

Organic ways to manage coconut pest and diseases

R. Jnanadevan

Deputy Director, Directorate of Cashewnut & Cocoa Development, Kochi-11

The population of harmful pests and disease causing microorganisms of coconut are very high in the nature now. This is due to the change in the quality of ecosystem as a result of indiscriminate use of pesticides, cutting and removal of collateral host trees, climate change and poor humus content of soil. Being a perennial crop coconut is more susceptible to attack of several pests all round the year. These pest and diseases are capable of causing considerable damage to the palm resulting in reduced yield. Even though several pests and diseases exist in coconut only few are causing serious problem. Increase in awareness on the side effects of chemical pesticides has led to the alternative pest and disease management system i.e., the organic management. Organic pest and disease management is mainly preventive rather than curative. Organic production system of coconut aim at minimizing losses due to pests and diseases by adopting eco-friendly methods. As organic system of cultivation does not permit use of chemical pesticides for the management of pests, other approaches recommended are: use of natural bio pesticide, biological agents, antimicrobial agents, mechanical and cultural practices, field sanitation etc. Organic pest and disease management involves the cumulative effect of many techniques, including encouraging beneficial microorganisms and insects and natural pesticides,

fungicides and herbicides, using insect traps to monitor and control insect populations that cause damage as well as transmit diseases, improving soil, health etc. Each of these techniques also provide other benefits, setting of more number of nuts by improvement of pollination and in the overall health of the palm.

Pest and their organic management

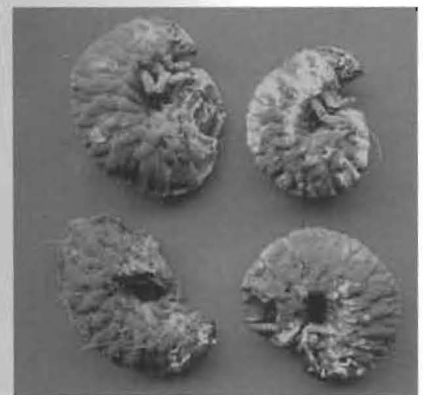
The organic package evolved for management of **rhinoceros beetle** consist of crown cleaning and extraction of beetles using a beetle hook during peak period of pest abundance (June - September) from the crown of palms. Apply natural bio pesticide powdered neem cake or Marotti @250g mixed with equal quantity of sand in top most three leaf axils thrice a year. Treating manure pits and other possible breeding sites with the culture of green muscardine fungus is also recommended. Spray 250mg fungal culture diluted in 750ml water/ m² of breeding site. The fungus can be mass multiplied in local materials such as coconut water and cassava chips. Biological suppression of this pest using the microbial agent baculovirus of oryctes is also recommended. Releasing this virus infected adult beetles @ 10-15 / ha of coconut plantation would bring down the pest population.

Red palm weevil is one the most dangerous lethal pest of coconut. Prevention of pest entry is most important since the palm

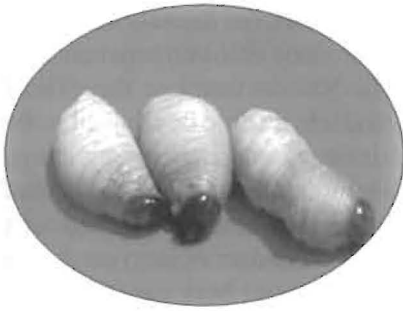
cannot be saved unless the incidence is identified in the initial stage. This is possible by adopting prophylactic treatments viz; maintenance of field sanitation by removing and burning of dead palms, periodically cleaning the crown and filling with powdered neem cake or marotti cake as suggested in the case of rhinoceros beetle will be useful to this pest also. Avoid injury to the palms, as it would attract the weevil to lay eggs. Injuries caused by rhinoceros beetle, mechanical injury during cutting of leaves or steps cut on the trunk for climbing give a favourable condition for egg laying. Mechanical injury caused, if any, should be treated



