

A field guide on identification and management of cashew insect pests

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भा.कृ.अनु.प.-केंद्रीय तटीय कृषि अनुसंधान संस्थान
(भारतीय कृषि अनुसंधान परिषद)
ओल्ड गोवा ४०३ ४०२, गोवा, भारत



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Cashew (*Anacardium occidentale* L., Family: Anacardiaceae) is one of the important commercial plantation crops in India. It plays a crucial role in terms of foreign exchange earnings through the export of kernels. It is presumed that cashew was originally introduced into India from Brazil by Portuguese travellers during 16th Century for checking soil erosion on the coast, afforestation and wasteland development. Cashew is now widely grown in tropical climates and it has very well adapted to the Indian conditions. In India, cashew is grown on 11.25 lakh ha area with annual production of 7.02 lakh metric tonnes of raw nuts and national average productivity is 665 kg per hectare (2019-20). India is the largest producer of raw cashew nut contributing 20% of total global production. India is the largest producer, processor, consumer and exporter of cashew in the world. In India, it is mainly cultivated in Maharashtra, Goa, Karnataka and Kerala along the West coast and Tamil Nadu, Pondicherry, Andhra Pradesh, Orissa and West Bengal along the East coast. It is also grown to a limited extent in non- traditional areas such as Bastar region of Chhattisgarh and Kolar region of Karnataka. The production and productivity of cashew is highest in the state of Maharashtra. The highest average productivity of Maharashtra is 1262 Kg/ha.

Pest infestation is a major constraint in cashew production. The crop is attacked by a number of insect pests during different stages of its growth and development. More than sixty species of insects are known to be infesting cashew in India. However, when the extent of damage and economic losses they cause to the crop only two are considered to be major pests. They are stem and root borers and tea mosquito bugs. On an average the borers kills about 5-10% of yielding trees every year. Unlike borers, the tea mosquito bugs will not kill the trees but causes damage to an extent of 30-50% yield loss, and went up to 100 per cent during outbreak situations. The sporadic insect pest includes apple and nut borer, leaf miner, leaf and blossom webber and thrips. It appears in some parts of the country and cause severe economic damage. The other minor insect pest includes mealy bugs, leaf beetle, ambrosia beetle, leaf roller, bark eating caterpillar, defoliators and aphid etc. Most of the cashew growers do not pay due care to cashew plantations as they are not aware of the advantages of adopting recommended package of practices. Due to lack of knowledge about these pests the growers come to know of the infestation only after the crop is lost or tree is dead. Hence, the production potential in most of the cases is not fully realised due to non-adoption of plant protection measures against these pests. A basic knowledge of the damage symptoms, identification of the infested trees, life history parameters of these insect pests will certainly help in timely managing the insect pests. The technical bulletin contains brief descriptions of the nature and extent of damage caused by these insect pests to the crop, the life history of the pest, and possible integrated management aspects of the major insect pests on cashew.

Stem and root borers – symptoms



Extrusion of frass



Gummosis



Grub damage



Damaged stem



Yellowing of tree



Drying of tree

Stem and root borers – *Neoplocaederus* spp, *Batocera rufomaculata* (Cerambycidae: Coleoptera)

Stem and root borers are the major insect pests of cashew which is capable of killing the tree outrightly. There are three main species of stem borers were found to infest on cashew. The species *Neoplocaederus ferrugineus*, and *N. obesus* are recorded as primary pests while *Batocera rufomaculata* recorded as a secondary pest of cashew. In India, the percentage of infestation and extent of damage varies across the regions. On an average, these borers kill about 5-10% of yielding trees every year. In association with cashew stem and root borer, other secondary wood borers viz., *Coptops aedificator*, *Aeolesthes holosericea*, *Glenaea multiguttata*, *Euplatypus parallelus*, and *Belionota prasina* were found aggravate the infestation.

