

### Management of mite species

1. Collect and destroy all types of damaged parts along with mites
2. Spray any of the following insecticides with 500 L – 700 L water/ha using hand operated sprayer to ensure proper coverage of spray solution

• Azadirachtin 5% 400 ml	• Flumite 20 SC/ flufenzine 20 SC 400-500 ml
• Dicofol 18.5 SC 1.25 L	• Hexythiazox 5.45 300-500 ml
• Ethion 50 EC 500 ml	• Profenofos 50 EC 800-1000 ml
• Fenazaquin 10 EC 1000 ml	• Propargite 57 EC 750-1250 ml
• Fenpropathrin 30 EC 165-200 ml	• Spiromesifen 22.9 SC 400 ml
• Fenpyroximate 5 EC 300-600 ml	• Wettable sulphur 1.0 kg

3. Spray entomathogen *Paecilomyces fumosoroseus* available a wettable powder against red spider mite (Mycomite)

### 3. Shot hole borer: *Euwallacea fornicatus* (Scolytidae: Coleoptera)

#### Damage symptoms

Presence of round shot holes in primary branches. Mortality of buds and dieback symptoms in branches occur. Presence of circular or longitudinal tunnels inside the stem.

#### Bionomics

Female beetle is black, small and cylindrical. Male is half the size of female, devoid of wings. Egg period 4 – 6 days, three larval instars lasts for 16 – 18 days, pupae whitish and pupal period 7 – 9 days. Total life cycle lasts for 27 – 33 days.



#### IPM

- Selectively remove badly affected branches at the time of pruning.
- Apply nitrogen and potassium at 1:2 ratio in the prune year and mid cycle
- Placing of partly dried cut stems of a jungle plant *Montanoa bipinnatifida* @ 400 ha attracts shot hole borer adults

- Perform chemical control in the third and fourth years, if the average percentage of infestation in the new wood is at or above 15 per cent at the end of second year
- Immediately after pruning spray quinalphos or chlorpyrifos 1.0 L or lambda-cyhalothrin 500 ml or lindane 20 EC 2.0 L in 500 L water
- Spray *Beauveria bassiana* available as a wettable powder (Biopower)

#### 4. Sapling borer: *Sahyadrassus malabaricus* (Hepialidae: Lepidoptera)

##### Damage symptoms

Presence of chewed tissue at the collar region. The tunnel mouth is covered by a thick mat of bark, wood and frass particles held together by silk (particle mat cover); sapling break off at the point of injury.

##### Bionomics

Adult moths hang vertically by the support of two pairs of legs. Third pair of legs is weak and has scent glands in male. Egg period 7-10 days, larval period 10 months, pupal period 3-5 weeks.

##### Management

- Clean the base of bush
- Kill the hiding larvae by inserting a thick wire into the bore hole
- Inject quinalphos 2 ml using a syringe or ink filler through the borer hole and plug with moist clay.

#### Minor pests

#### 5. Flushworm: (Tortricidae: Lepidoptera)

##### Damage symptoms

Caterpillar ties the margin of tender leaves and forms a case enclosing the bud. Affected leaves become rough, crinkled and leathery. Shoot growth is arrested when buds are damaged.

##### Bionomics

Adult is a very small blackish brown moth. Eggs are pale yellow and laid singly on the under surface of mature leaves. Incubation period 4-5 days, larva brown, larval period 19-25 days pupal period 8 – 10 days. Pupation takes place on the petioles of outer most leaf.



##### Management

Spray NSKE 5 % or endosulfan 35 EC or phosalone 50 EC or chlorpyrifos 20 EC or malathion 50 EC 1000 ml with 500 L water/ha.

## 6. Tea tortrix: *Homona coffearia* (Tortricidae: Lepidoptera)

### Damage symptoms

Caterpillars make leaf nests by webbing the leaves using silken threads and feed from inside. Single caterpillar makes several cases. Young larvae prefer tender leaves while the older larvae prefer matured leaves.

### Bionomics

Brown coloured adult moth is bell shaped in outline while at rest. Eggs are laid in masses on the upper surface of mature leaves. Egg period 6 – 8 days, larva green, larval period 20-30 days. Pupation takes place inside the leaf cases. Pupa green initially and turns reddish brown later. Pupal period 9 – 15 days.