Rhinoceros beetle healthy grubs



Metarizium affected diseased grubs



Red palm weevil - Feeding grubs



Red palm weevil - adult beetle

with coal tar. While cutting fronds, leave petiole to a length of 120 cm from the trunk to prevent the entry of weevils through the cut end. Trapping of the floating population of the weevil using coconut logs treated with fermented toddy is also recommended. Remove palm in the advanced stage of infestation, split open the stem and burn. Set longitudinally split coconut log traps (50 cm length) after smearing the cut surfaces with fermented toddy or pineapple or sugarcane activated with yeast or molasses to attract weevil. Coconut petiole pieces smeared with fermented toddy kept in pots @ 10 pots/ha also serve as weevil traps. The traps should be placed at dusk and the weevils trapped should be destroyed, the next morning. Install traps with aggregation pheromone @ 1 trap/

ha on coconut trunk at a height of 2 m from ground to mass trap and destroy the weevils. This technology should be taken up on a community basis by farmer collectives in a campaign mode.

The **Leaf eating caterpillar** can be well managed by biological control methods. However, the package is to be adopted in an epidemic outbreak. During such occasions, cut and burn the badly infested outer leaves/leaflets, spraying with botanical pesticide, neem seed kernel extract (NSKE). To prepare this take 50g of the powdered neem kernel to a cloth bag and dip it in 1½ litres of water for 24 hours. Squeeze the cloth bag repeatedly till the outflow turns brown. Dissolve 5g of soap in 0.5 litre of water. Add soap solution to the kernel extract, stir well and spray. Subsequently Adopt biological control by periodical release of larval parasitoids such as *Goniozus nephantidis* @ 20 parasitoid /palm, *Bracon brevicornis* @ 30 parasitoid /palm. The release of pre pupal parasitoid *Elasmus nephantidis* @ 49 per cent and pupal parasitoid *Brachymeria nosatoi*, @ 32 per cent respectively, for every 100 prepupae, pupae estimated to be present on the palm. Combined release of the parasitoids is required in multistage condition of the pest.

Eriophyid mite also can be managed by adoption of phytosanitary measures in coconut plantations like crown cleaning, collecting and destroying all the fallen buttons of the affected palm. Spraying the perianth region and general surface of developing nuts of 1-6 months bunches with neem oil-garlic-soap emulsion @ 2 % concentration (200 ml neem oil, 50g

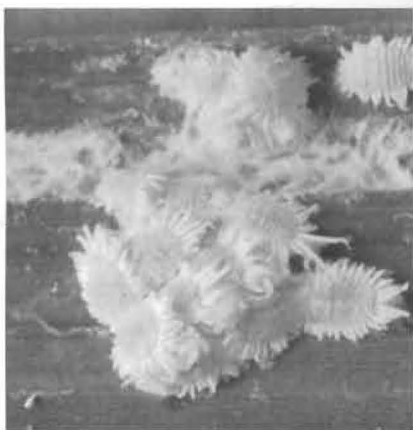
soap and 200 g garlic mixed in 10 litres of water) or commercial neem formulation azadirachtin 0.004 % (Neemazal T/S 1% @ 4 ml per litre of water) as fine droplets during April-May, October-November and January-February is effective in suppressing this pest attack. Improving the nutrient status by applying organic manure @ 50 kg and 5 kg neem cake per palm is also recommended for the management of this pest.

White grub another soil borne pest affecting the roots of coconut palm can be managed by deep ploughing and digging of soil during pre and post monsoon periods, collection and destruction of adult beetles during peak emergence period in May-June, and setting up of light traps to attract adult beetles. Collect and destroy adult beetles during peak period of emergence to reduce the population. Drenching the soil (CNSL) with cashewnut shell liquid solution (2% v/v) is effective against this pest.

Mealy bug and other scale insects are another serious pest affecting unopened tender leaves and inflorescence resulting in stunted growth of the plant.