Symptoms of damage

- Presence of small bore holes at the collar region.
- Extrusion of frass (like coarse dust powder) through the holes at the collar region.
- Oozing or exudation of gum from the damaged portion at the base of cashew tree trunk.
- Grubs bore into the living tissue of bark and feed on the sub-epidermal and vascular tissues.
- Extensive tunneling in the stem and root region and the tissues are tunnelled in irregular fashion.
- As a result of damage the supply of water and nutrients is arrested by which the leaves turn yellow and are shed, drying of twigs and finally leads to the death of the tree.
- Affected trees also tilt on one side due to loss of anchorage.

Identification and biology

- The adults of *N. ferrugineus* are chestnut red colored, longicorn beetle while adults of *N. obesus* are dull grey brown coloured longicorn beetle.
- *B. rufomaculata* adults are greyish in colour and pronotum having two kidney-shaped orange yellow spots.
- The eggs are deposited into the live tissues in crevices of loose bark in the trunk and exposed roots.
- The eggs are creamy white in colour, oval in shape and look like rice grains. The egg incubation period was 4-8 days.
- The grubs of *Neoplocaederus* spp are cream in colour having prognathous mouthparts

Life cycle



Eggs



Grub



Cocoon



Neoplocaederus ferrugineus



Neoplocaederus obesus



Batocera rufomaculata

with strong mandibles and passed through five instars. It has a pro-thoracic shield with two crescent shaped markings with three pro thoracic legs.

- The grub of *B. rufomaculata* also cream in colour and apodous.
- The grubs feed voraciously for a period of 4 to 8 months inside the tree trunk.
- Borer infested cashew trees die within a period 2-3 years depending upon the pest population.
- The tunnels made by *Neoplocaederus* spp are broad and irregular, deepest in the middle and shallow at the sides and fully packed with fibrous tissues and frass.
- The tunnels are extensive, irregular and deep, packed with coarse fibres and scraps of wood and bark by *B. rufomaculata*
- Grown up grubs enter into the heartwood region forms a calcareous cocoon. Pupal period last for 60-90 days.
- It complete the life cycle in one year.
- The adults are typically nocturnal (more active during night) in habit.
- The males have antennae more than the body length, whereas, in case of females it is smaller than body length.
- Throughout the year the pest incidence was recorded however peak incidence was noticed during the months of December – May in different cashew growing regions of India

Alternate host plants

Mango (*Mangifera indica*), Moringa (*Moringa oleifera*), Fig (*Ficus carica*), Guava (*Psidium guajava*), Chironji (*Buchanania lanzan*, *B. latifolia*), Anjan (*Hardwickia binate*), Eucalyptus (*Eucalyptus* spp), Mulberry (*Morus alba*), Jackfruit (*Artocarpus heterophyllus*), Silk cotton (*Bombax malabaricum*) Pomegranate (*Punica granatum*), Apple (*Malus domestica*) Walnut (*Juglans regia*) Sapota (*Manilkara zapota*) and Rubber (*Hevea brasiliensis*).

Integrated Pest Management

Prophylactic management

- Maintenance of field sanitation by ploughing the interspaces in cashew plantations without damaging the roots.
- Avoid injuring the plants by sickle and other garden tools, which otherwise will attract the adult for egg laying.
- The phytosanitary measure includes removal of alternate host plants in and around the cashew plantations and weeds.
- Closer examination of trunk portion at monthly interval during April-May and

Management



Examination of collar region



Removal of grubs



Mechanical control



Drenching the collar region



Drenching the exposed roots

October-November for eggs and grubs of stem borers.

- Periodical monitoring of trees having any damage symptoms like gummosis and frass material near the base of tree trunk.
- Remove dead trees and trees beyond recovery at least once in 6 months may reduce the spread of stem and root borer infestation.
- Mechanical removal of the immature stages (grubs) of the pest during initial stages of infestation.
- Insert the clutch cable into the bore holes to mechanically kill the grubs.
- Brushing the basal trunk region up to 2m height with a hard nylon brush to dislodge the eggs present in it.
- Prophylactic treatment by swabbing neem seed kernel extract 25% or swabbing the trunk region up to one meter height from the ground level with coal tar and kerosene (1:2) may be given twice a year during March-April and November-December to prevent the egg laying by adult beetles.

