

PEST OF GUAVA

Bark borer; *Indarbella tetraonis*; Cossidae; Lepidoptera.

Fruit borer; *Dichocrosis punctiferalis*; Crambidae; Lepidoptera.

Tea mosquito bug; *Helopeltis antonii*; Miridae; Hemiptera.

White fly; *Aleurotuberculatus psidii*; Coccidae; Hemiptera.

Thrips; *Scirtothrips dorsalis*; Thripidae; Thysanoptera.

Castor semilooper; *Achaea janata*; Noctuidae; Lepidoptera.

Guava scale; *Chloropulvinaria psidii*; Coccidae; Hemiptera.

Striped mealy bug- *Ferrisia virgata*; Pseudococcidae; Hemiptera.

BARK BORER

SYMPTOMS

- The caterpillar bores into young fruits.
- Feeds on internal contents.
- Dry up and fall off in without ripening.

BIOLOGY

Larva- Pale greenish with pink tinge and fine hairs with dark head

Adult- Yellowish moth with black spot in wing and body

IPM

- Collect and destroy the damaged fruits.
- Clean cultivation.
- Breaking the soil and flooding for 24 hours.
- Soil drenching.
- Gibberlic acid treatment of fruits at 50% conc.
- Proper agronomic practices should be done.
- Use resistant or less susceptible varieties.
- Covering the fruits with plastic bag or muslin cloth to overcome the damage by birds.
- Keep the orchard free from weeds.
- Use recommended chemicals at recommended dose.

PESTS OF BANANA

1. Banana rhizome weevil: *Cosmopolites sordidus*: Curculionidae: Coleoptera
2. Banana pseudostem borer: *Odioporus longicollis*: Curculionidae: Coleoptera
3. Banana aphid: *Pentalomianigronevosa*: Aphididae: Hemiptera
4. Banana flower thrips: *Thripsflorum*: Thripidae: Thysanoptera
5. Scale: *Aspidiotus destructor*: Diaspididae: Hemiptera
6. Fruitfly: *Bactrocera dorsalis*: Tephritidae: Diptera
7. Banana leaf thrips: *Stenchantothrips biformis*: Thripidae: Thysanoptera

Banana Pseudostem borer:

Symptoms:

- Grubs bore holes and tunnels inside the pseudostem. Jelly exudation on the stem indicates the activity inside the pseudostem.
- The Grubs are responsible for riding of the pseudostem and causing serious damage.
- Affected plants show withering symptoms.
- On severe infestation the affected plants break or topple along with the bunch.

Biology:

- Eggs are laid inside the air chambers of the leaf sheath.
- Adult is shiny black coloured medium sized weevil.
 - Egg period- 5 to 8 days
 - Grub period- 26 days
 - Pupal period- 10 to 12 days
 - Adult period- 20 to 26 days

Integrated Pest Management (IPM):

- Select healthy planting material.
- Weed free cultivation helps in reducing the spread of infestation.
- Removal and destruction of older and dried leaves.

- Collect the pseudostem weevils by using longitudinal split trap of 30 cm length
@ 10/ha.
- Collection of adult weevils with the help of disc stump trap of 25 cm above the ground level.
- Rhizome treatment 40g carbofuran plus clay soil slurry to control nematodes.
- Desucking and removal of water sucker practices should be followed in banana field.
- Collect and burn the affected or dried banana leaves.
- Earthing up should be followed.
- Proper agronomic practices should be done in the banana field.
- Judicious application of fertilizers and irrigation has to be followed.
- Use resistant or less susceptible varieties (Poovan and Kadali).
- Use sex pheromone trap Cosmolure which attracts the male and female and kill them.
- Crop rotation has to be followed.

BRINJAL HADDA BEETLE

Common name : Hadda beetle

Scientific name : *Henosepilachna vigintioctopunctata*

Family : Coccinellidae

Order : Coleoptera

Symptoms

- Both adult and grubs feed by scrapping chlorophyll from epidermal layer of leaves.
- The leaves give a stifled appearance.
- In severe infestation all leaves may be eaten off leaving only the veins intact and plants may wither.

Biology

- Egg period : 2 to 4days
Egg is cigar shaped, laid in clusters on lower leaf surface
- Grub period: 10 to 35 days
Grub is yellowish, bearing 6 rows of longitudinal spines.
- Pupal period : 5 to 6 days
Pupa is yellowish with spines on posterior part; anterior portion being devoid of spines
- Adult period : 20 to 50 days
Adult has 14 spots on each elytra, deep red.

Integrated Pest Management (IPM)

- Collect damaged leaves with grubs and egg masses and destroy them
- Shake plants to dislodge grubs,pupae,adult and destroy
- Summer ploughing
- Adopt clean cultivation
- Crop rotation
- Trap cropping
- Use resistant or less susceptible varieties
- Release egg parasitoids *Trichogramma sps*
- Spray NSKE 5%

- Judicious application of irrigation and fertilizers
- Conserve natural enemies in brinjal eco system
- Remove weeds
- Proper agronomic practices should be done
- Spray Carbaryl 50WP 3gm/l
- Use recommended chemicals at recommended dose
- Emulsify 1lt of neem oil with 60 gm of soap dissolved in ½ lt of water, dilute emulsion by adding 20lt of water, then mix about 400gm of well crushed garlic and spray

PESTS OF POMEGRANATE

1. Fruit borer ; *Virachola Isocrates* ; Lycaenidae ; Lepidoptera
2. Fruit fly ; *Bactrocera zonata* ; Tephritidae ; Diptera
3. Whitefly ; *Siphonimus phillyreae* ; Aleyrodidae ; Hemiptera
4. Aphid ; *Aphis punicae* ; Aphididae ; Hemiptera
5. Thrips ; *Retithrips syriacus* , *Rhiphorothrips creuntatus* ;Thripidae ;Thysanoptera
6. Mealybug ; *Ferrisia virgata*,*Pseudococcus lilacinus* ; Pseudococcidae ;Hemiptera
7. Hairy caterpillar ; *Euproctis fraternal* ; Lymantridae; Lepidoptera
8. Slug caterpillar ; *Latoia lepida* ; Cochlididae ; Lepidoptera
9. Caster semilooper ; *Achaea janata* ; Noctuidae ; Lepidoptera
- 10.Red spider mite ; *Tetranychus punicae* ; Tetranychidae ; Acarina
- 11.Eriophyid mite ; *Aceria granati* ; Eriophyidae ; Acarina
- 12.Bag worm ; *Clania crameri* ; Psychidae ; Lepidoptera

Symptoms of fruit borer (*Virachola Isocrates*) :

- Pomegranate fruit borer is most important and destructive pest of pomegranate distributed throughout the country
- It is the fruit borer feed on internal content of the fruit and cause economic damage , reduce marketability and yield
- This pest cause 40 – 90 % damage to fruits
- Severe infestation is dropping flower buds and fruits

Biology :

- Egg period : 4-5 days (Egg is white color)
- Larval period : 18-50 days (Larva is dirty brown color)
- Pupal period : 7-8 days
- Adult period : 8 days (Adult is bluish brown butterfly)

Integrated pest management :

