I. PESTS OF PEPPER

About 20 insect species have been recorded damaging pepper plantation.

<table>
<thead>
<tr>
<th>Major pests</th>
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<tbody>
<tr>
<td>Pollu beetle</td>
<td><em>Longitarsus nigripennis</em></td>
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<tr>
<td>Top shoot borer</td>
<td><em>Cydia hemidoxa</em></td>
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<tr>
<td>Berry gall midge</td>
<td><em>Cecidomyia malabarensis</em></td>
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<tr>
<td>Marginal gall thrips</td>
<td><em>Liothrips karnyi</em></td>
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<tr>
<td>Pepper mussel scale</td>
<td><em>Lepidosaphes piperis</em></td>
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<tr>
<td>Soft scale</td>
<td><em>Marsipococcus marsupiale</em></td>
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<tr>
<td>Coconut scale</td>
<td><em>Aspidiotus destructor</em></td>
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<tr>
<td>Whitefly</td>
<td><em>Aleurocanthus piperis</em></td>
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<tr>
<td>Wild silkworm</td>
<td><em>Cricula tritenestrata</em></td>
</tr>
</tbody>
</table>

I. Major pests

1. Pollu beetle: *Longitarsus nigripennis* (Chrysomelidae: Coleoptera)

**Distribution and status:** India (West Coast area)

**Host range:** Pepper (No alternate host reported so far)

**Damage symptoms**

The grubs bore into the berries of pepper. The infested berries dry up and turn dark in colour. Berries are hollow and crumble when pressed. Such hollow berries are called “POLLU” (Empty). Grub may also eat the spike causing the entire region beyond it to dry up. When contents of one berry is exhausted, the grub move to next and feed continuously.

**Bionomics**

Adult is a bluish yellow shining flea beetles. Eggs are laid on the berries and lays 1-2 eggs in each hole, egg period 5-8 days, larval period 30-32 days. Pupation occurs in soil in a depth of 5.0 - 7.5 cm. Pupal period 6-7 days. Life cycle completed in 40 - 50 days. Four overlapping generations in a year.
Management
1. Rake the soil and incorporate quinalphos 1.5 D, carbaryl 5 D, endosulfan 4 D @ 25 kg/ha to kill the pupae in the soil
2. Spray dimethoate 30 EC 1.5 L or quinalphos 25 EC 2.0 L in 500 - 1000 L of water per ha.

2. Top shoot borer: *Cydia hemidoxa* (Eucosmidae: Lepidoptera)
Distribution and status: India
Damage symptoms
Serious pests of pepper in Kerala. The larva feeds on growing and young leaves causing drying and dying of terminal shoots.

![Shoot damage by top shoot borer](image)

Bionomics
Larva greyish green, 12-14 mm long, larval period 10 -15 days. Pupates inside shoots, pupal period 8 – 10 days. Adult moth is tiny, forewing black with distal half red, hind wing greyish. Life cycle completed in a month.

Management
Spray endosulfan 35 EC 1.0 L or quinalphos 25 EC 1.0 L in 500 - 1000 L water/ha

3. Berry gall midge: *Cecidomyia malabarensis* (Cecidomyiidae: Diptera)
Damage symptoms
The maggots infest the berries at the attachment of the berry to the spine, which causes gall like swelling on the tender stalks and shoots. The attacked berries appear larger in size in the beginning but appear shrunken later on.

Bionomics

Management

Distribution and status: India
Host range: Pepper
Damage symptoms
Both nymphs and adults feed on leaves and cause formation of marginal folded galls on them. Presence of white or creamy white nymphs and adults inside the marginal galls is the typical symptom of attack. In severe cases of attack, whole plant becomes stunted and affects formation of spikes.

Bionomics

Eggs are laid in single within the marginal leaf folds or on the leaf surface, egg period 6-8 days. Nymphs whitish and sluggish, nymphal period 9-13 days, pupal period, 2 to 3 days adult longevity is 7-9 days.

Management

Spray monocrotophos 36 SL 750 ml or dimethoate 30 EC 1.0 L or chlorpyriphos 1.5 L in 500-1000 L water

Minor pests

- Pepper mussel scale: *Lepidosaphes piperis* (Diaspididae :Hemiptera)
- Soft scale: *Marsipococcus marsupiale* (Coccidae :Hemiptera)
- Coconut scale: *Aspidiotus destructor* (Diaspididae :Hemiptera)
- Whitefly: *Aleurocanthus piperis* (Aleyrodidae :Hemiptera)
II. PESTS OF CARDAMOM

About 56 species of insects and mites have been reported to attack cardamom in India.

