem based pesticides at 0.004% (Azadirachtin). If the pesticide formulation contains 1% Azadirachtin, 4ml has to be used in 1 ltr water. Wherever spraying is difficult root feeding may be resorted to with Azadirachtin 5% formulation (7.5ml+7.5ml water) or Azadirachtin 1% formulation (10ml + 10ml water) or spray the mixture of 5ml of Trizophas (phospomidal) + 5ml Nimicidine with 1 ltr of water.

Spraying has to be done 3 times a year - December-February, April-June and September-October. While spraying, ensure that the spray fluid falls over the perianth region especially on buttons and tender nuts. On an average 1-1.5 ltr spray fluid is required per palm. Care should be taken to harvest mature bunches before spraying.

TERMITE:





<u>Symptoms</u>

Termites are likely to cause damage to transplanted seedlings particularly in the earlier stages. They gnaw into the husk and the tender roots, and more serious loss is caused when they nibble at the tender growing point. They may attack adult trees as well.

Control measures

Apply PDD 10% during the seedling stage and also spraying of chlorpyriphos is found to be effective. Application of waste oil on the trunk will control termites on the tree. Use chlorpyriphos 20 TC at 2 ml/ltr. Spray Neem oil 5% (50 ml/ltr) once on the base and up to 2 meters height of the trunk for effective control.

BLACK HEADED CATERPILLAR





Fig. (a) Larvae inside leaf (b) Pupa inside frass galleries

Symptoms

The severity of attack is seen during January to May. The caterpillar feeds on green matter from the lower surface of the leaf, remaining within silk and frass galleries. In severe attacks, all green matter of the leaves will be eaten up.



Control measures

Biological control is very effective against this pest through release of parasitoids like Gorriozus Nephantidis, Elasmus and Brachimeria Nosatoi. In case of severe attack, remove the affected leaves and destroy by burning. Then spray the under surface of the leaves with 0.02% Dichlorvos (Dichlorvos 100EC).

COREID BUG



Adult Coconut Bug

Symptoms

This bug attacks tender buttons. Attacked buttons do not develop resulting in immature nut fall. Nuts, if developed may become barren.

Control Measures

Pesticide application is necessary if infection is severe. Spraying has to be done 3 times a year. Apply 0.1% Carbaryl or Roger on the inflorescence after the receptive phase of the female flowers. Spaying in the afternoon hours will avoid destruction of pollinating insects. Tying perforated polybags (2 bags/palm) containing 2.5g Phorate on to the stalk of the inflorescence is also effective.

LACE BUG





Symptoms

The Lace bug sucks the sap from coconut foliage; it acts as a vector in transmission of Phytoplasma from root wilt affected palms to healthy palms.

Control Measures

This can be controlled by spraying Roger or Monocrotophos 0.01%.

MEALY BUGS AND SCALE INSECTS

Symptoms

During the summer months mealy bugs cause damage to spindle leaves, spathes and bunches and the scale insects make encrustations on the foliage. The infested leaves turn yellow and finally dry up.



Control measures

Practice two rounds of spray with 0.1% Fenthion or 0.05% Monocrotophos.

In the case of scale insects spraying with Dimethoate or Monocrotophos 0.05% is efficacious.

WHITE GRUB



Life Cycle of White Grub

Symptoms

The white grubs are mostly found in sandy loam tracts. They damage the roots. In seedlings, they tunnel into the bole and collar region.

They have an annual life cycle with a grub period of 8 months. Peak grub population is observed from Sept. to Oct. Adult beetles emerge out of the soil after pre-monsoon showers in May-June during sunset hours.

Control measures

Ploughing and digging of soil during, pre and post monsoon periods will expose the insects to predation. Collect and destroy the

adult beetles during May-June. Set up light traps to attract adult beetles. Application of Phorate 10G @ 100 grms per palm mixed and raked in the top 15cm soil in May-June and Sept.-Oct. is recommended in coastal areas. Irrigation is necessary after the pesticide application.

SLUG CATERPILAR





Symptoms:

The larvae feed by scraping the green leaf tissues This causes drying and feeding holes on the dried portion of the leaves.