- Collection and destruction of the affected fruits
- Prune and burn infested shoots
- Growing less susceptible varieties
- Cover the fruits with polythene bag or muslin cloth with small holes for aeration
- Spray NSKE 5% or Neem oil 3%
- Release egg parasitoids *Trichogramma sp*
- Training and pruning the dry parts of plant
- Orchard should be clean
- Free from weeds
- Clean cultivation
- Agronomic practices should be done
- Use recommended chemicals at recommended dose
- Avoid use of excessive Nitrogenous fertilizers

PESTS OF GRAPES

1. Stem Gridler; *Sthenias Grisator*; Cerambycidae; Coleoptera
2. Flee Beetle ; *Scelodonta strigicollis* ; Chrysomelidae ; Coleoptera
3. Leaf Roller: *Sylepta lunalis* : Pyralidae : Lepidoptera
4. Sphingid ; *Hippotion celerio* ; Sphingidae ; Lepidoptera
5. Berry Thrips ; *Sirthrips dorsalis* ; Thripidae ; Thysanoptera

Stem gridler

Symptom

- The adult beetle causes ringing on the vines.
- The affected branches wilt.
- In case of, severe infestation the whole plant dies.

Biology

- Adult Female lays the eggs underneath the bark
- Grub –Head is dark brown colour, pairs of strong mandibles.
- Adult –Medium sized ,grey coloured with a white spot in the centre of each elytra.

Integrated pest Management (IPM)

- Clean Cultivation
- Proper agronomic practices should be done
- Crop rotation has to be followed
- Training and pruning the plants.
- Collection and destruction of gridled branches.
- Hand picking of adult beetles at night with the help of torches.
- Judicious application of fertilizer and irrigation.
- Set up light traps @ 1 per acre.
- Spraying Endosulfan 0.007% or Carbaryl 0.1% immediately after pruning and repeated two or three times at 15 days interval.

PESTS OF BER

A.BORERS

1. Ber Fruitfly ; *Carpomyia vesuviana*; Tephritide; Diptera
2. Fruit borer; *Meridarchesscyrodes*; Carposinidae; Lepidoptera

B.LEAF FEEDERS

3. Leaf butterfly – *Tarucus indica* (*Theophrastus*); Lycaenidae; Lepidoptera
4. Hairy caterpillar – *Thiacidas postica*; Lymantriidae; Lepidoptera

BER FRUITFLY

Symptoms of damage:

- The maggots feed on the fruit pulp
- The fruits emit a foul smell and fruits rendered unfit for marketing

Biology:

- Egg period – 2-3 days. Female lays 20-25 egg
- Larval period – 7-10 days. Maggot is yellow in colour
- Pupal period – 14- 20 days.
- Adult fly is small fly with black spots on the thorax and dark spots on the wings

IPM:

- Clean Cultivation
- Plant sanitation
- Adopt proper agronomic practices.
- Collection and destruction of infested fruits
- Removal of wild ber bushes which serves as a alternate host
- Destroy puparia by digging the soil under tree canopy and incorporate Lindane 1.3 D@ 30g / tree
- Collect and burn the affected materials at pruning
- Set up sex pheromone traps to monitor activity of flies
- Set up light traps one per acre
- Plough the interspaces during summer to expose the puparia
- Spray NSKE 5%

- Spray malathion 50 EC 2ml/l.

PESTS OF FIG

1. Fig blister mite- *Aceria ficus*; Eriophyidae;Acarina
2. Carpenter worm- *Prionoxystus robiniae*; Cossidae;Lepidoptra
3. Darkling ground beetle- *Blapstinus fuliginosus*;Tenebrionidae;Coleoptera
4. June beetle - *Cotinis texana*; Scarabidae; Coleoptera
5. Fig scale insect - *Parla toriaoleae*; Cerococcidae; Hemiptera

Fig blister mite:

Symptoms:

- ✓ Blister on surface of leaves which cause leaves to be russetted.
- ✓ Twigs may be stunted and leaves may drop from trees.
- ✓ It transmit fig mosaic virus.
- ✓ The fig mite infests bud scales and young leaves.
- ✓ It suck plant cells from tree foliage.
- ✓ Webbing on the leaves.
- ✓ Tiny dots on the leaves and bronze, yellow(or) red leaves are common symptoms.

Biology:

Egg-White colour

Larva-Brown

Adult-Yellow colour

Integrated Pest Management (IPM):

- ✓ Summer ploughing

- ✓ Adopt clean cultivation
- ✓ Use resistant (or) less susceptible varieties.
- ✓ Collection and destruction of affected parts from trees.
- ✓ Applications of horticultural oils (or) sulfur sprays are effective at controlling blister mites and should be applied if the mites were a problem the previous year.
- ✓ Insecticide is to be applied before bloom.
- ✓ Reduce the virus transmission.
- ✓ Do not collect propagation material from any affected fig trees.
- ✓ Remove weeds and debris from around the fig tree.
- ✓ Spraying a steady stream of water on the host plant to knock-off mites.
- ✓ Spray neem oil at 3%.
- ✓ Use recommended chemicals at recommended dose.
- ✓ Monitor leaves about a month after emerging of mites by using a 20x hand lens to reduce virus transmission.

PEST OF STAR GOOSEBERRY

1. Leaf roller ;*Caloptilia acidula* ;Gracillariidea ;Lepidopter
2. Whitefly ;*Trialeurodes rara* ;Aleyrodidea ;Hemiptera
3. Aphid ;*Setaphis bougainisillia*;Aphididea ;Hemiptera
4. Fruit borer ;*Deudorix Isocrates* ;Lycaenidea ;Lepidoptera
5. Fruit pierching moth ;*Othreis maternal, O.fullonica and O.ancilla*;
Noctuidae ;Lepidoptera.
6. Mealy bug ;*Ferrisia virgata* ;Pseudococcidea ;Hemiptera

Fruit borer

Symptoms and Damage:

- Larva bores into the fruit in different phases.
- Young larva feed on tender fruits.
- Grown up larva attack matured fruits.
- Infested tender fruits turn brown initially, and become black later.
- Matured fruits start decaying from one side, which gradually spreads all over, before they fall off.

Biology:

- Egg period :3-4 days
- Larva period :6-8 days
- Pupa period :14-16 days
- Adult period :4;6 days

Integrated pest management (IPM)

- Collection and destruction of damaged fruits.
- Remove alternate hosts pomegranate, guava, sapota, tamarind.
- Release egg parasitoids *Trichogramma chilonis* at 10 days intervals 4 times.
- Inundative release of *Trichogramma chilonis*@ 15cc/ha.
- Spray NSKE 5%, Neem oil 3%
- Adopt clean cultivation.
- Summer ploughing.
- Set up sex pheromone trope @ 12/ ha.
- Set up light trope @ 1/ha.

PESTS OF WOOD APPLE

1. Fruit borer; *Deudorix isocrates*; Lycaenidae; Lepidoptera

2. Wood apple borer; *Euzophera plumberrifaseilla*; Phycitidae; Lepidoptera

3. Koa seed moth (or) Litchi borer; *Argyroplote illepida*; Tortricidae; Lepidoptera

4. Shoot and capsule borer; *Conogethus punctiferalis*; Pyraustidae; Lepidoptera

1. Fruit borer:

Symptoms and damage:

- Caterpillar bores into young fruits and feed on internal contents (pulp and seeds).
- Fruit rotting and dropping.