<table>
<thead>
<tr>
<th>Major pests</th>
<th>Minor pests</th>
</tr>
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<tbody>
<tr>
<td>Host range: Cardamom, tea, grapevine, castor, cotton, Prosopis juliflora, ginger and turmeric.</td>
<td>11. Root borer: <em>Hilarographa caminodes</em> (Yponomeutidae: Lepidoptera)</td>
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| Host range: Cardamom, tea, grapevine, castor, cotton, Prosopis juliflora, ginger and turmeric. | 11. Root borer: *Hilarographa caminodes* (Yponomeutidae: Lepidoptera) |

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1. **Cardamom thrips**: *Sciothrips cardamomi* (Thripidae: Thysanoptera)

**Distribution and status**: India and Papua New Guinea. Most destructive pest of cardamom in South India

**Host range**: Cardamom, tea, grapevine, castor, cotton, *Prosopis juliflora*, ginger and turmeric.
Damage symptoms

Thrips lacerate the surface tissues of capsules and suck the exuding sap. The injured tissues form a corky layer on the capsule surface which appear as scales. Such capsules appear stunted, malformed and shrivelled with gaping slits on the skin. The condition is popularly known as “cardamom itch”. Seeds from infected capsules give poor germination. At panicle formation stage, infestation causes stunting of panicles and shedding of flowers. Scrapping of capsules lower their quality and quantity to the extent of even 80-90%.

Bionomics

Greyish brown full grown adult female lays 5 - 31 minute, kidney shaped eggs on the leaf sheath, flowers and surface tissues of capsules, egg period 9-12 days. I and II nymphal instars lacerate the surface of the tissues; nymphal period 9-12 days; pupal period 3-5 days. Life cycle is completed in 20 -25 days. High temperature and low humidity favours the growth of the insects.

Management

• Maintain plant density with wider spacing of 2.5x2.5 m
• Regulate the shade in open areas
• Remove and destroy alternate hosts like Panicum longipes, Ammomum sp, Alocasia sp, Colacasia sp
• Remove dry leaves, leaf sheath and old panicles prior to chemical spraying.
• Spray phenthoate 500 ml or dimethoate or quinalphos 1.0 L or diafenthiuron 50 WP 800 g with 500 - 1000 L water/ha

2. Cardamom whitefly: Dialeurodes cardamomi (Aleyrodidae: Hemiptera)

Distribution and status: Serious pests in cardamom growing parts of Kerala in India

Damage symptoms

Nymphs occurs on the under surface of the leaves and suck the sap from the leaves causing yellowing and discolouration. Infested plant becomes stunted and covered with honey dew and sooty mould later.

Bionomics: Adult is small soft bodied moth like insect covered with white waxy bloom. Nymphs are pale greenish to greenish yellow in colour. Life cycle completed within 2-3 weeks

Management

• Collect and destroy damaged leaves with nymphs and puparia
- Use yellow sticky traps @ 12/ha
- Spray methy demeton 25 EC or dimethoate 30 EC 1.0 L or acephate 75 SP 500 g 500 – 750 L water per ha


**Distribution and status:** India, Australia, Sri Lanka. Major pest. It is a vector of “Katte” or marble mosaic disease in small cardamom.

**Host range:** Colocasia sp., Alocasia sp. and Banana.

**Damage symptoms**
Nymphs and adult infest the leaf sheath and the pseudostem. Colonies of aphids are seen inside leaf sheaths of the older pseudostems.

**Bionomics:** refer banana

**Management**
1. Remove alternate hosts like *Alocasia* and *Colcasia* in the vicinity.
2. Remove partly dried and decayed pseudostems which harbour the colonies of aphids.
3. Spray methy demeton 25 EC or dimethoate 30 EC 1.0 L in 500 – 1000 L water per ha.