### Management

Spray endosulfan 35 EC or phosalone 50 EC or chlorpyrifos 20 EC or malathion 50 EC 1000 ml with 500 L water/ha

## 7. Tea leaf roller: *Caloptilia theivora* (Gracillariidae: Lepidoptera)

Second instar larvae mine the tender leaf and reaches leaf margin. Fourth instar larva rolls the leaves from tip downwards. Larva yellowish. Adult is a microlepidopteran with long antenna, golden iridescent patches in forewing and abdomen.



### Management

Spray NSKE 5 % or endosulfan 35 EC, phosalone 35 EC, chlorpyrifos 20 EC, dimethoate 30 EC, malathion 50 EC, phenthoate 50 EC 1000 ml with water 500 L per ha

## 8. Scales: *Saissetia coffeae* (Coccidae: Hemiptera)

### Damage symptoms

Vegetatively propagated clones are susceptible. Presence of hemispherical brown scale along the midrib and tender stem. Sooty mould found on lower leaves.



**Bionomics:** Nymphs are white. Adult male is winged. Female is sedentary



### **Management**

Spray any of the following insecticides viz., carbaryl 1 kg or endosulfan 35 EC or quinalphos 25 EC or chlorpyrifos 20 EC 1000 ml/ha or ethion 50 EC 500 ml or profenofos 50 EC 800-1000 ml with 500 L water/ha

### **9. Thrips: *Scirtothrips bispinosus* (Thripidae: Thysanoptera)**

#### **Damage symptoms**

Thrips lacerate leaf tissues and suck oozing sap. Lacerations appear as brownish irregular streaks or silvery patches on the leaf surface. Infested leaves become distorted, crinkled or mottled. Damage is more pronounced in exposed areas during dry weather.

#### **Bionomics**

Adults are minute. Wings are characteristically fringed with fine hairs. Thrips insert eggs singly into the leaf tissues. Eggs hatch in 9 days. There are two nymphal instars followed by prepupal and pupal stages. The pupae remain on the leaf, or drop to the ground. Immature stages last for 3 weeks. Under favourable conditions, there could be 12 generations in a year.

#### **Management**

- Maintain optimum overhead shade.
- Spray any of the following insecticides viz., endosulfan 35 EC 500 ml, malathion 50 EC 400-500 ml, chlorpyrifos 20 EC 500 ml, dimethoate 30 EC 200-300 ml or ethion 50 EC 500 ml or profenofos 50 EC 800-1000 ml with 500 L water/ha.

#### 10. Tea jassid: *Empoasca flavescens* (Cicadellidae: Hemiptera)

Adults and nymphs suck plant sap from tender leaves. Leaves curl downwards, gradually turn brown and dry up. Severity is more in North Eastern India. Wedge shaped nymphs green, adult yellowish green. Eggs are inserted singly into the leaves. Egg period 6 – 13 days, nymphal period 8 – 10 days



#### 11. Aphid: *Toxoptera aurantii* (Aphididae : Hemiptera)

It is a polyphagous species attacking tea and other host plants such as coffee, cacao, citrus etc. Colonies of aphids are seen on tender shoots of tea immediately after pruning. Leaves curl up and shoot growth is stunted. Ants attend aphids for their honeydew. Honey dew fallen on the leaves facilitates the growth of black sooty mould fungus. Adult is dark brown in colour. Both alate and apterous forms exist.



## II. PEST OF COFFEE

Both Arabica and robusta coffee are attacked by about one dozen insect pests, only a few of which are serious, some of them being specific to one or the other variety. The coffee stem borer is the pest of Arabica coffee, whereas the shot hole borer prefers robusta coffee. In certain areas the severe attack of white stem borer leads to discontinuation of the crop.