Biology:

- Egg period-7-10 days.
- Larval period-18-47 days.
- Pupal period-7-34 days.
- Adult period-8 days.

Integrated pest management:

- Collect and destroy damaged fruits.
- Clean cultivation as weed plants serve as alternate hosts.
- Endemic areas – grow less susceptible varieties.
- Cover the fruit with polythene bags when the fruits are up to 5cm.
- Use light trap @ 1/ha to monitor the activity of adults.
- Malathion 50EC 0.5 % or two rounds, one at flower formation and next at fruit set.
- Flowering stage – spray NSKE 5% or neem formulation 2ml/litre.
- Apply dimethoate 30EC 1.5ml /litre.
- Release *Trichogramma chilonis* at one lakh/acre.
- Follow proper agronomic practices.

- Judicious application of irrigation water and fertilizers.

PESTS OF JAMUN

- 1) Jamun white fly ; *Bemisia tabaci* ;Aleyrodidae ;Hemiptera
- 2) Deaths head moth ; *Acheronti styx* ; Sphingidae ; Lepidoptera
- 3) Leaf twisting wheevil ; *Apoderus tranqueba ricus* ;Attelabidae
Coleoptera
- 4) Three striped fruit fly ; *Bactrocera diversa* ; Tephritidae ; Diptera
- 5) Stellata scale (or) star scale ; *Ceroplastes stellifer* ;Cocconidae;
Hemiptera
- 6) Tea tortrix moth ; *Homona coffearia* ; Tortricidae ; Lepidoptera

Symptoms of Jamun white fly :

- White fly cause direct damage to plants by sucking plant sap.
- Removing plant nutrients there by weaking the plants.
- Damage may be more severe when plants are under water stress.
- It is produce sooty mould on the lower leaves.
- Yellowing of infested leaves.
- Dropping of affected leaves.
- Nymphs and adult suck the sap from leaves.

Affected plant stages:

Seedling ,vegetative growing and flowering.

Biology:

Egg period :8 days

Nymph period:5 to10 days

Life cycle complete in 18 days to 35 days

Integrated Pest Management (IPM) :

- Collect and destroy the damaged plant parts.
- Clean cultivation.
- Proper agronomic characters should be done.
- Training and pruning the affected plants.
- spray NSKE 5%
- Timely harvest the berries.
- Avoid use of excessive N fertilizer
- Use resistant and less susceptible varieties.
- Drunch soil around the base of the plants with lindane.
- Affected plants should be uprooted and burning.
- Use judicious application of fertilizers.
- Installation of yellow sticky traps or use yellow colour hard plastic sheet , coated with oil and hang it in the infested area.
- Spray neem oil (commercial formulation) @ 2ml/litre
- During heavy infestation spray trizophos @ 2ml/litre

PESTS OF PINE APPLE

- 1.Mealy bugs -*Dysmicoccus brevipes*; Pseudococcidae; Hemiptera
- 2.Thecla moth - *Thecla basilides*; Lycaenidae; Lepidoptera
- 3.Elaphria moth –*Elaphria nucicolora*;Noctuidae; Lepidoptera
- 4.Leaf worm -*Spodoptera littoralis*;Noctuidae;Lepidoptera
- 5.Termites -*Odontotermus obesus*;Termitidae;Isoptera

Mealy bug:

Symptoms:

- ✓ It sucking sap from roots, tender leaves, petioles, and fruit.
- ✓ They excrete honeydew on which sooty mould develops.
- ✓ Severely infested leaves turn yellow and gradually dry. Severe attack can result in shedding of leaves, inflorescence and young fruit, reduced fruit setting.
- ✓ The foliage and fruit may become covered with honeydew, which reducing photosynthetic efficiency and may lead to leaf drop.
- ✓ Contamination of honeydew with fruit reduces the market values.
- ✓ Feeding on fruits results in discoloured bumpy and scarred fruit.
- ✓ It cause stunting of roots, rotting of roots and subsequent wilting of the plant.
- ✓ It cause decaying of suckers.
- ✓ Insects attract ants which may also be present.
- ✓ Plants may show symptoms of mealybug wilt.

Biology:

Egg - white in colour.

Nymphs- yellow in colour.

Adult - soft bodied, elongate, white in colour.

Integrated Pest Management(IPM):

- ✓ Summer ploughing.

- ✓ Clean cultivation.
- ✓ Use resistant or less susceptible varieties.
- ✓ Collection and destruction of damaged parts.
- ✓ Early detection of mealy bugs is necessary for effective control.
- ✓ Pruning and removing heavily infested plants.
- ✓ Spraying a steady stream of water on the host plant to knock-off mealy bugs.
- ✓ Ensure the soil fertility which increase plant resistant against mealy bugs.
- ✓ Avoid water stagnation in field.
- ✓ Ant populations which tend the mealy bugs should treat with an appropriate insecticide.
- ✓ The field has to be kept weed free.
- ✓ Most common natural enemies include lady bird beetles, lace wings.
- ✓ All neem products have a repellent effect on some mealy bugs.
- ✓ Spray NKWE concentration of (1-25%).
- ✓ Use recommended insecticide at recommended dose.

Pests of papaya

1. Papaya mealybug; *Phenacoccus marginatus*; Pseudococcidae; Hemiptera
2. Papaya whitefly; *Bemisia tabaci*; Aleyrodidae; Hemiptera
3. Ash weevil; *Myloccerus discolor*; Curculionidae; Coleoptera
4. Fruitfly; *Bactrocera dorsalis*; Tephritidae; Diptera
5. Green peach aphid; *Myzus persicae*; Aphididae; Hemiptera

Symptoms:

- Papaya mealy bug infestation appears on above ground parts on leaves stem and fruits as clusters of cotton-like masses.
- Waxy coating on papaya fruit.
- Crinkled leaf of papaya.
- The insects suck the sap by inserting its stylets into the epidermis of the leaf, fruit and stem.
- Heavy infestations are capable of rendering fruit inedible due to the build-up of thick white waxy coating.

Biology:

Egg- Egg is greenish yellow colour.

Larva- Larva is dull black colour.

Pupa- pupa was light brown colour.

Adult- male is pink colour, female is yellow colour.

Integrated Pest Management (IPM):

- Pruning and burning of crop residues.
- Removal and burning of crop residues.
- Avoiding flood irrigation.
- Avoiding the movement of planting from infested areas to the other area.
- Sanitization of farm before moving it to the equipment moving it to the uninfected crop.

- Regular monitoring of the crop for mealy bug infestation and its natural enemies.
- Spot application of insecticide immediately after noticing mealy bug on some plants in the crop field.
- Installation of yellow sticky trap.
- Spray neem oil 3% or NSKE 5%.
- Provide summer ploughing to expose the pupa.

