

PEST MANAGEMENT in COCONUT NURSERY

A. Josephraj Kumar
Chandrika Mohan
P. Rajan
Regi J. Thomas
R. Chandramohan
P.M. Jacob



Central Plantation Crops Research Institute

(Indian Council of Agricultural Research)

Kasaragod - 671 124, Kerala

Phone: 04994 - 232894 / 5 / 6

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Dr. George V. Thomas

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Central Plantation Crops Research Institute
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Compiled and edited by

A. Josephraj Kumar

Chandrika Mohan

P. Rajan

Regi J. Thomas

R. Chandramohan

P.M. Jacob

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Technical support

Sunny Thomas

M. Shanavas

P. Rajendran

Photographs

E.R. Asokan

Cover Photo: Termite infested coconut seedlings, boring rhinoceros beetle.
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PEST MANAGEMENT IN COCONUT NURSERY

Pest management is an integral component of nursery operations for the successful production of quality coconut seedlings. This is equally as important as selection of healthy and superior mother palms as well as selection of quality seed nuts for production of vigorous seedlings. A healthy and vigorous coconut seedling maintained by good agricultural practice would therefore result in a hale and hearty palm capable of producing a sustained yield. Some of the nursery pests such as ash weevil, whiteflies, scale insects and mealy bugs affect the appearance of coconut seedlings. Though such seedlings may be vigorous, preference by farmers is lost due to damage symptoms on coconut seedlings. Since the nut production is by and large initiated after a period of at least three years for dwarf coconut cultivars and seven years for tall varieties, timely and need-based health management techniques hold the key for better output. A wide array of pests infesting coconut seedlings is enumerated hereunder with the characteristic symptoms and management strategies. These pests are broadly classified as internal borers, subterranean pests, sap feeders, defoliators and nematode pests.

I INTERNAL BORERS

(i) **Rhinoceros beetle, *Oryctes rhinoceros* Linn.**

Adult beetle bores into the collar region of the coconut seedlings and brings forth deadheart like symptoms. Central core of the spindle is severely affected and irrecoverable loss is induced. This is one of the new modes of entry by the pest. Extrusion of chewed up fibres at the bore hole is one of the characteristic symptoms of



Rhinoceros beetle



Grubs of rhinoceros beetle



Damage on Juvenile palm



Collar region entry of rhinoceros beetle on seedling



identification. In many cases, the growing point gets twisted, malformed and remarkable loss in vigour is observed. In certain pockets of Alappuzha and Kollam districts of Kerala incidence as high as 2-5% is reported. Presence of geometric V-shaped cuts on leaflets is quite common in juvenile palms.

Management

Integrated pest management involves disposal of breeding grounds such as farm yard manure heaps, compost pits, left over coconut stumps *etc.*, treating breeding sites of beetle with green muscardine fungus, *Metarhizium anisopliae* @ 5×10^{11} spores/m³ as well as incorporation of weed plant, *Clerodendron infortunatum*, release of *Oryctes rhinoceros* nudivirus (OrNV) infected beetles @10-12 beetles/ha and setting pheromone traps (Oryctalure) for trapping adult beetles (one in 5 ha area) in the field. Application of chlorpyrifos dust (2-3 g) /neem cake (10 g) /marotti cake (10 g) admixed with sand is recommended on the collar region of the seedlings. Wherever possible, hooking of beetle is one of the best methods of management of black beetle.

(ii) Red palm weevil, *Rhynchophorus ferrugineus* (Oliv.)

Infestation by red palm weevil is found to be severe if aged seedlings are retained in the nurseries. Nurseries adjoining the root (wilt) diseased tracts have higher damage percentage by this weevil. Grubs of red palm weevil feed inside the growing point and results in death



Red Palm Weevil damage on aged seedling



Red Palm Weevil



Grub

of the seedling especially the aged ones. Chlorosis of mid-whorls and toppling of the entire seedling are the key diagnostic features. All stages of the pest are confined within the infested growing point. Dwarf cultivars are relatively susceptible to red palm weevil infestation compared to the tall varieties.