B) Curative management

- ❖ Treat the infested trees of the trunk region up to one meter height from the ground level and on exposed roots with Fipronil @ 2 ml in one litre of water
- ❖ Application of Imidacloprid @ 2 ml in one litre of water on collar region up to 1m height and on exposed roots.
- ❖ If fresh infestation occurs repeat the treatment after 30-45 days.
- ❖ Entomopathogenic fungus *Metarhizium anisopliae* and *Beauveria bassiana* known to cause mycosis to grubs of CSRB. Spawn may be mixed with organic matter and neem cake and applied to the bore holes and swabbed on the tree trunk.
- ❖ Entomopathogenic nematodes belonging to *Steinernema* and *Heterorhabditis* are found to be effective in managing stem and root borer under laboratory conditions.

Tea mosquito bugs – symptoms



Damaged young leaves



Dried panicle



Damage on fruit peduncle



Damaged nut



Severely affected tree



Scorched appearance of affected trees

Tea mosquito bugs – *Helopeltis* spp (Miridae: Heteroptera)

Tea mosquito bugs (TMB) are most serious insect pest of cashew in India and causes more economic loss to the crop. There are four species of TMB viz., *Helopeltis antonii*, *H. bradyi*, *H. theivora* and *Pachypeltis maesarum* (Hemiptera: Miridae) were found to infest in cashew. The mirid bug *H. antonii* is the dominant species and has been found infesting in all major cashew growing regions of India followed by *H. bradyi* and *H. theivora*. It causes damage to an extent of 30-50% yield loss, and went up to 100 per cent during outbreak situations.

Symptoms of damage

- Both nymphs and adults suck the cell sap from tender shoots, leaves, floral branches, developing nuts, fruit peduncle and apples.
- Formation of necrotic lesion on green tender stem of young shoots and inflorescence rachis are the characteristic damage symptoms.
- The lesions on shoots and panicles join together and finally the affected shoot dries up.
- The immature nuts infested by this pest develop characteristic eruptive spots and finally shrivel and fall off.
- Under outbreak conditions, heavily infested trees show scorched appearance, leading to the death of shoots and growing tips.
- Severely affected branches may lead to the secondary infection by fungus (*Botrydiplodia theobromae*) causing die back disease

Identification and biology

- Adult bug of *H. antonii* is reddish brown with black head, red thorax and black and white abdomen. The nymph is reddish orange in colour whereas, they are light brown in *H. Bradyi* and slight greenish in *H. theivora*.
- All the three species of *Helopeltis* having thoracic knob which is reddish brown, erect and tapering with the tip knobbed and funnel shaped. The thoracic knob was absent in *P. maesarum*.
- Eggs are reniform and creamy white in colour laid in rows deep inside the tender shoots and soft tissues of inflorescence branches.
- A pair of fine thread-like chorionic processes projecting outside indicates the presence of egg inside the tissues.
- Fecundity varies from 94-140 eggs / female. The egg incubation period was 6-7 days.

Identification



Nymph of TMB



Helopeltis antonii



Helopeltis bradyi



Helopeltis theivora

- Nymph undergoes five instar and becomes adult in 10-15 days. The total life cycle is completed in 17-25 days.

Alternate host plants

- The nymphs and adults feed on a variety of host plants such as tea, neem, guava, cocoa, mahogany, cinchona, cotton, apples, grapes, drumstick, black pepper and jamun *etc*
- It also feeds on numerous weeds like *Terminalia paniculata*, *Getonia floribunda*, *Macaranga peltata*, *Chromolaena odorata*, *Melastoma malabathricum*, *Meremmia vitifolia*, *Solanum torvum*, *Cissus repanda*, *Strychnos nux vomica*, *Ixora sp.*, *Lantana camera*, *Leea sp.*

Seasonal incidence

- ❖ Seasonal incidence shows that feeding and multiplication of these bugs will start during the month of November- December because the cashew trees are in their most active growth phase.
- ❖ Trees with the new flush and tender inflorescence are highly attractive to the nymphs and adults.
- ❖ The pest population reaches its peak, during the month of January-February because these periods the trees are in the full blossom stage.
- ❖ Young trees are getting affected more, because of the availability of succulent growth throughout the year.
- ❖ Minimum pest activity is noticed during the monsoon period June- September

Integrated Pest Management

Integrated pest management approaches involving monitoring, surveillance, cultural, host plant resistance, chemical and biological control could be adopted to manage these mirid bugs.