Major pests				
1.	White stem borer	<i>Xylotrechus quadripes</i>	Cerambycidae	Coleoptera
2.	Red borer	<i>Zeuzera coffeae</i>	Cossidae	Lepidoptera
3.	Shot hole borer	<i>Xylosandrus compactus</i>	Scolytidae	Coleoptera
4.	Berry borer	<i>Hypothenemus hampei</i>	Scolytidae	Coleoptera
5.	Green scale	<i>Coccus viridis</i>	Coccidae	Hemiptera
Minor pest				
6.	Mealy bug	<i>Ferrisia virgata</i> , <i>Planococcus lilacinus</i> , <i>P. citri</i>	Pseudococcidae	Hemiptera

## Major pests

### 1. White stem borer: *Xylotrechus quadripes* (Cerambycidae : Coleoptera)

#### Distribution and status

White stem borer is the most serious pest of *Arabica* coffee in India. It occurs in China, Thailand, Sri Lanka and Vietnam.

#### Host range

*Arabica* coffee is the most preferred and principal host plant. Alternate host plants include *Robusta* tree coffee, teak, *Oleadioica* etc. However, borer usually does not breed in these plants.

#### Damage symptoms

Presence of ridges on the stem; yellowing of leaves. Grubs bores into the branches and cause wilting and occasional drying of plants. Young plants (7 to 8 years old) attacked by the borer may die in a year, while older plants withstand the attack for a few seasons. However, such plants are less productive, yielding more of floats.



#### Bionomics

Egg period 10 days, grub period 10 months, pupal period 30 days. Grub white or yellowish with anterior end broader and tapering towards tail end. Adult is a black, elongate beetle with grey pubescence on the head, thorax and elytra. Characteristic white markings are seen on the elytra.



#### Management

1. *Arabica* coffee grown under inadequate shade is highly prone to attack. Provide optimum shade.
2. Trace the infested plants prior to the adult flight periods (March - September) by tracing the ridges on the stem. Avoid injuries on stem and roots.
3. Uprooted stem / plants should not be heaped inside the plantations.
4. Remove the loose scaly barks of main stem and primaries using coir glove or coconut husk to remove cracks and crevices on which eggs are normally deposited. Do not

use any sharp implements. Spray and swab the main stem and thick primaries once in April- May and October - December with Lindane 20 EC 1.25 lit + 200 ml Teepol in 500 L water at the time of peak adult activity (March and September). NSKE 5% also can be applied frequently.

5. Spray *Beauveria bassiana* available as a wettable powder formulation

## 2. Red borer: *Zeuzera coffeae* (Cossidae: Lepidoptera)

**Distribution and status:** Widespread in coffee producing areas

**Host range:** Tea, cinnamon, sandal, cotton, orange, teak and many forest trees.

### Damage symptoms

Larva causes damage in Arabica and Robusta coffee by boring into young stem, primary and secondary branches to feed on the wood. In early stages of attack, young plants or branches show signs of wilting. Infested part bears one or two holes through which, pellet-like excrement of the larva hangs out and accumulate at the base of the plant. In advanced cases, the branch or the whole plant dries up.

### Bionomics

Eggs are laid in strings on the barks. Egg period is 8 to 12 days. Red larva enters through the junction of leaf stalk and twig, constructs a tunnel that extends even up to the roots. Larval and pupal stage together last for about 12 to 24 months. After moth emergence, pupal skin protrudes outside through exit hole. Adult is a medium sized moth with spotted wings.



### Management

1. Cut and burn red borer infested plant or twigs
2. Encourage the activity of braconid parasitoid, *Amyosoma zeuzerae*
3. Use entomopathogen pathogen *Beauveria bassiana* as in the case of white borer management.

## 3. Shot hole borer: *Xylosandrus compactus* (Scolytidae: Coleoptera)

**Distribution and status:** Serious pest of south India

### Host range

Anmola, Avocado, Clerodendron, cocoa, Crotalaria, croton, dadap, Dendrobium, mahogany, mango, neem etc.

## Damage symptoms

Small holes can be seen on the undersurface of young succulent branches between nodes. Withered or dried branches with shot-holes indicate the presence of the pest. Attacked branches dry up. Leaves above the point of attack fall prematurely. Terminal leaves wilt, droop and dry. Withering is faster in young branches and delayed in older twigs. Severe infestation results in the loss of productive branches. Due to the loss of primaries, establishment of young plantations is delayed.