Management

Ensure timely distribution of seedlings and avoid maintenance of aged seedlings in the nursery. Destroy infested dead palms in the immediate vicinity of the nursery. Skilled early detection and prophylactic filling of collar region with chlorpyrifos dust (2-3 g) / chlorantraniliprole granules (1-2 g) / neem cake (10g) / marotti cake (10g) admixed with sand is recommended. Curative treatment with carbaryl (1%) / imidacloprid (0.025%) / spinosad (0.013%) is very effective. Trapping of red palm weevil using aggregation pheromone lures “Ferrugineol” in food baited bucket traps @ 1 trap / ha forms an important component of the IPM strategy.

II SUBTERRANEAN PESTS

(i) White grub, *Leucopholis coneophora* Burm.

White grubs are predominantly noticed in sandy as well as sandy-clay soils in coastal districts, feeding on the roots of coconut seedlings. Vigour of the seedlings is thus affected and initial establishment after transplantation is impaired.



Adult beetle of white grub



White grub

Management

Nursery establishment in white grub endemic zones is to be avoided. Summer ploughing and exposing grubs and pupae for predation are recommended. Mechanical collection and destruction of emerging beetles during May/June may also be done. Drench soil with chlorpyrifos 0.05% after initial raking.

(ii) Termites, *Odontotermes obesus* Ramb.



Termite damage on emerging sprout



Husk fed by termites



Termite damaged haustorium

Termites generally attack seedlings in the nursery especially in the laterite areas preferring the husk of seed nuts. Invasion is either through the base of the seednut or at the collar region. Wilting of the central shoot is usually the first visible symptom of attack

followed by death of the seedlings. Infestation also continues in the transplanted field resulting in poor establishment.

Management

Wooden wastes, coconut petiole wastes and un-germinated seed nuts have to be removed and destroyed in advance prior to taking up of sowing of seed nuts. River sand is preferred as rooting media for innate selection of superior seedlings as well as reducing menace by termites. Soil application of chlorpyrifos dust @ 3.8 g / nursery bed (7.5 m²) or fipronil granules @ 2.3 g / nursery bed before sowing of seed nuts is also recommended.

(iii) Small red ant, *Dorylus orientalis* Westwood



These ants in gregarious forms feed on the growing tips as well as the haustoria by making tiny holes on the husk. Any injury to seed nuts would enhance the invasion by these ants. It feeds

the inner contents and drains off the haustoria leading to the death of the seedlings. At times it attracts secondary infection by fungus accelerating rotting of seedlings. Sometimes infestation is continued in the main field also.

Management

Removal of un-germinated nuts at regular intervals, preferably at five months for tall varieties and at four months for dwarf cultivars is to be done. Avoid injured seed nuts during sowing. Soil application of chlorpyrifos dust @ 3.8 g / nursery bed (7.5 m²) before sowing of seed nuts in endemic tracts

(iv) Bandicoots, *Bandicota bengalensis* Gray.

Bandicoots feed on the emerging sprouts and collar region causing severe damage to coconut seedlings in the nursery as well as immediately after transplantation into the main field. In most cases, the young seedlings collapse when invaded by bandicoots. Presence of burrow opening covered with mud in a discontinuous fashion is an indicator of its activity.



Management

Habitat management by reduction of field bund height and reconstruction is recommended. Monitor the nursery area critically for entrance holes of bandicoots and installation of bamboo traps / PVC traps along the route for trapping them.

III SAP FEEDERS

(i) Lace bug, *Stephanitis typica* Distant



Lace bug (Adult and nymph)

White speckles on leaf

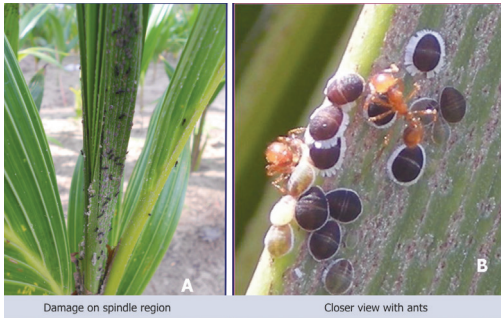
Nymphs and adults feed from undersurface of leaflets of coconut seedlings causing white speckles on the upper surface. Black stains of honey dews

are quite prominent along with exuviae restricted to under surface of leaf. Feeding damage by lace bugs induce an ugly look to seedlings. It is reported as one of the vectors of coconut root (wilt) disease.