4. Shoot, panicle and capsule borer: *Dichocrocis punctiferalis* (Pyraustidae: Lepidoptera)

**Distribution and status:** Tamil Nadu, Karnataka and Kerala. Serious pest of nursery in cardamom

**Host range:** Castor, turmeric, guava, mulberry etc.,

**Damage symptoms**
The larva bores into the central core of the pseudostems resulting in the death of the central spindle causing characteristic “dead heart” symptom. Larva feeds on the immature capsules and feed on seeds rendering them empty. Oozing out of frass materials at the mouth of the bore hole - very conspicuous on stem / pods.

**Bionomics**
Adult moth lays eggs singly/ groups on tender parts of plant. Egg period is 6 to 7 days. Larva is brown in colour and covered with minute hairs arising on warts. Larval period 15-18 days, pupal period 7-10 days. Pupation takes place in loose silken cocoon in larval tunnel. Adult is pale, yellowish with black spots on wings. Life cycle lasts for 3-35 days.

Management: Refer castor

5. Rhizome weevil: Prodiocites haematicus (Curculionidae : Coleoptera)
Distribution and status: India and Sri Lanka
Host range: Cardamom
Damage symptoms
Grubs tunnel and feed on the rhizome causing death of entire clumps of cardamom.
Bionomics
Eggs are laid in cavities made on rhizome. Egg period 8 -10 days. Larvae feed inside the rhizome, larval period 21 days. Pupate in the feeding tunnels, pupal period 21 days. Adult is a brown weevil, 12 mm in length. Adults live for 7 – 8 months. Only one generation in a year.
Management
1. Destroy affected plant/seedlings
2. Drench the base of the clump with malathion 1.25 L or carbaryl 50 WP 1.25 kg in 500 1000 L of water/ha

6. Early capsule borer: Lampides elpis; Jamides sp. (Lycaenidae: Lepidoptera)
Damage symptoms
The larva feeds on the buds, flowers and capsule making a circular bore hole on the developing capsules. The capsules become yellowish brown, dried, empty and shed.
Bionomics
Adult is a blue butterfly with wings having metallic luster on the upper surface and bordered with a white thin line and black shade. It lays eggs on the buds, flowers and inflorescence. Egg period 10 days. The larva is like slug, flat and pink measuring 2 – 3 cm long, larval period 18 – 20 days. Pupal period 15 days. Total life cycle is 45 days.
Management
Spray quinalphos 25 EC 1.5 L or carbaryl 50 WP 1 kg in 500 - 1000 L of water per ha.

7. Hairy caterpillar: Eupterote cardamomi (Bombycidae: Lepidoptera)
Distribution and status: South India
Host range: Cardamom
Damage
The caterpillars congregate on the trunks of shade trees and then drop to the cardamom plants. They feed voraciously in leaves of cardamom plants, defoliating within a short time.

**Bionomics**

The adult are large moth 70 -80 mm, ochrus in colour with post medial lines on the wings. 300 – 800 eggs are laid on the under surface of leaves of shade trees. Egg period 13 – 20 days. Larva is hairy and has a dark – grey body, pale brown head. Larva undergoes 10 instars in 5 months. Pupate in soil at a depth of 2 – 2.5 inch, pupa is cocoon, pupal period 7 – 8 months.

**Management**

1. Collect and destroy the hairy caterpillars.
2. Set up light traps to attract and kill the moths.
3. Spray phasalone 35 EC 35 EC 750 ml in 500 - 1000 L of water per ha

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**8. Galerucid borer: Thamnuroides cardamomi (Galerucidae :Coleoptera)**

**Distribution and status:** South India

**Host range:** Cardamom

**Damage symptoms**

The adult beetle drill capsules and cause tiny, circular bore holes. The infested capsules drop off of disintegrates with a crater like entry hole permanently. Fine saw like frash thrown out indicates the presence of beetle.

**Bionomics**

Adult is small dark brown cylindrical beetle with short hairs all over the body. Colourless barrel shaped 6 -12 eggs are laid in clusters in the capsule. The larva is white, soft bodied, wrinkled and slightly curved.

**Management**

- Regulate shade in thickly shaded areas.
- Spray insecticides like quinalphos 25 EC or phosalone 35 EC 1 L during March, April, May, August and September in 500 - 1000 L per ha.

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**Minor pests**

**9. Shootfly: Formisina flavipes (Chloropidae: Diptera)**

The maggots bore into the central growing shoots of young cardamom causing dead heart symptom.

Adults lay white cigar shaped eggs in between the leaf sheath and pseudostem on the top whorl singly or in rows of 4 - 5. Pupates inside the shoot. Total life cycle is about 50 -92 days.