## Bionomics

Adult beetle is brown to black with a short, sub cylindrical body. Females are darker and larger, whereas males are dull and small. Body is covered with fine hairs. Female beetle bores into the bark of tertiary branches and lays upto 50 eggs. Egg period 7 days, grub period 20 days and grub feed on ambrosia, a fungal growth developed on the beetle excreta. Grubs pupate near the exit in cocoons. Pupal period 10 days and the lifecycle is completed in 35 - 45 days. There are several generations in a year.



## Management

1. As soon as the first symptoms of attack like drooping of leaves is noticed (from September) prune affected twigs 2 to 3 inches beyond the shot-hole and burn as a routine measure at regular intervals.
2. Remove and destroy all the unwanted/infested suckers during summer as the pest prefers to breed during dry weather.
3. Maintain thin shade and good drainage.
4. Spray endosulfan 35 EC 1.0 L in 500 L water per ha

## 4. Berry borer: *Hypothenemus hampei* (Scolytidae: Coleoptera)

### Distribution and status

Cosmopolitan and reported in 58 coffee growing countries. Under Indian conditions, Robusta suffers badly than Arabica as the latter is harvested early, and the pest build up is more when Robusta ripens.

### Host range

Females take shelter in the seeds of *Crotalaria*, *Lantana*, *Maesopsis*, tamarind, tea etc, without feeding and breeding.

### Damage symptoms



Presence of small round hole in the navel region of developed berry is the main symptom. Grubs tunnel in berry, feed on bean and damage endosperm by making small galleries near the main tunnel. As a result, tender berries drop.

### **Bionomics**

Adult berry borer is a small black beetle with a sub cylindrical body covered with thick hairs. Female lays about 30 – 50 eggs in the tunnel. Eggs hatch in about 10 days. Larvae feed on the beans, making small tunnels. Larval and pupal periods last for 20 and 7 days respectively. Development from egg to adult takes 30 days. Sex ratio is 10:1. Mating takes place inside the berries.



### **Management**

1. Maintain thin shade and proper training of the plant.
2. Harvesting should be perfect without any left over beans on plants sole.
3. Harvest of the left over (gleaning) reduces the inoculum to a great extent
4. Dry the berries to the following moisture level  
Parchment - 10%, Arabica cherry - 10.5%, Robusta cherry - 11.0%
5. Spray white muscardine fungus *Beauveria bassiana*
6. Spray endosulfan 1.0 L in 500 L water/ha at the time of initial berry formation
7. Seed beans may be transported after thorough disinfestations.

### **5. Green scale: *Coccus viridis* (Coccidae: Hemiptera)**

**Distribution and status:** India, Sri Lanka, Bangladesh, Myanmar, Thailand and Malaysia.  
Widespread serious pest in tropics.

**Host range:** Citrus, mango, loquat, guava, sapota and a number of weeds.

### **Damage symptoms**

They congregate on the undersurface of leaves close to the midrib and veins, on the green shoots, spikes, berries etc., and suck sap. Severe infestation results in death of the plant. The infested leaves may curl up and tender twigs droop. Honeydew excreted by the scale forms a layer on the leaves and acts as a medium for the growth of the “sooty mould”. Green scale is attended by various species of honeydew seeking ants. Certain ants especially the red ant and the cocktailed ant drive away the natural enemies. Removal of honeydew by ants further enhances survival of nymphs.



### Bionomics

Adult scale is flat, oval, light green with an irregular, distinct intestinal loop of blackish spots visible through the dorsum. It is sedentary and leads its whole life usually in one place. Reproduction is by parthenogenesis. Female produces up to 600 progenies. Nymphs develop when the eggs are inside the body, and hatch out at the time or immediately after extrusion. Nymphs are pale yellow. There are three nymphal instars with a total duration of 4 to 6 weeks. Nymphs are disseminated on their own, or through wind. Green scale is a summer pest, proliferating during hot dry weather.