Control Measures

Remove the affected leaves in the lower rows. Spray Dichlorvos at 2 ml/ltr of water on the tree top. Root feeding with Monocrotophos (10 ml + 10 ml water). A waiting period of 45 days must be observed from application to harvest. Monitor the pest occurrence in new areas with the Help of light traps to attract moths.

Leaflets have to be observed for fresh incidence

DISEASE MANAGEMENT

BUD ROT

<u>Symptoms</u>

The earlier symptom is the yellowing of one or two younger leaves. Black spots appear on spindle leaves. In the later stages the spindle withers and drops down. The tender leaf base and soft tissues of the crown rot into a slimy mass of decayed material emitting a foul smell. Ultimately the entire crown falls and the palm dies.



Control measures

Remove all affected tissue of the crown and apply Bordeaux paste on cut ends and provide a protective covering till the normal shoot emerges (Dissolve 100 gm of copper sulphate and 100gm of quick lime each in 500ml. water separately and mix to form 1 ltr of Bordeaux paste). Spray 1% Bordeaux mixture on the crown of the neighboring palms as a prophylactic measure. Spray with 1% Bordeaux mixture during May and September if the disease occurs frequently. Cut and burn severely affected palms which cannot be saved.

LEAF ROT



Symptoms

Blackening and shriveling up of distal ends of the leaflets in the central spindle and younger leaves will occur, which later break off in bits. Gradual weakening of the tree result in reduced yield.

Control measures

Improve general condition of palms through proper manuring and management. Remove decayed portions of spindle leaf

and the up-most two leaves only. Pour fungicide solution of Hexaconazol (Contaf 5E) - 2ml or Mancozeb (Dithane M45/Indifil M45) - 3g in 300ml water per palm to the base of spindle leaf. Apply 20g Phorate mixed with 200g fine sand around the base of spindle leaf. 2-3 rounds of spraying is sufficient in case of a mild infection.

STEM BLEEDING

Symptoms

Exudation of reddish brown liquid through cracks developing on the stem, decaying of tissues at the bleeding point, declining of vigor and yield and the development of big holes inside the trunk are seen.



Control measures

Chisel off affected tissue and dress the wound with 5% Calixin (5ml in 100ml water). Apply coal tar after 2 days. Burn off chiseled pieces. Avoid any mechanica injury to the stem. To avoid spread of disease on to the upper portion of the trunk, root feeding with 5% Calixin may be adopted 3 times a year - April-May, September-October and January-February. Along with 50kgs organic manure, apply 5kgs Neem cake Containing the antagonistic fungi, Trichoderma culture to The basin during September. Provide adequate irrigation during summer and drainage during rainy season. Apply recommended doses of organic manures and chemical fertilizers. Coconut stem boring insects like Xyleborus, Diocalandra should be controlled by applying Carbaryl 50% WP on the trunk @ 3gms per ltr water.

ROOT (WILT) DISEASE



Symptoms

Abnormal bending or ribbing of the leaflets, flaccidity of the leaves, general Yellowing followed by marginal necrosis of the leaflets. Abnormal shedding of buttons, reduced leaves and crown, gradual reduction in yield.

Control Measures

Being a non-lethal, debilitating disease an integrated approach is to be followed for management of root wilt.

Recommended control measures for leaf rot disease as this disease gets superimposed on most of the root wilt affected palms.

Follow integrated nutrient management by applying organic manure @ 50kg / palm / year, apply a balanced dose of recommended chemical fertilizers. In addition to this 500g MgO (1kg Magnesium sulphate) also has to be applied along with the second dose of fertilizer application. Cut and remove advanced diseased, uneconomical palms yielding less than 10 nuts per palm per year.

Grow green manure crops - cowpea, sun hemp (Crotalaria juncea), Mimosa invisa, Calapagonium mucanoides, Pueraria phaseoloides etc. in the coconut basins during April-May and incorporate the green manure into the soil during September-October. Irrigate coconut palms with at least 500 ltrs water in a week. Provide adequate drainage facilities.

THANJAVUR WILT (GANODERMA WILT)



Symptoms

Decay of finer nuts, withering, yellowing, drooping and drying of outer whorl of leaves and exudation of reddish brown fluid at the base of the trunk.