**Management**

- Remove the affected shoots at ground level and destroy them.
- Spray dimethoate 30 EC or quinalphos 25 EC 1 L in 500 -1000 L of water per ha.
10. Brown scale: *Saissetia coffeae* (Diaspididae: Hemiptera)
   Adults and nymphs cause infestation. Infested leaves turn yellow and put forth scorchted appearance. Adult female is red brown to dark brown in colour with smooth shining surface, more or less hemispherical. The eggs hatched inside the body of the female and after some time the crawlers starts emerging from the underside.

11. Lacewing bug: *Stephanitis typicus* (Tingidae: Hemiptera)
   Both nymphs and adults suck the sap from the leaves causing yellowing and discolouration of leaves. Adult is small dull coloured bug with transparent shiny lace like reticulate wing. Female lays an average of 30 eggs, singly inserted in leaf tissue. Egg period is 12 days. Nymphal period is 13 days.

12. Cutworm: *Arcilassia plagiata* (Noctuidae: Lepidoptera)
   The cut worms feeds on the tender leaves and causes defoliation in the nursery. The caterpillar is dark brown with prominent light yellow and longitudinal marking on the abdominal segments. Pupates in soil for 17 – 18 days.

13. Looper: *Eumelia rosalia*, *Ansiodes denticulatus*, *Thalassodes sp* (Geometridae: Lepidoptera)
14. Root borer: *Hilarographa caminodes* (Yponomeutidae: Lepidoptera)
15. Skipper butterfly: *Plesionoeura alysos* (Hesperiidae: Lepidoptera)
17. Red spider mite: *Dolyhotetranychus floridanus* (Tetranychidae: Acari)

### III. PESTS OF BETELVINE

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<td>Leaf eating caterpillar</td>
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<tr>
<td><em>Aphis gossypii</em></td>
<td><em>Spodoptera litura</em></td>
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<tr>
<td>Scales</td>
<td>Termite</td>
</tr>
<tr>
<td><em>Lepidosaphes cornutus</em></td>
<td><em>Odontotermes obesus</em></td>
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<tr>
<td>White fly</td>
<td>Green looper</td>
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<tr>
<td><em>Aleurocanthus nubilans</em></td>
<td><em>Synegia sp.</em></td>
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<tr>
<td><em>Dialeurodes pallida</em></td>
<td></td>
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<tr>
<td>Mealy bug</td>
<td>Giant African snail</td>
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<tr>
<td><em>Geococcus citrinus</em></td>
<td><em>Achatina fulica</em></td>
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<tr>
<td>Shoot bug</td>
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<tr>
<td><em>Pachypeltis politus</em></td>
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</table>
Two types of cultivation viz., A single bete

Major pests

1. Aphid: *Aphis gossypii* (Aphididae: Hemiptera)

**Damage symptoms**
Both nymph and adults desap the tender shoot and leaves causing yellowing, curling and crinkling in leaves of support plants viz., *Sesbania* spp. Honey dew secreted by the aphids fall on the betelvine leaves and lead to the development of sooty mould which appear as black spots.

**Bionomics**
Two forms of females are available in an aphid colony. The alate (winged) and apterous (wingless) forms which can reproduce parthenogenetically and viviparously, giving birth to 10-20 nymphs per day. The nymph becomes adults in another week time.

**Management**
1. Clip off excess infested *Sesbania* leaves
2. Spray chlorpyriphos 2 ml/L on agathi leaves

2. Scales: *Lepidosaphes cornutus* (Coccidae: Hemiptera)

**Damage symptoms**
Both nymph and adults infest the leaves, petioles and main veins. The scale infested leaves lose their colour, exhibit warty appearance, crinkle and dry up ultimately. The affected vines present a sticky appearance and wilt in due course.

**Management**
1. Select scale free seed vines
2. Spray NSKE 5 % @ 50 g / L or chlorpyriphos 20 EC 2ml/L or malathion 50 EC 1ml/L of water

3. White fly: *Aleurocanthus nubilans* and *Dialeurodes pallida* (Aleurodidae: Hemiptera)

**Damage symptoms**
Both nymph and adults suck the sap from the tender leaves causing yellowing, chlorotic spots and shooty mould development on leaves.