PESTS OF TAMARIND

- ❖ Hard scale; *Aonidiella orientalis*; Diadpididae; Hemiptera.
- ❖ Mealy bugs; *Nipaecoccus viridis*; Pseudococcidae; Hemiptera.
- ❖ Thrips; *Scirtothrips dorsalis*; Thripidae; Thysanoptera.
- ❖ Lac insect; *Kerria lacca*; Lacciferidae; Hemiptera.
- ❖ Aphids; *Toxoptera aurantii*; Aphididae; Hemiptera.
- ❖ Beetles; *Lasioderma serricorne*; Anobiidae; Coleoptera.

1.HARD SCALE:

SYMPTOMS:

- It is a polyphagous pest.
- Which attack tamarind.
- Other crops like,groundnut,tomato,onion.

BIOLOGY:

- The eggs are laid under a protective covering,such as cracks in the bark of the trees.
- After hatching,the nymphs crawl in search of suitable succulent parts of the plant.

IPM:

- Collection and destruction of the affected plant parts.
- Plant sanitation.
- Training and pruning practices should be done.
- Clean cultivation.
- Set up light trap one per acre.
- Set up sex promone trap 12 per acre.
- Spray NSKE 5%.

- When the severe infestation, chemical spraying is require.
- Spray diazinon or carbosulphan at 0.1% solution provide effective control.
- Proper agronomic practices should be done.
- Summer ploughing.
- Judicious application of irrigation water and fertilizers.
- Crop rotation.
- Use resistant varieties or less susceptible varieties.
- Use recommended chemical and recommended dose.

PESTS OF PEAR

1. Stem borer ; *Sahydrassus malabaricus* ; Hepialidae ; Lepidoptera
2. Hairy caterpillar ; *Euproctis fraternal* ; Lymantriidae ; Lepidoptera
3. Leaf beetle ; *Nodostoma pubicolle* ; Eumolpidae ; Coleoptera
4. Aphid ; *Dilachnus krishnii* ; Aphididae ; Hemiptera
5. Psyllid bug ; *Cacopsylla mali*; Psyllidae ; Hemiptera
6. Ash weevil ; *Myllocerus discolour* ; Curculionidae ; Coleoptera

STEM BORER

SYMPTOMS

- Larva bore hole at the base of the stem with circular particle mat covering
- Wilting of tree

BIOLOGY

- Larva – Stout caterpillar
- Adult – Big , brownish white moth

INTEGRATED PEST MANAGEMENT (IPM)

- Remove and destroy damaged branches and tree
- Clean cultivation
- Free from weeds
- Training and pruning the dry parts of the plants
- Use light trap one per hectare to attract and kill the adults
- Iron hooking – locate the bore hole and kill the grub
- Drench the stem with chlorpyrifos 20 EC @2.5 liters of water(during February – March and September- October)
- Plant sanitation
- Proper agronomic practices should be done
- Judicious application of irrigation and fertilizer
- Spray dimethoate 0.03% or methyl demethon 0.025% or phosphamidon 0.025%
- Conserve natural enemies like coccinellid beetles

AMARANTHUS LEAF CATERPILLAR

Common name: Amaranthus leaf caterpillar

Scientific name: *Hymenia recurvalis*

Family : Pyraustidae

Order : Lepidoptera

SYMPTOMS:

- ❖ Web the leaves with silken threads and feed within
- ❖ Webbed leaves become devoid of chlorophyll and dry up

BIOLOGY:

Larva- Greenish with white lines and black crescents on thorax below the lateral lines

Adult- Small, black coloured, moth with slender body. Wings dark brown in colour with white wavy markings

INTEGRATED PEST MANAGEMENT (IPM):

- ❖ Summer ploughing
- ❖ Clean cultivation
- ❖ Collect and destroy the affected plant parts with caterpillar
- ❖ Spray recommended chemicals at recommended dose
- ❖ Setup light trap 1/ha to attract and kill the adults
- ❖ Spray malathion 50 EC 1ml/liter
- ❖ Spray NSKE 5% , Neem oil 3%
- ❖ Use resistant or less susceptible varieties
- ❖ Proper agronomic practices should be done
- ❖ Crop rotation
- ❖ Avoid use excessive N fertilizers

PESTS OF BRINJAL

1.Shoot And Fruit Borer / *Leucinodes Orponalis* / Pyraustidae /
Lepidoptera

2.Brown Leaf Hopper /*Cestius Phycitis*/ Cicadellidae/ Hemiptera

3.Ash Weevil /*Mylloceris Discolour*/ Curclionidae / Coleoptera

4.White Fly / *Bemisia Tapaci* /Aleyrodidae/ Hemiptera

MAJOR PEST

- shoot and fruit borer

SYMPTOMS:

- Larva borer into young shoots flower buds and developing fruits
- It causes shedding of shoot withering
- The affected fruits are unmarketable value

BIOLOGY

Egg Period : 2-5days (Egg white Colour)

Larva Period : 14-16 Days (Larva Pink Colour)

Pupa Period : 6-8 Days (Tough Greyish Boat Shaped Cocoon)

Adult Period : 7-8days

INTEGRATED PEST MANAGEMENT (IPM):

- Collection and destruction of damaged fruit and seeds
- Adopt clean cultivation
- Crop rotation
- Summer ploughing
- Trap cropping
- Use resistant or less susceptible varieties pusa, green long, palur-1
- Set up light trap 1/acre
- Set up sex pheromone trap 10/ac
- Release egg parasitoids trichogramma sp
- Spray NSKE 5% or neem oil 3%
- Growing fruit borer resistant varieties pusa purple cluster, arka kusmak.
- Use yellow sticky trap 10-12/ha
- Use recommended chemicals at recommended dose .

Pests of Tomato

1. Fruit borer ; *Helicoverpa armigera* ; Noctuidae ; Lepidoptera
2. Whitefly ; *Bemisia tabaci* ; Aleyrodidae ; Hemiptera
3. Leaf miner ; *Liriomyza trifolii* ; Agromyzidae ; Diptera
4. Leaf caterpillar ; *Spodoptera litura* ; Noctuidae ; Lepidoptera
5. Cotton aphid ; *Aphis gossypii* ; Apididae ; Hemiptera
6. Green peach aphid ; *Myzus persicae* ; Hemiptera
7. Striped mealy bug ; *Ferrisia virgata* ; pseudococcidae ; Hemiptera
8. Thrips ; *Thrips tabaci* ; Thripidae ; Thysonoptera
9. Jassids ; *Amrasca devastans* ; Cicadellidae ; Hemiptera
10. Fruit sucking moth ; *Otheris fullonica*/ *Otheris materna* ;Noctuidae ; Lepidoptera
11. Cabbage semilooper ; *Trichoplusia ni* ; Noctuidae ; Lepidoptera

Fruit borer:

Symptoms

- It is a polyphagous insect pest.
- Young larva feeds on tender foliage and infests fruits from fourth instar onwards.
- Bore circular holes and thrust only a part of its body into fruit and eat the inner contents. It reduces marketability and yield of tomato fruits.
- It also attacks like bendi, pulses, cotton, groundnut and chillies.

Biology

Egg period = 3-4 days [Egg is yellowish white color]

Larval period =15-17days [pale green to pale brown color larva]

Pupal period =6-8 days [Pupa is brown color]

Adult period =5-7 days [Male adult - light green color

Female adult - dark brown color]

Integrated Pest Management:

- Collect and destroy the infected fruits and grownup larvae.