### Management

1. Spray white halo fungus *Verticillium lecanii* fungus @  $6 \times 10^6$  spores/ml.
2. Release Australian ladybird beetle *Cryptolaemus montrouzieri* @ 750/ha
3. Spray quinalphos 1.0 L in 500 L water/ha

### Minor pests

**6. Mealy bug:** *Ferrisia virgata*, *Planococcus lilacinus*, *P. citri* (Pseudococcidae: Hemiptera)

**Host range:** Citrus, guava and mango

**Damage symptoms**

Mealy bugs infest tender branches, nodes, leaves, spikes, berries and roots in large numbers. Both nymphs and adults suck the sap. Young plants succumb to heavy infestation. Leaves become chlorotic, flower buds abort and berries become small if severely infested. A black fungus (sooty mould, *Capnodium* sp.) develops on the honeydew excreted by the bugs. Consequently, the leaves of infested plants become black, affecting photosynthesis.



### Bionomics

They are small, soft bodied insects. Adult female is wingless. Oval body is clothed with mealy secretion in the form of small, white threads. Males are rare, small and winged. Reproduction is mainly through parthenogenesis. Female lay 100 to 1000 eggs. Eggs hatch in 3 days. The first instar nymphs crawl and settle in a place for feeding and secrete the mealy covering over the body. Nymphs are disseminated by wind also. There are three nymphal instars. Life cycle is completed in about a month. Mealy bugs multiply rapidly during hot weather with the cessation of monsoon. Nymphs and adults from the root zone migrate to the aerial parts, settle down, feed and reproduce. Intermittent showers and irrigation help in the build up of the pest. Excessive removal of shade in Robusta plantations often leads to flare up of mealy bugs.



*Ferrisia vigata*



*Planococcus lilacinus*



*P. citri*

### Management

- Spray 500 ml quinolphos 25 EC or fenitrothion 50EC in 750 L of water /ha

### Questions

1. Give the scientific name of the coccid pest of tea- ***Saissetia coffeae***
2. Which sex of the coffee scale is sedentary - **Female**
3. Presence of chewed tissue at the collar region of tea sapling is the damage symptom of \_\_\_\_\_  
**Sapling borer: *Sahyadrassus malabaricus***
4. Adult moths hang vertically by the support of two pairs of legs. Third pair of legs is weak and has scent glands in male. Give the scientific name of the pest - ***Sahyadrassus***

**malabaricus**

5. Presence of round shot holes in primary branches and mortality of buds and dieback symptoms in branches occur due to \_\_\_\_\_ - **Shot hole borer, *Euvallacea fornicates***
6. Name two mites infesting tea - **Scarlet mite: *Brevipalpus californicus*, Red spider mite: *Oligonychus coffeae*; Purple mite, *Calacarus carinatus*; Pink mite or orange mite: *Acaphylla theae*; Yellow mite: *Polyphagotarsonemus latus***
7. Name the important mirid pest of tea - **Tea mosquito bug, *Helopeltis theivora***
8. Name the aphid infesting tea- ***Toxoptera aurantii***
9. Name a micro lepidopteran insect which infests tea - **Tea leaf roller, *Caloptilia theivora***
10. \_\_\_\_\_ is the most serious pest of *Arabica* coffee in India.- **White stem borer**
11. *Beauveria bassiana* can be used in the management of \_\_\_\_\_ in coffee- **Red borer, *Zeuzera coffeae*, White stem borer: *Xylotrechus quadripes***
12. Name the entomopathogen used in the management of coffee green scale- **Fungus *Verticillium lecanii***
13. Robusta suffers badly than Arabica from \_\_\_\_\_ **Berry borer, *Hypothenemus hampei***
14. Red borer, *Zeuzera coffeae* is a Coleopteran –Say true or false
15. The activity of braconid parasitoid, *Amyosoma zeuzerae* is encouraged for the control of \_\_\_\_\_ - **Red borer, *Zeuzera coffeae***
16. Assam tea is more susceptible to \_\_\_\_\_ Pink mite *Acaphylla theae*
17. An erect knobbed process on the scutellum is characteristic of \_\_\_\_\_ **tea mosquito bug.**
18. ----- ties the margin of tender tea leaves and forms a case enclosing the bud  
**Flush worm**