Management

Encourage the population build up of the natural enemies. Spray dimethoate @ 0.05% on the undersurface of leaflets during peak population period.

(ii) Palm aphid, *Cerataphis brasiliensis* (Hempel)



Dense aggregations of palm aphid colonies are found on spindle leaves as well as on younger leaves of coconut seedlings. Due to de-sapping and subsequent excretion of honey dews the lower whorls are covered

with sooty mould fungus. Ant colonies are usually associated with the pest. Dwarf varieties especially Malayan Green Dwarf are highly susceptible.

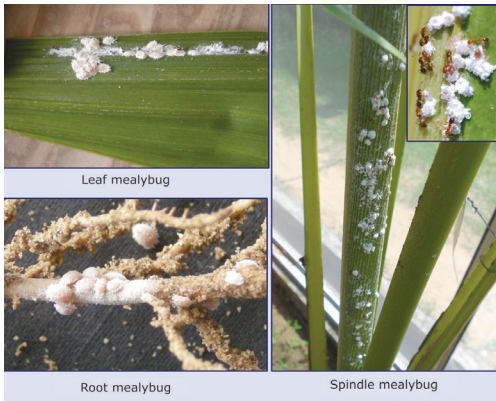
Management

Conservation of lady beetles in the ecosystem for natural suppression of the pest before the arrival of phoretic ants. Two sprayings of dimethoate @ 0.05% at fortnightly intervals was found to be effective in the management of the pest.

(iii) Mealybugs

- a) Leaf mealybug, *Pseudococcus cryptus* Hempel,
- b) Spindle mealybug, *Palmicultor palmarum* Ehrhorn
- c) Root mealybug, *Nipaecoccus nipae* (Maskell)

P. cryptus is confined on leaves of coconut seedlings, *P. palmarum*



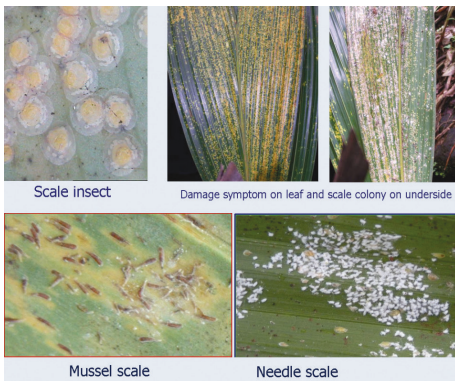
is restricted on spindle region and *N. nipae* is located only on the roots of coconut seedlings. Due to dense colonies and continuous desapping, the seedlings become weaker. Ants are normally associated except on root mealybugs.

Management

Destroy heavily infested plant parts and removal of alternate weed hosts in the immediate vicinity of coconut nursery. Management strategies are to be initiated at the initial stages of infestation. Locate ant colonies during summer ploughing and destroy. Apply neem oil 0.5% or dimethoate 0.05% based on the severity of infestation. Conserve natural enemies identified against the pest.

(iv) Hard scales

- a) Coconut scale, *Aspidiotus destructor* Sign.,
- b) Mussel scale, *Lepidosaphes megregori* Banks
- c) Needle scale, *Chionaspis* sp.



A. destructor is found mainly on the undersurface of leaves. Entire leaves may turn yellow to brown and fall. The bright yellow colour of affected leaves is clearly visible from a great distance. *L. megregori* female scales are normally aggregated, typically boat-shaped and feed

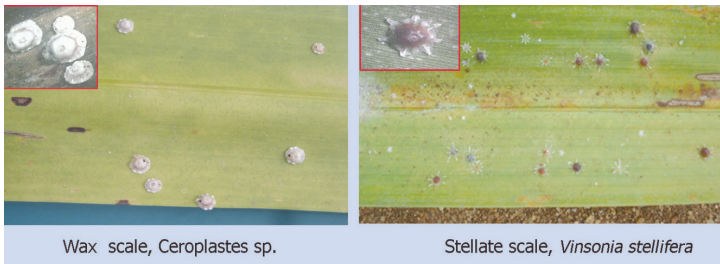
continuously from under surface of coconut leaflets. Mussel scales are mostly confined on coconut leaflets and no other plant parts are normally invaded. *Chionaspis* sp. is confined to undersurface as well as upper surface of coconut seedlings in large numbers and is densely congregated. Continuous feeding leads to chlorosis and drying of un-split leaves of the seedling. Honey dew production and ants are not associated.