Mealy bugs on buttons



Mealy bugs on leaves

Application of neem oil garlic emulsion 2% on the central leaves, inflorescence and bunches check this pest attack and regains normal growth.

Diseases and their organic management

The coconut palm is affected by a number of diseases, some of which are lethal and others gradually reduce the vigor of palms causing severe loss in yield. As in the case of pests, most of the diseases are also suppressed by organic methods viz; use of bio-

fungicides, beneficial antagonistic microorganisms, field sanitation/ crop residue management etc. An integrated crop protection is recommended under organic means to keep the disease incidence below the economic threshold level.

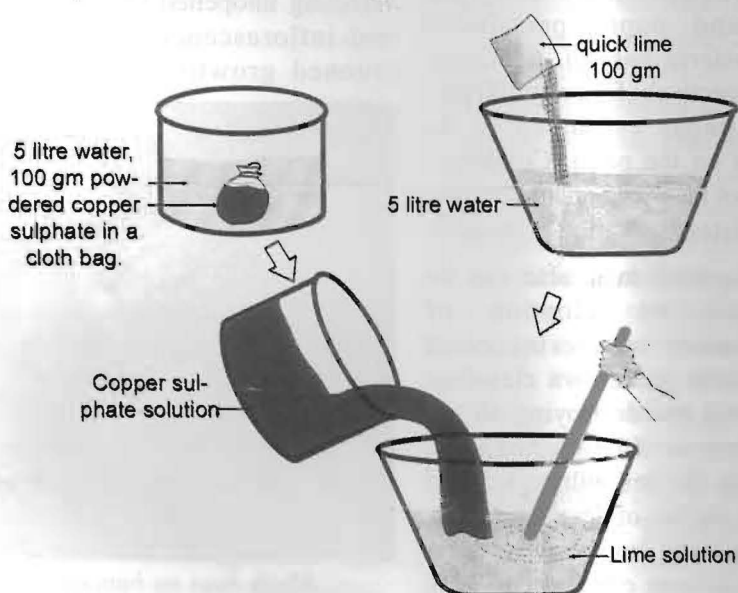
Leaf rot disease. Rotting of the tender spindle leaves, retarding normal growth and reduction in yield is one of the serious disease problems seen in root wilt diseased affected areas. The yield of root wilt affected palms drastically reduce and will die if this fungal disease is not controlled. Organic approach recommended to combat this fungal disease through organic means is the cutting and removal of rotten portion of the spindle and two adjacent leaves and filling the youngest three leaf axils with a mixture of powdered neem/marotti cake as suggested in the case of rhinoceros beetle management since leaf rot affected palms are prone to pest attack. After this application, beneficial bacterial bioagents *Pseudomonas*

fluroscens or *Bacillus subtilis* either alone or in combination @50 g in 500 ml water to the axil of spindle leaf could be adopted in the disease prone areas for suppressing this disease. Spary the spindle leaf and crown with 1% Bordeaux mixture three times in a year during January, April-May and September is also effective in suppressing the disease in endemic areas.

Freshly prepared natural fungicid Bordeaux mixture is very effective in management of fungal diseases like leaf rot and bud rot in coconut. Preparation of 10 liter boredeaux mixture is shown in the diagram. Test the mixture before use for the presence of free copper which is harmful to plants by dipping a polished knife in it. If the blade shows a reddish colour due to the deposit of copper, add more lime. Care shall be taken to use the fungicide on the same day of preparation of the mixture.