- The phytosanitary measure includes removal of alternate host plants in and around the cashew plantations and periodic removal of weeds.
- A proper monitoring of the pest incidence is highly advocated to rationalize the IPM strategies.
- Mid and late season cashew varieties such as Bhaskara are able to escape from the severity of TMB incidence to a certain extent.
- The build of this pest is naturally regulated by egg parasitoids *Erythmelus helopeltidis*, *Telenomus cuspidis*

Natural enemies



Red Ants



Spider



Reduviid nymph



Reduviid predator

- Red ants *Oecophylla smaragdina* should be encouraged in cashew plantations as it will repel the tea mosquito bug. The population of TMB was significantly lower in plants colonized by red ants.
- Entomopathogenic fungus viz., *Beauveria bassiana* and *Metarizhium anisopliae* are found effective against TMB.
- As an ad hoc recommendation, 10% damaged fresh foliar and floral flushes may be considered as the ETL for tea mosquito bugs.
- Need based sprays are recommended during most vulnerable periods of crops such as flushing, flowering and fruiting stage of the crop. Three round of spray schedule is recommended for TMB management.
 - ❖ **1st Spray:** Lamdacyhalothrin at 0.003% (0.6 ml/litre) or imidacloprid 0.6 ml/ litre during new flushing stage (November- December).
 - ❖ **2nd Spray:** Acetamiprid (0.5g/litre) or triazophos (0.05% i.e., 1 ml/lit) at flowering stage (Dec- January).
 - ❖ **3rd Spray:** If pest population persist repeat the first spray at the initial fruiting stage (Feb-March)
 - ❖ Spray well in advance before the insect inflicts damage to the crop. Thorough foliar coverage is a must.
 - ❖ The same insecticide should not be repeated in the second round. Avoid indiscriminate use of synthetic pyrethroids as it causes flare-up of sucking pests.
 - ❖ The sprayings should be done before 9 am or after 4 pm in order to save non-target pollinators.
 - ❖ Whenever die-back disease is associated, spray the canopy with Bordeaux mixture (1%).

Apple and nut borers – symptoms



Affected fruit and nut



Larva

Apple and nut borers – *Thylacoptila paurosema* Meyrick, *Hyalospila leuconeurella* Ragonet, *Nephopteryx* spp (Lepidoptera)

A serious pest incidence was observed in parts of Andhra Pradesh and Goa. It causes 10% yield loss during severe infestation in certain cashew growing areas.

Symptoms of damage

- Dark pink larvae initially damage flowers by webbing the panicles and feed the unopened flower buds.
- The caterpillars attack the fruits at all the stages and cause shrivelling and premature fall of nuts.
- The young caterpillar bores near the apple and nut joint and cause premature fall of fruits
- The affected fruits could be easily identified as the bore hole is plugged with frass and excreta.
- Grown up caterpillar bore into tender apples and nuts and feed on them. Infested fruits and nuts shrivel up and drop prematurely.

Identification and biology

- The adult *T. paurosema* is a medium sized moth with dark fore-wings and pale dark hind wings.
- The larva is pinkish dark and very active. It has five larval instars lasting 15- 33 days.
- The fully grown larvae drop to the ground and pupate in earthen cocoons. The pupal period lasts about 8-10 days.

Management

- Removal and destruction of dead and dried inflorescences during the pre-flowering season is an effective cultural method for controlling pest population.
- Collection and destruction of infested apples and nuts could be followed to prevent spread of the pest.
- Spraying of Lambda cyhalothrin at 0.003% (0.6 ml/litre) or quinolphos (2 ml/lit) during the off-season is found effective for apple and nut borers.
- Larval parasitoids viz., *Panerotoma* spp., (Braconidae) and *Trathala flavorbitalis* (Ichneumonidae) were found parasitizing the apple and nut borer.