- Summer ploughing.
- Use trap crop Marigold at 1:16 rows to attract female moth egg laying.
- Setup light trap 1 per acre.
- Setup sex pheromone trap with Helilure at 12 per acre.
- Hand picking the visible larvae and kill.
- Use egg parasitoids like *Trichogramma species 6* release at weekly intervals 3.5cc per hectare
- Use resistant or susceptible varieties (Karnataka variety)
- Spray NSKE at 5ml per liter of water.
- Use NPV 250 LE per hectare.
- Spray recommended chemical at recommended dose.

PESTS OF BHENDI

- Bhendi shoot and fruit borer ; *Earias vitella/Earias insulana* ; Noctuidae ; Lepidoptera
- White fly; *Bemisia tabaci* ; Aleyrodidae ; Hemiptera
- Semilooper ; *Anomis flava* ; Noctuidae ; Lepidoptera
- Leaf roller; *Sylepta derogata* ; Pyraustidae ; Lepidoptera
- Jassids ; *Amrasca devastans* ; Cicadellidae ; Hemiptera
- Fruit borer ; *Helicoverpa armigera* ; Noctuidae; Lepidoptera
- Tobacco caterpillar ; *Spodoptera litura* ; Noctuidae ; Lepidoptera
- Aphid ; *Aphis gossypii* ; Aphididae ; Hemiptera
- Thrips ; *Thrips tabaci* ; Thripidae ; Thysanoptera
- Stem weevil ; *Permptherulus affinis* ; Curculionidae ; Coleoptera
- Shoot weevil ; *Alcidodes affaber* ; Curculionidae ; Coleoptera
- Stem fly ; *Melanagromyza obtusa* ; Agromyzidae ; Diptera

BHENDI SHOOT AND FRUIT BORER

SYMPTOMS

- ❖ Larva bore holes into the tender terminal shoots in the vegetative stage as a result the terminal shoots droop, wither and dry up.
- ❖ Larva bore holes the buds, flowers and young fruits in the fruit formation stage which lead to the shredding of buds and flowers.
- ❖ Larva bore holes the fruits and feed on it.
- ❖ The entry holes are plugged with excreta.
- ❖ The yield loss ranges from 30% to 50%.
- ❖ The affected fruits become unsuitable for consumption.

BIOLOGY

Earias vitella

- Egg: Sculptured egg and sky blue in colour.
Egg period -3-5 days.
- Larva: Brownish with longitudinal white streaks dorsally and pale yellow ventrally.
Larval period- 10-12 days.
- Pupa : Brown shaped tough silken cocoon
Pupal period- 8-10 days.
- Adult: Moths are small sized with green fore wing which is bordered by two longitudinal white streaks.

Earias insulana

- Egg: Crown shaped, blue coloured.
Egg period- 3-5 days.
- Larva: Cream coloured body with orange dots on the pro-thorax.
Larval period-10-12 days.
- Pupa: Brown and boat shaped.
Pupal period- 1 week.
- Adult: Moths are small sized with a distinct fore wing.
Forewings are uniformly silvery green.

IPM (Integrated Pest Management)

- ✓ Summer ploughing has to be practiced.
- ✓ Clean cultivation has to be adopted.
- ✓ Avoid cultivation of alternative hosts such as *Hibiscus cannabinus*, *Hibiscus abelmoschus* and *Abutilon indicum*.
- ✓ Collection and destruction of infested shoots, buds, flowers and fruits.
- ✓ Trap cropping of Bhendi with Castor.
- ✓ Mixed cropping can be adopted.
- ✓ Release of egg parasitoid like *Trichogramma chilonis* @ 1.0 lakh/ha.

PESTS OF CUCURBITS

1. Fruit flies; *Bactrocera cucurbitas*; Tephritidae; Diptera.
2. Pumpkin beetle ; *Aulacophora foveicollis*; Galerucidae; Coleoptera.
3. Stem borer or clear winged moth; *Melittia eurytion*; Sesiidae; Lepidoptera.
4. Snake gourd semilooper; *Plusia peponis*; Noctuidae; Lepidoptera.
5. Pumpkin caterpillar; *Diaphania indica*; Pyraloidae; Lepidoptera.
6. Bottle gourd plume moth; *Sphenarches caffer*; Pterophoridae; Lepidoptera.
7. Leaf miner; *Liriomyza trifolii*; Agromyzidae; Diptera.

1. Fruit fly:

Symptoms and damage:

- Damage by this pest causes oozing of brown, resinous fluid from fruits and the fruits become distorted and malformed.
- The maggots feed on the pulp of fruits and cause premature dropping.
- Maggots feed on the pulp of the fruits.

Biology

- ❖ Egg period : 3 to 8 days.
- ❖ Larval period : 4 to 17 days. (Dirty white)
- ❖ Pupal period : 7 to 13 days.
- ❖ Adult period : Upto 150 days.

Integrated pest management(IPM)

- Collect infested fruits and dried leaves and burn it.
- In endemic areas change the sowing dates as the fly population is low in hot dry condition and at its peak during rainy seasons.
- Expose the pupae by ploughing and turning over the soil after harvest.
- Use ribbed gourd as a trap crop and apply carbaryl 0.15% or Malathion 0.1% on congregating adult flies on the undersurface of leaves.
- Use attractants like citronella oil, eucalyptus oil, vinegar (acetic acid).dextrose and lactic acid to trap.

- Use poison baiting in severe infestation. Saturated sugar solution 5ml – Malathion 50EC 5ml +100ml of fermented palm juice. Keep the bait in earthen lids placed at various corners of the field.
- Fruit fly resistant pumpkin varieties like Arka Swarnamuki may be grown.
- Use fish meal trap to attract and kill the flies.
- Early planting of pumpkin during October to November.
- Application of NSKE 5%.
- Hand collection and destruction of infested leaves and fruits.
- Frequent raking of soil beneath the crop to expose and kill the eggs and grubs.
- Use fly trap.
- Mix methyl eugenol+Malathion 50 EC at ratio and keep 10 ml of the bait in polythene bags @25/ha.
- Judicious application of irrigation water and fertilizers.
- Clean cultivation.
- Proper agronomic practices should be done.

PESTS OF CRUCIFEROUS

- 1 . Diamond back moth ; *Plutella xylostella* ; Plutellidae ; Lepidoptera
- 2 . Tobacco caterpillar ; *Spodoptera litura* ; Noctuidae ; Lepidoptera
- 3 . Cabbage borer ; *Hellula undalis* ; Noctuidae ; Lepidoptera
- 4 . Cabbage aphid ; *Brevicoryne brassicae* ; Aphididae ; Hemiptera
- 5 . Casbbage butterfly ; *Pieris brassicae* ; Pieridae ; Lepidoptera
- 6 . Leaf webber ; *Crocidolomia binotalis* ; Pyraustidae ; Lepidoptera
- 7 . Mustard aphid ; *Lipaphis erysimi* ; Aphididae ; Hemiptera

1 . DIAMOND BACK MOTH:

SYMPTOMS AND DAMAGE:

- The heads of cruciferous is chewed by the larva and it is unmarketable.
- Larva damage the buds of plants and causes stunted growth
- Very serious loss in terminal foliage.
- Young larva causes minning of leaves.
- The affected curd of cauliflower reduces the marketable value.