(v) Soft scales

a) Wax scale, *Ceroplastes* sp.

b) Stellate scale, *Vinsonia stellifera* Westwood

Wax scales (*Ceroplastes* sp.) are occasionally found on coconut leaflets and are easily recognized by thick wax coverings with characteristic mounds or projections. Stellate scale (*V. stellifera*) adversely affects the vigour of the seedlings by mass-feeding on leaflets. Abundant honey dew production is observed and ants are generally associated.



Management

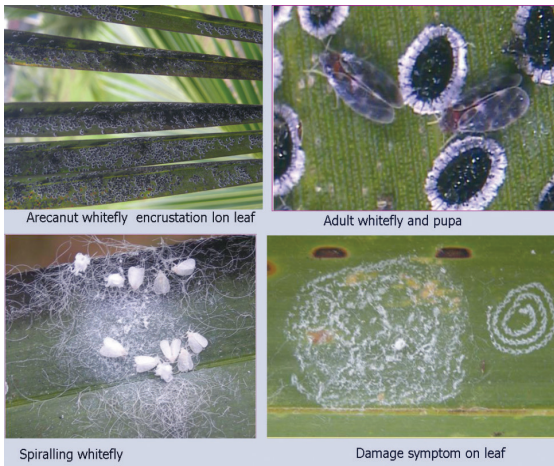
Quarantine and restrict movement of planting materials across transcontinental borders. Adequate nutrition and well-drained soil reduces the pest attack. Heavily infested leaves are to be removed periodically. Conserve lady beetles and cybocephalids for natural suppression. Application of neem oil (0.5%) or dimethoate (0.05%) on need-based situation is recommended.

(vi) Whiteflies

- a) Areca whitefly, *Aleurocanthus arecae* David & Manjunatha
- b) Spiralling whitefly, *Aleurodicus dispersus* Russel

Nymphs and adults of *A. arecae* insert the stylets on plant tissues, feed on the phloem sap and secrete honeydew. These sugar-rich excreta support sooty mould fungus interfering with photosynthesis. Eggs are laid in circular to spiral rings on the abaxial surface of leaves. The immature and adult stages of spiralling whitefly (*A. dispersus*)

desap coconut foliage by direct feeding through the piercing and sucking mouth parts. Feeding damage is predominantly effected by the first three nymphal stages. Direct feeding even under heavy infestations is usually insufficient to kill seedlings.



Management

Lady beetles are found predaceous on adults and nymphs of *A. arecae*. Eggs of *A. arecae* are also fed by an anthocorid bug in Kerala. Natural biological suppression is found to be very successful and no intervention with insecticides is recommended at this point of time. Natural presence of *Encarsia* sp. nr. *haitiensis* and *Encarsia guadeloupae* are identified as potential parasitoids against *A. dispersus* and bring out effective bio-suppression. In addition, lady beetles and cybocephalids also reduce the population of whiteflies.

(vii) Foliage mites - *Raoiella indica* Hirst., *Oligonychus iselemae* Hirst., *Tetranychus ludeni* Z.



Foliage mites

Mites live in on the undersurface of coconut leaflets and suck sap resulting in yellowing and drying of affected parts. High population is observed during February to June.

Management

In case of severe infestation spraying with dimethoate 0.05% or wetttable sulphur 0.2% can effectively control the pest. Phytoseiid predatory mites check the population of the pest in nature. Provide shade to the seedlings to reduce mite infestation.

IV DEFOLIATORS

(i) Ash weevils

- a) Coconut ash weevil, *Myloccerus curvicornis* Fab.
- b) Asian Grey Weevil, *Myloccerus undatus* Marshall



Notching - like symptoms



Ash weevils

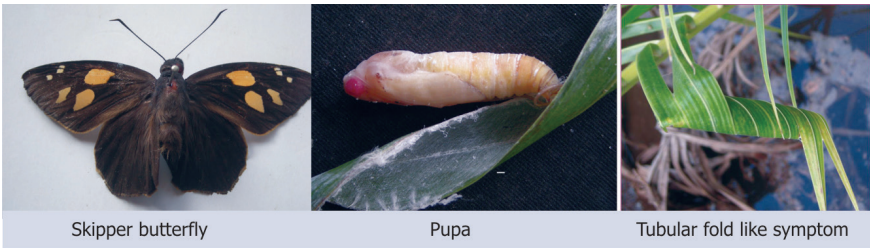
Adult weevils belonging to both species feed along the margin of leaves of coconut seedlings making a semi-circular cut leading to typical notching-like symptom. Such damaged

seedlings have lesser consumer preference. Nearly 40% of seedlings are infested by the weevil pest. Grubs feed on underground roots. All cultivars are equally susceptible to the pest attack.