Thrips – symptoms



Nymphs and adults damage



Damaged plant



Damage on apples and nuts



Damage on nut

Leaf and flower thrips

Foliage thrips: *Retithrips syriacus* (Mayet) *Rhipiphorothrips cruentatus* Hood and *Selenothrips rubrocinctus* Giard, (Thripidae:Thysanoptera)

Flower thrips: *Rhynchothrips raoensis* G., *Scirtothrips dorsalis* H. *Frankliniella schultzei* was found infesting in cashew. Among these *R. cruentatus* and *S. rubrocinctus* cause severe damage to young plantations during summer months. Leaf thrips occur during October – December and the flower thrips during January – April.

Symptoms of damage

- Nymphs and adults colonise the lower surface of leaves and suck the cell sap.
- As a result of feeding, the leaves become pale brown and slightly crinkled with roughening of the upper surface.
- Scab- like rough skin was observed on infested panicles, floral branches, nuts and apples.
- Premature shedding of flowers, leaves and nuts was noticed in severe cases of attack.
- Formation of corky layers on the affected parts, malformation of nuts and immature fruit drop.
- Severe damage is recorded on young plantations during summer months April-May.

Identification and biology

- ❖ They are minute, slender, fragile, soft bodied, fast moving insects and adults have fringed wings.
- ❖ The eggs are inserted singly in the epidermis of the leaf. The nymphs emerge in about 10 days.
- ❖ Nymphal period last for 8-10 days. The pupal period last for 3-4 days.

Management

- Spraying of neem based insecticide or dimethoate 1ml/ litre or quinolphos (2 ml/ lit) is recommended for the management.
- Several common predators like coccinellids, syrphids and green lace wing were found predating various stages of the pest.

Leaf miner – symptoms



Affected leaf



Larva

Leafminer – *Acrocercops syngamma* M. (Gracillariidae: Lepidoptera)

It is one of the important pests of cashew during post monsoon period all over the country. Nursery seedlings and young plantations are more prone to the infestation by this pest.

Symptoms of damage

- Young caterpillars feed on both the tender leaves as well as tender shoots.
- Caterpillars mine the epidermal layer of the tender leaves
- As result of feeding white blister like patches appear on the leaves.

Identification and biology

- The adult is a silver grey moth which lays eggs on tender leaves.
- Freshly hatched larvae are pale white in colour and fully grown caterpillars are reddish brown in colour.
- The total larval period ranged between 10 to 15 days.
- The grown up caterpillar fall down to the soil where they pupate and emerge after 7-9 days as a silvery grey moth.
- The life cycle of this pest is around 20 to 25 days. The pest also reported on Mango and Jamun.

Management

- Two larval parasitoids viz., *Chelonus* sp. and *Sympiesis* sp. have been recorded on leaf miners in Kerala and Goa.
- Three larval parasitoids namely, *Chyrsocharis* sp., *Aprostocetus* sp. and *Closterocerus* sp. (Eulophidae) have been recently recorded in Puttur region of Karnataka.
- Under severe incidence in nursery and young plants may be sprayed with quinolphos (1.5 ml/lit) or profenophos (1.5 ml/lit).

Mealybugs – symptoms



Damage on fruiting bodies



Dried flowers



Damage on nuts



Parasitoid *Aenasius bambawalei*

Mealybugs – *Phenococcus solenopsis*, *Pseudococcus longispinus*, and *Ferrisia virgate* (Pseudococcidae: Heteroptera)

Mealybugs are potential emerging insect pests of cashew. The mealy bugs *Phenococcus solenopsis* and *Ferrisia virgate* is a serious pest of cashew in all cashew growing areas. It occurs in Karnataka, Kerala, Tamil Nadu, but severe in Konkan region and Goa.