**Bionomics**
Adult is a minute insect covered with white waxy bloom.

**Management**


**Damage symptoms**
Both nymph and adults found on the root regions and desap the root portions

**Management**
Spray chlorpyriphos 20 EC 2ml/L or dimethoate 2ml/L. Concentrate the spray towards
the collar region.

5. Shoot bug: *Pachypeltis politus* (Miridae: Hemiptera)

Damage symptoms

Both nymph and adults suck the sap from the tender leaves causing leaf blotches leading to ultimate drying.

Bionomics

The adult is reddish brown bug. It thrusts its eggs singly within the tender plant parts. Egg period 8 - 16 days. Fecundity 72 eggs/female. Nymphal period 12 - 18 days. The incidence of this pest is severe in June to October.

Management: Spray malathion 50 EC at 2.0 ml/L

Minor pests

6. Leaf eating caterpillar: *Spodoptera litura* (Noctuidae: Lepidoptera)

Damage symptoms

The larva feeds on tender leaves of agathi crop and after complete devastation of agathi, they start feeding in newly planted betelvine causing irregular sides on leaves. It also damages the tip of the veins that results in failure of vein establishment.

Bionomics & Management: Refer cotton

7. Green looper: *Synegia sp.* (Geometridae: Lepidoptera)

Damage symptoms

The caterpillar feeds on leaves causing severe defoliation.

Bionomics

The adult is yellow and orange spotted moth. It lays eggs singly on leaves. The larva is dark green and grows to a length of 25 mm. It pupates in leaf fold. Life cycle completed in 25 - 30 days.


Damage symptoms

The snails are found in betelvine gardens clinging to the lower and protected surface of the leaves of supporting plants. They feed on sprouted buds, leaves, outer layers of the stem of betelvine and supporting trees. Infestation is high during rainy and winter season.

Bionomics

The snails are large, bisexual with shell. Eggs are laid in rainy season in the soil surface or just below in batches of 200, adult fecundity 1000 eggs, egg period 7 days. Young ones take about nine months to mature, adult longevity up to 3 or 4 years.

Management

1. Heap the gunny bags near the fences of the betel vine gardens to attract, collect and kill the snails
2. Collect and destroy the hiding snails.
3. Metaldehyde pellets 5 % over the field to attract and kill the snails.
10. Betelvine Bug: *Dispunctus politus*

The nymphs and adults damage the leaves by puncturing and sucking the juice causing the leaves to shrivel, fade and dry up.

**Question: Pepper, cardamom and betelvine**

1. Scientific name of pollu beetle - *Longitarsus nigripennis*

2. Pepper berries become hollow and crumble when pressed is due to -------------- **Pollu beetle**

3. Pollu beetle pupates in ---------------
   a. Soil  
   b. Berry  
   c. inbetween leaf  
   d. Within berry

4. -------------- causes gall like swelling on the tender pepper stalks and shoots. **Berry gall midge**

5. Presence of white or creamy white nymphs and adults inside the marginal galls of pepper is the typical symptom of attack by
   a. Pollu beetle  
   b. Berry gallmidge  
   c. **Marginal gall thrips**  
   d. Topshoot borer

6. Scientific name of pepper mussel scale is ---------------
   a. *Aspidiodus destructor*  
   b. *Marsipococcus marsupiae*  
   c. *Lepidosaphes piperis*  
   d. None of the above

7. *Dichocrocis punctiferalis* larva bores into the central core of the pseudostems resulting in the death of the central spindle causing characteristic “dead heart” in cardamom. Say **True** or False

8. ‘Cardamom itch’ is caused by
   a. **Thrips**  
   b. Whitefly  
   c. Aphid  
   d. Scale

9. High temperature and low humidity favours the growth of cardamom thrips. Say **True** or False

10. --------------- is responsible for transmitting Katte or marble mosaic disease in small cardamom
    a. Thrips  
    b. Whitefly  
    c. **Aphid**  
    d. Scale

11. Scientific name of cardamom rhizome weevil --------------- **Prodiactes haematicus**

12. *Spodoptera litura* after feeding agathi, also damages the tip of the vine and results in failure of vine establishment. Say **True** or False

13. Giant African snail feeds on sprouted buds, leaves, outer layers of the stem of betelvine and supporting trees. Say **True** or False

14. Site of pupation of giant African snail is --------------- **Soil**