BIOLOGY:

- Egg period : 3-6 days
- Larval period : 11-12 days
- Pupal period : 3-7 days
- Adult period : 8-10 days

INTEGRATED PEST MANAGEMENT

- Collection and destruction of damaged plants.
- Avoid close planting.
- Judicious application of the irrigation water and fertilizers.
- Adopt clean cultivation.
- Follow proper agronomic practices.
- Set up sex pheromone trap 10/acre.
- Adoption of sprinkler irrigation will kill the young larva.
- Spray NSKE 5%
- Grow mustard as a trap crop[2 : 25]
- Spray NPV, GV, [250 LE/hectare] and Bt[400 g/acre]
- Release larval parasitoids *Cotesia plutrella*[1,00,000 adult/hectare]

Moringa hairy caterpillar

Systematic position:

- Common name : Hairy caterpillar
- Scientific name : *Eupterote mollifera*
- Family : Eupterotidae
- Order : Lepidoptera

Symptoms:

- Larva seen in groups in tree trunks .
- It feeds gregariously by scrapping the bark and gnawing foliage.
- Severe infestation leads to defoliation of tree

Biology:

- Egg period : 6 days (egg laid on leaves and tender stem)
- Larval period : 12 to 14 weeks (larva brown in colour with dense hair)
- Pupal period : 8 to 10 weeks (pupation takes place in the soil .
Only one generation per year)
- Adult is large size moth with uniform light yellowish brown colour with faint lines in wings.

Integrated pest management (IPM):

- Clean cultivation
- Proper agronomic practices should be done
- Use resistance varieties
- Collect and destroy the egg masses and caterpillars
- Set up light trap 1/ acre to attract and kill the adults immediately after rains
- Use burning torch to kill congregating larvae on the trunk
- Spray FORS @25g/ lit or Carbonyl 50 WP @2g /lit
- Spray fish oil rosin soap 25g /lit on the trunk and foliage immediately after rains and 15 days later
- Spray chlorpyrifos 20 EC or quinalphos 25ECor Endosulfon B5EC 1.0 in 500-750 L of water per ha

Pests of beans

1. Field bean pod borer; *Adisura atkinsoni* ; Noctuidae ; Lepidoptera
2. Gram pod borer; *Helicoverpa armigera* ; Noctuidae ; Lepidoptera
3. Plume moth ; *Exelastis atomosa* ; Pterophoridae ; Lepidoptera
4. Spotted pod borer ; *Maruca vitrata* ; Pyraustidae ; Lepidoptera
5. Flower webber ; *Eublemma hemirrhoda* ; Noctuidae ; Lepidoptera
6. Blue butterflies ; *Lampides boeticus* ; Lycaenidae ; Lepidoptera
7. Red gram pod fly ; *Melanagromyza obtusa* ; Agromyzidae ; Diptera
8. Bean aphid ; *Aphis craccivora* ; Aphididae ; Hemiptera
9. Stem fly ; *Ophiomyia phaseoli* ; Agromyzidae ; Diptera
10. White fly ; *Bemisia tabaci* ; Alerodidae ; Hemiptera
11. Mealy bug ; *Coccidohystrix insolitus* ; Coccidae; Hemiptera
12. Leap thrips; *Ayyaria chaetophora*; Thiripidae; Thysanoptera

Field bean pod borer:

Symptoms:

The larva bores inside the pod and feed on the seeds.

Bore holes on affected pods.

Biology:

Larva: Greenish having brown lateral markings and a slightly humped anal segment.

Adult: Yellow coloured having light forewings with V shaped specks and pale brown markings on hand wings.

Integrated pest management(IPM):

- Set up bird perches at 50\ha.
- Mechanical collections of grown up larva and blister beetle.
- Summer ploughing.
- Early sowing ,short duration varieties.
- Avoid close planting.
- Collect and destroy larva to the extent possible
- Set up sex pheromone traps at 5/ha.
- Set up light traps 5/acre to kill moth population.
- Crop rotation.
- Avoid excessive use of N fertilizer.
- Plant sanitation.

- Judicious application of irrigation and fertilizer.
- Release egg parasitoides like *Trichogramma chilonis* at weekly intervals at 1.5 lakh/ha.
- Application of NPV 250 LE/ha.
- Conserve green lace wing, predatory sting bugs, spider, ants
- Spray NSKE 5%.

PESTS OF AMARANTHUS

1. Amaranthus stem weevil ; *Hypolixus truncatulus* ; Curculionidae; Coleoptera
2. Amaranthus caterpillar ; *Hymenia recurvalis*; Pyraustidae; Lepidoptera
3. Leaf webber; *Eretmocera impactella* ; Heliodinidae ; Lepidoptera
4. Leaf webber; *Psara basalis* ; Pyraustidae; Lepidoptera
5. Tortoise beetle ; *Aspidomorpha exilis* ; Cassididae ; Coleoptera
6. Grasshopper ; *Atractomorpha crenulata* ; Acritidae ; Orthoptera
7. Leaf twisting weevil ; *Apoderus tranquebaricus* ; Curculionidae ; Coleoptera
8. Aphids ; *Aphis crassivora*; Aphididae ; Hemiptera
9. Mealy bugs; *Ferrisia virgata*; Pseudococcidae ; Hemiptera
10. Thrips ; *Eurylothrips crassus*; Thripidae; Thysanoptera

Amaranthus weevil:

Distribution and status

- Specific major pest and widely distributed in India and neighbouring countries.
- It attacks both wild and cultivated crops and leafy vegetables with large leaves.

Symptoms:

- Grubs bite into stems, feed on pith region making regular zigzag tunnels and fill with excreta.
- Stems split longitudinally.
- Plants dry completely.
- Adult feeds on tender leaves, makes circular holes stems, branches and mid-ribs.
- Attack causes stunting of plants, twisting and swelling of branches and stem and suppression of shoot and leaf production.

Biology:

- **Egg period:** 4 to 10 days (smooth, oval, pale yellow in colour, laid singly in stem)
- **Grub period:** 17 to 20 days (Stout, curved, legless, and white in colour)
- **Adult period:** 12 to 24 days (Ash grey in colour with brown elytra and has a very long snout)

IPM (Integrated Pest Management):

- Collect and destroy wild amaranthus hosts in the vicinity of cultivated crop
- Collect and destroy affected plant parts along with grubs and adults
- Clean cultivation
- Summer ploughing
- Collect and burning the affected leaves
- Proper agronomic practices should be done
- Use resistant varieties
- Plant sanitation
- Light traps can be setup orchards
- Proper training and pruning the plants
- Remove weeds
- Spray malathion 50 EC 2 ml/lit after the harvest of leaf
- Avoid use of excessive 'N' fertilizer

PESTS OF ROSE

SAP FEEDERS:-

1. Rose aphids; *Macrosiphum rosaeformis*; Aphididae; Hemiptera
2. Red spider mite; *Tetranychus cinnabarinus*; Tetranychidae; Acarina
3. Black fly; *Alueroanthus spiniferus*; Aleyrodidae; Hemiptera
4. Thrips; *Thrips tabaci*; Thripidae; Thysanoptera

LEAF FEEDERS:-

1. Castor semilooper; *Achaea janata*; Noctuidae; Lepidoptera
2. Gram caterpillar; *Helicoverpa armigera*; Noctuidae; Lepidoptera
3. Termites; *Odontotermus obesus*; Termitidae; Isoptera
4. Slug caterpillar; *Parasa laepida*; Cochlididae; Lepidoptera

Rose aphids; *Macrosiphum rosaeformis*; Aphididae; Hemiptera

DESCRIPTION:-

It is the most common pest in Australia. Aphids damage the plants by sucking sap from plant tissues. Aphids can breed very rapidly and built up vast numbers, especially in warm, humid weather. Females give birth to young ones by parthenogenetic and have a very short generation time. It grows by moulting through several stages.