Symptoms of damage

- Mealy bugs colonies found on the lower surfaces of tender leaves, twigs, inflorescence panicles and fruit peduncles.
- The nymphs and adults of mealy bugs suck the cell sap from tender leaves, twigs, inflorescence panicles and fruit peduncles results in withering of growing shoots, inflorescence and developing fruits.
- Mealybugs excrete honeydew on which sooty mould develops, impairing photosynthetic activity. The infestation led to withering of inflorescences, thereby reducing nut yield.
- Heavy nut yield loss observed under severe outbreak conditions.
- The infestation of *P. solenopsis* ranged between 0 to 20.73 mealybugs/ 5 cm twig. The peak infestation of 20.73 mealybugs/ 5 cm twig was recorded in the months of April and May.

Identification and biology

- Mealybugs are soft bodied, and covered with milky white coating on the body.
- The adult female of *P. solenopsis* has two dark stripes on either side of the body and also has short to medium sized waxy filaments around the body
- The total nymphal development period of *P. solenopsis* on cashew ranged from 23–29 days with an average of 25.20 days.

Management

- Regular monitoring and removal of alternate host plants and weeds are essential to manage this pest.
- Destruction of mealy bug infested plant parts like leaves, inflorescence and twigs help to minimize their infestation and spread.
- Conservation of predators and parasitoids could regulate the mealybug population in nature
- The solitary endoparasitoid *Aenasius bambawalei* has been recorded as an efficient natural mortality factor of *P. solenopsis*
- Under severe outbreak conditions spray profenophos (2 ml/lit) or dimethoate (2 ml/lit) or thiamethoxam (0.6 g/lit) may be followed to manage mealy bugs in combination with fish oil Rosin soap at 20 g/lit.

Aphid – symptoms



Damage on leaves



Aphids on nuts



Scymnus castaneus grub



Cheilomenes sexmaculata adult



Dideopsis aegrota larvae



Paragus serratus larvae

Aphid – *Aphis odinae* (*Toxoptera odinae*) (Van der Goot) (Aphididae: Hemiptera)

It is a polyphagous, occasional sucking insect pest of cashew. It has a broader host range and feeds on trees and shrubs of more than 45 plant families. Some of important host plants are cashew, jack, citrus and mango

Symptoms of damage

- Nymphs and adults aggregate in large numbers under surface of tender leaves, shoots inflorescences, apples and nuts and suck the cell sap.
- They excrete honeydew resulting in development of sooty mould on leaves and shoots impairing the photosynthetic activity of the crop plants.
- The damage is heavier on young plantations.
- Heavy infestation leads to shedding and drying of inflorescences or distorted nuts and apples.
- The aphid colonies are attended by many species of ants.
- Initially, the aphid population or damage was observed on young leaves and later migrated to apples and nuts. Maximum population of aphids was noticed in Nuts.

Identification and biology

- Adults are greyish-brown to reddish-brown in colour and reproduce parthenogenetically throughout the year.
- Seasonal incidence of aphid noticed from December- April in Goa

Management

- Regular monitoring and removal of alternate host plants and weeds are essential to manage this pest.
- Destruction of aphid infested plant parts like leaves, inflorescence and twigs help to minimize their infestation and spread.
- Six species of aphidophagous predators comprising three species of coccinellids, viz., *Scymnus castaneus* Sicard, *Cheilomenes sexmaculata* (Fabricius) and *Pseudaspidimerus flaviceps* (Walker) and three species of syrphids, viz., *Paragus serratus* (Fabricius), *Dideopsis aegrota* (Fabricius) and *Ischidon scutellaris* (Fabricius) were found predating on *A. odinae*.
- The natural enemies comprising of coccinellids and syrphids keep the population of aphid below the ETL.
- Augmentation and conservation of these predators could be encouraged to regulate the pest.