Root wilt is a non-lethal but a debilitating disease affecting palms of all age group. As curative measure are not available at present, the approach will be to manage the disease in the already infected gardens. To reduce the loss due to the disease, the strategy recommended is to contain the disease by improving the health of the affected palms and increasing the yield through proper manuring and other agronomic practices. Cut and remove all the affected palms in mildly disease affected areas. In the heavily disease affected tracts, remove severely affected uneconomic adult palms yielding less than 10 nuts per palm per year and all diseased palms in the pre-bearing age. Adoption of organic recycling to improve the soil heath

Preparation of Natural fungicide - Bordeaux Mixture 1%



and palm heath, mixed farming system, raising fodder crops in the interspaces and maintaining mixed cows, application of farm yard manure to palms, growing suitable inter and mixed crops, basin management with green manure crops, irrigation during summer months and leaf rot disease management as stated above are the organic approaches recommended for maintaining the health and getting economic yield from disease affected gardens. Application of farm yard manure 25 kg + coir pith compost 25 kg + 5 kg wood ash + kayal silt per palm, sowing 35g of cowpea seed per basin and incorporating into the soil, burying 25 coconut husk in the basin and irrigation is recommended for improving the health of affected palms.

Bud rot is a lethal fungal disease of coconut palm causing rotting terminal bud and surrounding tissues. Removing the palms in the advanced stage of disease and dead palms, and burning the infected crown are very important in controlling this disease. As a prophylactic measures spray 1% Bordeaux mixture to all the palms in the garden in the disease endemic areas. In early stages of the disease, when the spindle leaf starts withering, cut and remove all affected tissues of the crown and apply Bordeaux paste and protect it from rain by providing polythene covering till normal shoot emerges. Later remove the cover as the shoot grows. Spraying of 1% Bordeaux mixture on spindle leaves and crown of palms around the infected area is recommended to prevent the disease spread. Drench the crown with the *Pseudomonas fluorescens* 2% is also

recommended for suspension biological suppression for these diseases.

Stem bleeding is another fungal disease affecting the stem of coconut palm. Since poor drainage and water stagnation is more congenial for disease incidence, remove water stagnation, if it is a problem chisel out and apply 5 kg neem cake per palm in the basin along with other organics fortified with *Trichoderma* @ 50gm per palm in the affected tissues of the stem completely and paint the wound with Bordeaux paste.

Thanjavur wilt/*Ganoderma* disease. This is another fatal disease caused by a root infecting fungi. This disease can be suppressed by application / adoption of management practices viz: phytosanitary measures such as remove dead palms, bury the affected roots and bole in a pit, apply 50 kg organic manure and 5 kg neem cake fortified with *Trichoderma* per palm. Drench the basins with 40 liter of 1% Bordeaux mixture to soak soil upto 15 cm depth at quarterly intervals and provide irrigation, provide drainage channels between rows of palms, isolate the affected palm from the healthy ones by digging a trench around the affected palms etc. Intercropping of banana is desirable as the root exudates of banana are found to inhibit the growth of pathogens.

Field sanitation/recycling of residues.

Regular crown cleaning, removing crop residues and field sanitation is very important in the management of most of the pests and diseases of coconut. Palm waste like coconut leaves, crown waste, dried spathe, husk etc may

be deposited in small trenches of 0.5 meter depth, 2.5 meter away from the trunk. Burying diseased plant material in the soil reduces the movement of spores by wind and will not act as breeding material for the major pest, red palm weevil and rhinoceros beetle. This practice has been found to improve the growths and productivity of palms.

Damage of tendernuts by rat is another problem in many places. This can be controlled by providing mechanical tin barriers around the tree. Rats can also be controlled by using organic field baits. Broadcast the field with boiled wheat with glyricidia bark as bait. For boiling 10 kg wheat two large pieces of glyricidia bark is required. Shrimp powder mixed with dry cement or gypsum and sugar and keeping it as a bait where rats are frequent is also effective in controlling this pest.

Organic pest management approaches mentioned above need a community approach to bring down the population growth of disease causing pathogens and pests of coconut. Since coconut holdings are contiguous in traditional states and the pest and diseases are migrating from holding to holding, adopting management of strategies on a community basis through farmers' collectives on area wise basis is required. Considering the harmful effects of chemical pesticides efficient use of the alternative organic management pests and diseases, viz; use of bio-pesticides, bio-control methods, field sanitation and recycling of residues, cultural practices and use of synthetic pheromones as described above are important for sustainable coconut farming with protection to environment and human health.