SYMPTOMS OF DAMAGE:-

- Both Nymph and adult suck the sap from various parts and flowers by using highly specialized sucking mouth parts.
- Distortion of new leaves and flowers are the symptoms caused by rose aphids.
- It excretes large amounts of honeydew which cover the plants.
- It reduces the photosynthetic and aesthetic appeal. Severe infestation results in defoliation of the plant and loss of flowering.

BIOLOGY:-

Egg- The egg has not been described.

Nymph-Nymphs resemble wingless adults. Both green and pink forms occur in

Adult-Large aphid has long, dark legs and honey tubes. Body is pink, purplish, green and may have wings.

INTEGRATED PEST MANAGEMENT(IPM)

- Hand spraying the infected leaves and flowers with a strong jet of water.
- Pinch or squish the aphids and kill them by hand.
- Release ladybugs and pirate bugs which are predatory insects to consume rose aphids.
- Use insecticidal soaps covering the aphid's spiracles and suffocating them.
- Use yellow sticky trap at 15/ha to monitor the activity of aphids.
- Spray methyl demeton 2ml/l
- Spray NSKE or neem oil 3%
- Apply Carbofuran 3G 5g/plant
- Collection and destruction of damaged leaves and flowers.
- Acephate has systemic activity move through the foliage of the plant and kill the aphids.
- Avoid excessive use of N fertilizers.
- Pruning out heavily infested leaves, stems, buds.
- Use resistant varieties
- Cut and burn the affected branches.
- Use recommended chemicals at recommended dose.

PESTS OF CHRYSANTHEMUM

- 1) Aphids ; *Macrosiphoniella sanborni* ; Aphididae ; Hemiptera
- 2) Thrips ; *Microcephalothrips abdominalis* ; Thripidae ; Thysanoptera
- 3) Leaf Folder ; *Hedylepta indicate* ; Crambidae ; Lepidoptera
- 4) Bud Borer ; *Helicoverpa armigera* ; Noctuidae ; Lepidoptera
- 5) Hairy Caterpillar ; *Spilosoma oblique* ; Arctiidae ; Lepidoptera
- 6) Termites ; *Microtermes obesi* ; Termitidae ; Isoptera
- 7) Lesion Nematode ; *Pratylenchus coffeae* ; Pratylenchidae ; Tylenchida
- 8) Bud and Leaf Nematode ; *Aphelenchoides ritzemabosi* ;
Aphelenchoididae ; Tylenchida

CHRYSANTHEMUM APHID :

SYSTEMIC POSITION :

COMMON NAME : Chrysanthemum aphid

SCIENTIFIC NAME : *Macrosiphoniella sanborni*

FAMILY : Aphididae

ORDER : Hemiptera

SYMPTOMS :

- The chrysanthemum aphid feeds by piercing the plant surface with its thread like mouthparts to suck out plant juices.
- They gather about the terminal buds and feed on the new growth.
- This feeding causes distorted growth and the leaves may be covered by the feeding aphids' honeydew and cast skins.
- Damage by aphid's results in loss of vigour, yellowing and premature leaf fall and stunted growth of attacked plants.

- Sooty mould may grow on the honeydew giving the leaves and stems a black appearance.
- Chrysanthemum aphids are able to transmit chrysanthemum vein mottle virus and chrysanthemum virus B.

BIOLOGY :

- Nymphs are greenish-black in colour
- Adults are chocolate brown colour aphids.
- Nymphs have brick red bodies with the outer two-thirds of the legs and the antennae is grey.

INTEGRATED PEST MANAGEMENT (IPM):

- Aqueous spray application of *Vercillium lecanii* (Vertilec) @ 15 g/lit (108 CFU/g)
- Application (ultra low volume) of the entomogenous fungus *V.lecanii*
- Neem formulations can be used in rotation with regular insecticides
- Spray any following insecticides malathion 50 EC @ 1 ml/l of water,
- Infested plants in the greenhouse should be sprayed thoroughly when aphids are first noticed.
- On outdoor plantings natural enemies control minor infestations.
- Spraying of Monocrotophos @0.05% or Phosphamidon @0.02% at 15-20 days interval controls aphid population effectively.
- Grubs and adults of *Coccinellid* beetles prey upon the aphids and effectively wipe out their population.
- For chemical control,use any plant spray formulated with 1 or 2 % horticultural oil, such as canola oil and mist the spray wherever aphid activity is noticed, such as on the underside of the chrysanthemum leaves.

Pests of pepper

1. Pollu beetle ; *Longistarsus nigripennis* ; Chrysomelidae ; Coleoptera
2. Berry gall midge ; *Cecidomyia malabarensis* ; Cecidomyiidae ; Diptera
3. Hard scale ; *Lepidosaphes piperis* ; Diaspididae ; Hemiptera
4. White fly ; *Aleurocanthus piperis* ; Aleurodidae ; Hemiptera
5. Top shoot borer ; *Cydia hemidoxa* ; Eucosmidae ; Lepidoptera

Pollu beetle:

Symptoms:

- It is the most destructive pest of black pepper and causes 30 – 40% loss in yield.
- The incidence is more in Cannanore , Calicut and Kottayam areas of Kerala.
- Affected berries are with small holes , dry, dark and hallow.
- Irregular feeding holes are seen on leaves.
- The grubs bore hole into the berries of pepper. The infested berries dry up and turn dark in colour.
- Berries hollow and crumble when pressed such hollow berries are called “POLLU” (Empty).
- Grub may also eat into spike causing the entire region beyond it to dry up.

Biology:

- Young grub is yellow colour.
- Adult is oblong beetle with shiny black colour.
- Adults are small.
- Eggs are laid on tender berries
- Egg period - 5 to 8 days
- Larval period – 30 to 32 days
- Pupal period – 6 to 7 days
- Adult – Bluish yellow shining flea beetle

Integrated pest management (IPM):

- Affected plants should be uprooted.
- Remove weeds.
- Avoid use of excessive N fertilizers.
- Remove and destroy the infested berries.
- Use resistant or less susceptible varieties.
- Clean cultivation.
- Timely harvest
- Regular agronomic practices.
- Sun drying the berries.
- Spray quinolphos 25 EC , 2ml/lit for spike initiation and berry maturation.
- Cultivate close to the seedling to remove weeds and aerate soil.
- Cultivate furrow bottoms of mulched fields.
- Hand weed approximately 30 days following planting or transplanting.