Ambrosia beetle – symptoms



Bore holes with powdery frass



Saw dust at the base of tree



Saw dust on tree trunk



Population on the infected galleries



Male



Female

Ambrosia beetle – *Euplatypus parallelus* (Platypodinae: Coleoptera)

Ambrosia beetles, also known as pin-hole borers, are wood-boring insects that live in symbiosis with fungi. They usually attack weakened, dying, and recently cut or killed trees, but some species can attack living trees also. The occurrence of ambrosia beetle *Euplatypus parallelus* (Fabricius) (Coleoptera: Curculionidae: Platypodinae) infestation on cashew (*Anacardium occidentale* L.) is reported for the first time from Goa, India. Most of the infested trees were either previously attacked by cashew stem and root borer *Plocaederus ferrugineus* or were pruned trees.

Symptoms of damage

- The visible symptoms of attack include appearance of numerous round bore holes on the tree trunk and branches, and extrusion of fibrous dust frass on the tree trunk and in loose piles at the base of the tree.
- Two types of frass material were observed: powdery frass, and small strings of compacted sawdust (ejected wood fiber) with 1.5 cm to 2.8 cm in length protruding from small bore holes along the tree trunk and limbs.
- Large numbers of larvae, pupae and adults were observed in the galleries of the affected trees.
- Gallery length varied from 1.0 cm to 5.6 cm and the gallery walls were dark stained with fungal mycelia.

Identification and biology

- The larvae, 3.0–3.5 mm in length, are creamy white in color, curved and legless.
- Pupa is white in color and 3.7–4 mm in length.
- Adult beetles measure 4.0–4.3 mm in length and are brown in color, having long and slender bodies with yellow hairs.
- They have a characteristic feature of absence of pores on the pronotum. Male and female insects were identified based on the elytral declivity.

Management

- Monitor for the presence of frass near the base of tree trunk.
- Brush the basal trunk region up to 2m height with a hard nylon brush.
- Treat the infested trees of the trunk region up to one meter height from the ground level with Fipronil @ 2 ml in one litre of water.

Jewel Beetle – symptoms



Exit bore holes



Grub feeding galleries



Grub feeding



Different stages of grub



Pupae



Adults

Jewel Beetle – *Belionota prasina* (Buprestidae: Coleoptera)

The Jewel beetle, *Belionota prasina* (Thunberg, 1789) (Coleoptera: Buprestidae) is a polyphagous insect pest and widely distributed in India. The other potential host plants are *Ceiba pentandra*, *Delonix regia*, *Casuarina* spp and *Mangifera indica*.

Symptoms of damage

- Presence of semi-circular D-shaped exit bore holes measuring 7–10 mm in length and 4–7 mm in width along the main trunk and larger branches.
- The cross section of the affected trees having numerous galleries.
- The gallery measured 3.8 cm in length and 1.9 cm in width and were filled with powdery frass material.
- A large number of grubs, pre-pupae, pupae and adults were observed in these galleries.
- Early instar grubs were mostly found in smaller galleries inside the cambium region of the tree
- In cashew, most of the infested trees were previously attacked by stem borers

Identification and biology

- Adult beetles are dark greenish blue in colour and measured about 21–28 mm in length.
- Grubs are fleshy, whitish yellow in colour and measured 9–50 mm in length.
- Pre-pupa and pupa are yellowish white in colour and measures 26–32 mm and 20–23 mm in length, respectively.
- Adult beetle are very active, walking rapidly with interrupted jerky movements over the trunks.
- Adults also found on trunk and branches of the tree at various heights with their head facing downwards. Female beetles were larger than the male.

Management

- Monitor the activity of adult beetle on the main trunk and branches
- Brush the basal trunk region up to 2m height with a hard nylon brush.
- Treat the infested trees of the trunk region up to one meter height from the ground level with Fipronil 2 ml in one litre of water.

Leaf and blossom webber – symptoms



Leaf webbing



Webbed leaves

Leaf beetle – symptoms



Leaf damage



Adults causing damage

Leaf and blossom webber – *Lamida (Macalla) moncusalis* Walker and *Orthaga exvinacea* (Pyralidae: Lepidoptera).

Symptoms of damage

- New flushes and flowers are attacked by two species of leaf and blossom webbing caterpillars
- The damage symptoms include presence of webs on terminal portions and drying of webbed shoots and inflorescences.
- The caterpillars are remain inside web and feed on them. It was recorded as sporadic pest in certain pockets.