Control Measures

Root feeding with Calixin (2ml in 100ml water) once in 3 months. Drench the basin with 25 ltr of 0.1% Calixin. Apply Neem cake along with Trichoderma @ 5kg /palm/year. Apply recommended dose of organic manures. Avoid flood irrigation and follow drip irrigation. Practice clean cultivation and burn off diseased plant pests. Isolate infected palms by taking trenches of 1m depth and 0.5m width around the palm at 1.5m away from it.

MAHALI



Symptoms

Shedding of female flowers and immature nuts. Lesions appear on the young fruits or buttons near the stalk which later result in decay of the underlying tissues.

Control measures

Spray 1% Bordeaux mixture on the crown of the palm once before the monsoon and later after 40 days interval. Remove and destroy fallen nuts. Drenching around the basin with the mixture of 400gms of Tricoderma Verdi in 40 ltrs of water also helps control this problem.into the soil during September-October. Irrigate coconut palms with at least 500 ltrs water in a week. Provide adequate drainage facilities.

CROWN CHOCKING



Symptoms

This disease is characterized by emergence of shorter leaves with fascinated and crinkled leaves. The leaflets show severe tip necrosis and fail to unfurl. In many cases, it gives a choked appearance to the frond. Ultimately the affected palm dies.

Control measures

Application of 50gms Borax at half-yearly intervals (Feb-Mar and Sept-Oct) along with recommended fertilizers in the basins will control the disease when it is in the early stage. In root wilt affected areas a dosage of 200gm - 300gm per palm per year is recommended. Drenching with the mixture of 5gms Bevestine in 1 ltr of water also is ideal to control this disease.

LEAF BLIGHT OR GREY LEAF SPOT



Symptoms

Minute yellow spots encircled by grayish bands appear on the surface of mature leaves of the outer whorl. Later they become grayish white. These spots coalesce into irregular necrotic patches. Complete drying and shriveling of the leaf blade are common when the infection is severe.

Control measures

Removal of the older 2-3 disease affected leaves and spraying the foliage with 1% Bordeaux mixture will check the spread of the disease.

WATER MANAGEMENT

WATERING STAGES	NUMBER OF LTRS PER DAY PER	
	TREE	
From Planting to 3 Months	30 to 32 ltrs	
From4 th Month to 12 th Month	50to55 ltrs	
From13 th Month to 18 months	65to70 ltrs	
From 19 th Months onwards	100 ltrs	

- Water application to be suited to soil conditions in different regions
- Ensure that 40% min and 80% maximum moisture is maintained

Recommended fertilizer dosage for coconut crop Dosage: per tree per application

Fertilizer(in grams)	Duration (Month)		
granio)	4 th Month (Grams)	12 th Month (Grams)	Above 18 Month (Grams)
			January
Urea	850	200	400
DAP	220	225	200
MOP	350	400	500
	8 th Month	16 th month	June/ July
Urea	1000	0	2000
DAP	425	2000	1500
MOP	700	2500	2500
Boron (Borax)	0	300	300
MgSo₄	0	500	1000
Calcium Nitrate	150	200	250
			Sep / October
Urea			500
DAP			1000
MOP			1000
Calcium Nitrate			250

• Depending upon on the soil PH, suitable soil conditioners are advised to be applied.

- For Acidic soil- Lime @ 1 kg / Tree/ Application
- For Alkaline soil Gypsum @ 1 kg / Tree / Application
- Completely composed organic FYM 20 kg /Tree/ Application (3 applications per year)
- Dissolve 5 kg of DAP in 100 liters of water and pour 10 liters of this solution per palm in the basin during initial flowering stage to encourage flower emergence.
- Dissolve 1 Kg of MOP in 100 liters of water and 10 liters of this solution per palm in the basin during initial stages of flowering and also when high button drop is noticed.

And for younger plants, 352N: 330 P: 690K is recommended. Depending upon on the soil PH, suitable soil conditioners are advised to be applied.

Acid soil- Eps Rite / Lime @ 1 kg / Tree/Application Alkaline soil – Sat Rite / Gypsum @ 1 kg / Tree/Application Saline – Sodic soil – Charcoal @ 500 gm Completely composed organic FYM 20 kg / Tree/Application If Sat Rite or Eps Rite is used, two application of calcium Nitrate can be Reduced.