Management

Rake soil during summer months and expose the grubs for predation. Soil application of entomopathogenic nematode suspension for infecting grubs. Application of contact insecticides is recommended only at higher level of pest infestation.

(ii) Skipper butterfly, *Gangara thyrasis* Moore and *Suastus gremius* Fab.



Typical tubes are constructed by the caterpillar of *G. thyrasis* uniting the edges of the leaflets with strong whitish silken threads and feeds on leaf lamina. Pupae have the habit of vibrating and striking against the inner surface of the fold when disturbed. It is minor pest in coconut nursery and young palms.

Management

Avoid water stagnation in the coconut nursery. Mechanically collect and destruct the caterpillars and pupae of the pest. Need based application of any contact insecticides is recommended only when necessary.

(iii) Slug caterpillars - *Conthyla rotunda* H., *Latoia lepida* Cram., *Macroplectra nararia* Moore

Early-instar caterpillar feeds from undersurface of coconut leaflets by scrapping the surface tissues giving a glistening appearance on the feeding area. Leaf spot-like black halo marking develops on the



feeding areas which later coalesce and form bigger lesions. During heavy infestation caterpillars feed on the entire leaflet sparing only the midrib. These caterpillars are covered with tiny spines that cause severe irritation on contact.

Management

Establish light traps in endemic tracts proved effective in monitoring the pest incidence well in advance. Mechanically remove the pest at initial stages of infestation. Cutting and burning infested leaflets prevent the spread of the pest. In case of severe damage, spray lower side of the leaves with carbaryl 0.1%.

(iv) Bagworm, *Mentha albipes* M.

Caterpillars live inside a protective covering and hang from abaxial leaf surface. Feeding marks are seen as circular shot holes on the leaf.



Management

Cutting and burning heavily infested leaves prevent the spread of the pest.

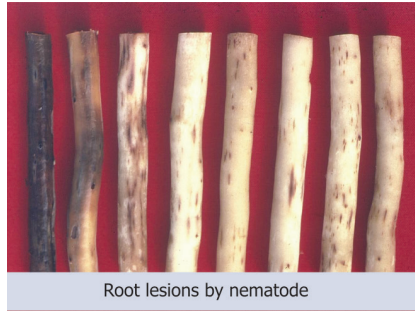
V NEMATODE PEST

(i) Burrowing nematode, *Radopholus similis* Thorne

R. similis has migratory endoparasitic habits and develops

and reproduces inside the roots of coconut seedlings. Feeding by *R. similis* causes brown lesions on the infected roots impairing the nutrient uptake potential of the seedlings. Continuous feeding leads to the production of weaker seedlings in nursery.

It is usually dispersed through root material and by poorly sanitized bare root propagative planting material.



Management

Remove old infected roots of coconut seedlings at the time of transplanting. Intercrop such as banana (most-preferred host) is not recommended near the nursery. Planting of marigold along the borders can act as trap crop and reduce the infestation. Apply neem cake (3 kg / nursery bed) at the time of preparation of coconut nursery bed. Changing the nursery site every year is recommended to avoid nematode build up and thereby to reduce damage by nematodes.

Internal borers such as rhinoceros beetle, subterranean pests like white grubs, termites and bandicoots, sap feeders such as lace bugs, mealybugs and scales, defoliators like ash weevils as well as burrowing nematode are important nursery pests infesting the quality of coconut seedlings. Though other pests have been enumerated, they emerge in severe proportions only in certain endemic regions under ideal weather conditions, which therefore is not a matter of concern. Skillful monitoring and correct identification of the pests would result in effective management of key nursery pests at the appropriate time. This information could be an eye opener for nursery managers and farmers for healthy maintenance of coconut nursery leading to production of quality coconut seedlings.