Management

Spraying of lambda-cyhalothrin (0.6 ml / lit).

Leaf beetle – *Monolepta longitarsus* (Chrysomelidae: Coleoptera)

Leaf twisting weevil – *Apoderus tranquebaricus* (Curculionidae: Coleoptera)

- The leaf beetle appear in large numbers during south west monsoon and cause damage to young tender leaves, flushes and shoots.
- Skeletonise the young leaves, affect the tender shoots and seedlings leads to dry up.
- Severe incidence was found on young trees. Within 2-3 days it causes complete defoliation of young shoots. After the monsoon it disappears from cashew trees.
- The leaf twisting weevil also found feed on young tender leaves, flushes and stem regions during south west monsoon.
- The weevil folds the leaves along the midrib and feed on the leaf tissues. Co-occurrence of these two species was found in cashew.

Management

- Spraying of lambda-cyhalothrin (0.6 ml / lit) or chlorpyriphos (1.5 ml/lit).

References

- Maruthadurai. R, Desai, A.R. Prabu, H. R. C and Singh N.P (2012). Insect Pests of Cashew and their Management. Technical Bulletin No. 28, ICAR Research Complex for Goa (Indian Council of Agricultural Research), Old Goa-403 402, Goa, India.
- Maruthadurai R, Desai AR, Singh NP (2014) First record of ambrosia beetle *Euplatypus parallelus* infestation on cashew from Goa, India. *Phytoparasitica* 42:57–59
- Maruthadurai R, Singh NP (2015) First report of invasive mealybug *Phenacoccus solenopsis* Tinsley infesting cashew from Goa, India. *Phytoparasitica* 43:121–124
- Maruthadurai. R and Singh N.P (2017) A report on occurrence of aphidophagous predators of *Aphis odinae* (Van der Goot) (Hemiptera: Aphididae) in cashew ecosystem from Goa, India. *J Threatened Taxa*.
- Maruthadurai, R. (2019). A scientific note on occurrence and infestation of Jewel beetle *Belionota prasina* (Coleoptera: Buprestidae) on Cashew (*Anacardium occidentale*). *Nat. Acad. Sci. Lett.* 42(2): 91-94
- Mohapatra RN, Jena BC (2008) Effect of prophylactic measures in management of cashew stem and root borer (*Plocaederus ferrugineus*). *J Plantn Crops* 36 (2): 140-141.
- Pillai GB, Dubey OP, Singh V (1976) Pests of cashew and their control in India- a review of current status. *J Plantn Crops* 4: 37-50
- Raviprasad TN, Bhat PS, Sundararaju D (2009) Integrated pest management approaches to minimize incidence of cashew stem and root borers (*Plocaederus* spp.). *J Plantn Crops* 37: 185-189
- Sundararaju D, Bakthavatsalam N (1990) Cashew pest management for coastal Karnataka. *The Cashew* 4: 3-6
- Sundararaju D (1985) Chemical control of cashew stem and root borer at Goa. *J Biol Control* 13(1): 63-66
- Sundararaju D (2004) Status of management of tea mosquito bug on cashew. In: Proceedings of National Group Meeting of Scientists of AICRP on Cashew, 4-6 June, NRCC, Puttur, Karnataka, pp.12-16
- Vanitha K, Srikumar KK, Bhat PS (2014) Record of weed flora of cashew plantations as hosts of tea mosquito bug. *The Ecoscan* 8(3):221-224.
- Vanitha K, and Saroj, P.L (2015) Insect pests of cashew and their management. Technical bulletin 27. ICAR-Directorate of cashew research. Pp 1-70.
- Vasanthi P, Raviprasad TN (2013) Biology and Morphometrics of cashew stem and root borer *Plocaederus ferrugineus* and *Pobesus* (Coleoptera:Cerambycidae) reared on cashew bark. *Int J Sci Res Pub* 3(1): 1-7
- <https://www.ikisan.com/tn-cashew-insect-management.html>

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हर कदम, हर डगर

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