BIO-MICROBIAL INOCULANTS

Bio microbial inoculants are agricultural amendments that use beneficial microbes to promote plant growth by converting the unavailable nutrients into absorbable form from the soil. Microbial inoculants can induce Systemic Acquired Resistance of crop species to several common crop diseases.

Role of Bio fertilizers (Bio-Microbial Inoculants):

- Improves soil structure & texture
- Improves water holding capacity of the soil
- Increases supply of nutrients
- Proliferates useful soil micro organisms
- Promotes root development
- Plants become more healthy and productive
- · Significantly reduces pollution and improves environmental health

Five major Bio Microbial Inoculants are useful for Coconut crop:

Azotobactor and Azospirillum:

Azotobactor & Azospirillum is a nitrogen fixing biofertilizers. Nitrogen is a major nutrient for all plants. It also produces growth promoting substances like IAA, Gibberellins, pantothenic acid, thiamine and niacin and it promotes root proliferation and it improve the plant growth yield. It increases the rootlet density and branching resulting in the increased uptake of mineral and water.

Phosphobacteria:

Phosphorous is a major nutrient for plants inducing vigorous growth and also contributing to their disease resistance. Phosphorous helps in root formation and plant growth. The plants utilize only 10-15 % of phosphate applied. The balance 85-90% remains in insoluble form in the soil. This bio promoter has highly efficient phosphate solubilizing bacteria that grow and secrete organic acids, which dissolve this unavailable phosphate in to soluble form and make it available to the plants.

Trichoderma:

Trichoderma is an important bio control agent against fungal diseases of plants.

Pseudomonas:

Pseudomonas is an important bio control agent for the plants growth development.

Bacillus substillus:

Bacillus substillus is an important bio control agent to control wilt disease in coconuts.

Application Process:

One Kilo each of the above all five Bio-fertilizers should be mixed with 100 kg of composted organic manure along with 25 kilos of top soil from the garden and keep the heap under moist condition under shade for fifteen days. After this period mix the content properly and apply this mixture in equal quantity for ten trees, if applied once a year. OR twenty trees if applied twice a year.

Kindly ensure that the Bio-fertilizers are not applied along with any antibacterial agents OR chemical fertilizers. A minimum of thirty days gap needs to be maintained between application of Bio-fertilizer mixture and chemical fertilizers.

METHOD OF PREPARING BIO-COMPOST MANURE

- Make a pit of convenience size say 10'length X 3'depth X 3'width.
 - Fill up a layer of agriculture waste like dried coconut leaves, twigs, dried weed etc., and that is available in the farm.

- Fill up a layer of organic manure (FYM or sheep or goat manure or cow dung slurry).
- Fill up a layer of agricultural waste.
- Fill up a layer of gypsum @ 300kg per such pit.
- Fill up a thin layer of native soil.
- Spread a layer of Bio-Inoculants such as Trichoderma or Free nitrogen fixers or Phosphate solubilising bacteria.
- Fill up a thin layer of native soil.
- Spread a thin layer of Single super phosphate @ 200kg per such pit, and cover it up with soil to form a heap.
- On top of the heap, spread the seed of legumes such as black gram or horse gram.
- Keep the heap moist always.
- Once the legumes plant starts drying up, it's an indication that the manure below is ready to be used.
- Normally this method takes around 4 months of time and the manure is ready to be used.

Enriching the culture:

When the fresh liquid culture is obtained from Universities or manufacturing companies of Trichoderma, nitrogen fixers or PSBs etc, the pure culture should not be directly added to the organic manure. Instead it should be enriched.

- Take fully decomposed organic manure of around 20-30kg, spread it in shade.
- Sprinkle water enough to make it wet.
- Spread the liquid culture on the manure evenly.
- Lightly mix it with a layer of native soil.
- Sprinkle some more water.
- Cover it with a wet gunny bag.
- Intermittently sprinkle water so that it is not allowed to dry.
- After 10-15 days, the manure is ready to be mixed with decomposing manure pit.