PEST OF CARDAMOM

1. Shoot & capsule borer; *Dichocrocis punctiferalis*; Pyraustidae;
Lepidoptera
2. Cardamom thrips; *Sciothrips cardamom*; Thripidae; Thysanoptera
3. Cardamom aphid; *Pentalonia nigronervosa*; Aphididae; Hemiptera
4. Lacewing bug; *Stephanotis typicus*; Tinged; Hemiptera
5. Hairy caterpillar; *Eupterote cardamom*; Bombycidae;
Lepidoptera

Major pest:

Common name: Cardamom aphid

Scientific name: *Pentalonia nigronervosa*

Family : Aphididae

Order : Hemiptera

Symptoms:

- It act as a vector of KATTE or marble mosaic disease in small cardamom.
- Nymphs & adult infest the leaf sheath and the pseudo stem.
- Colonies of aphid are seen inside leaf sheaths of the older pseudo stem.

Biology:

Aphid

Wingless-dark brown

Winged-prominent black veins

Nymph & Adult dark brown color.

IPM (Integrated Pest Management):

- Remove alternate hosts like *Alocosia* and *Caucasia* in the vicinity.
- Remove partly dried and decayed pseudo stems which harbor the colonies of aphids.
- Spray methyl demotion 25EC or dimethoate 30EC 1.0L in 500-1000L of water per ha.
- Collect & destroy affected shoots.
- Regulate shade in thick leaves shaded areas.
- Setup pheromone traps at 5/ac.
- Avoid use of excess N-fertilizer.
- Clean cultivation.
- Timely harvest.
- Regular agronomics practices should be done.
- Maintain good shade.
- Affected plants should be uprooted and burning.
- Use resistant varieties.
- Prune & destroy the affected branches.

PESTS OF GINGER

- Shoot and capsule borer; *Conogethes punctiferalis* ; Pyraustidae ; Lepidoptera
- Rhizome maggot ; *Formosina flavipes* ; Chloropidae ; Diptera
- Rhizome maggot ; *Chalcidomyia atricornis* ; Chloropidae ; Diptera
- Syrphid fly ; *Eumerus pulcherrimum* ; Syrphidae ; Diptera
- Rhizome maggot ; *Calobata sp.* ; Micropezidae ; Diptera
- Rhizome maggot ; *Mimegralla coeruleifrons* ; Micropezidae ; Diptera
- Rhizome scale ; *Aspidiella hartii* ; Diaspididae ; Hemiptera
- Tingid bug ; *Stephanitis typicus* ; Tingidae ; Hemiptera
- Thrips ; *Panchaetothrips indicus* ; Thripidae ; Thysanoptera
- Leaf roller ; *Udaspes folus* ; Hesperiiidae ; Lepidoptera
- Leaf weevil ; *Hedychrous rufofaciadus* ; Curculionidae ; Coleoptera

SHOOT AND CAPSULE BORER

SYMPTOMS

- The caterpillar bores into the shoot and damages the branch causing dead heart symptom.
- It also feeds on the rhizome leading to reduction in quality.

BIOLOGY

- ✓ Egg period- 6 to 7 days
- ✓ Larval period- 12 to 22 days
- ✓ Larva-Greenish with pink warts on the dorsal side.
- ✓ Pupal period 7 to 10 days.

IPM (Integrated Pest Management)

- ❖ Remove the affected clumps and drench.
- ❖ Avoid water stagnation.
- ❖ Provide adequate drainage.
- ❖ Remove weeds periodically.
- ❖ Use high quality rhizome for sowing.
- ❖ Treat rhizome bio inoculants *Pseudomonas fluorescens* and *Trichogramma haezionum*.
- ❖ Before sowing treat the rhizome in hot water 51⁰ C for 10 minutes.
- ❖ Covering young plants with floating rock covers.

- ❖ Clean cultivation.
- ❖ Spray NSKE 5%

PESTS OF CHILLIES

LIST OUT OF PESTS

BORERS

1. Stem borer - Euzophra Perticella : Phycitidae : Lepidoptera
2. Fruity fly - Bactrocera Darsalis : Tephritidae : Diptera
3. Gall fly - Asphondylia Capsici : Cecidomyiidae : Dipter

Sap Feeders

4. Thrips - scirtothrips dorsalis : Thripidae : thysanoptea
5. Green peach aphid – myzus persical : Aphidicae : Hemiptera
6. Fruit bug - Lygaeus horpes : Lygacidae : Hemiptera
7. White fly - Bemisia tabaci : Aleyrodidae : Hemiptera
8. Striped mealy bug – Ferrisia virgata : Psuedococeidae : Hemiptera
9. Scale - Aspidistus destructor : Diaspididae : Hemiptera
10. Mussel scale- Lepidosaphes piperis : Diaspididae : Hemiptera
11. Fruit sucking moth- othreis spp : noctuidae : Lepidoptera

Defoliators

12. Tobacco caterpillar – Spodoptera litura : Noctuidae : Lepidoptera
13. Lucerne caterpillar – spodoptera enigua : Noctuidae: Lepidoptera
14. Cutworm - Agrotis ipsilor : Noctuidae : Lepidoptera
15. Pod borer - Helicoverpa armigera : Noctuidae : Lepidoptera

Common Name : Chilli Thrips

Scientific Name : Scirtothrips dorsalis

Family : Thripidae

Order : Thysanoptera

Symptom:

- ❖ Both nymphs and adults secrete the leaf tissues.
- ❖ It prefers tender leaves and growing shoots.
- ❖ The pest is more active during day weather.
- ❖ The infested leaves start curling and crumbling and are shed.
- ❖ It transmits leaf curl disease.

Biology:

- ❖ Each female lays 100-120 Egg.
- ❖ Egg – dirty white colour.

IPM:

- ❖ Setting up sex pheromone traps for *Helicoverpa armigera* / *Spodoptera litura* at 12/ha.
- ❖ Collection and destruction of damaged fruit and grow up caterpillar.
- ❖ Poison baiting with carbaryl 1.25Kg rice bran 12.5Kg. Jaggery 1.25Kg and water 7.5 lit / ha.
- ❖ Spray carbaryl 0.1% (or) quinalphos 0.05%
- ❖ Spray dimethoate 0.06% or methylde mentox 0.05% or during quinalphos at 20kr/ha
- ❖ Clean cultivation
- ❖ Summer plough
- ❖ Use light traps 1/acre.
- ❖ Use recommended dose or recommended chemicals.
- ❖ Use resistance varieties (or) Less susceptible varieties.
- ❖ Spray neem oil 3%.
- ❖ Inter crop with agathi.
- ❖ Do not grow chilli after sorghum
- ❖ Do not follow chilli and onion mixed crop.
- ❖ Apply carbofuran 3% G @ 33kg /ha or phorate 10%G @ 10kg/ha.

PESTS OF ARECANUT

- Black headed caterpillar ; *Opisina arenosella* ; Cryptophasidea ;
Lepidoptera
- Spindle bug ; *Carvalthoia arecae* ; Miridae ;
Hemiptera
- Inflorescence aphid ; *Cerataphis lataniae* ; Aphididae ;
Hemiptera
- Scale insect ; *Icerya acgyptiaca* ; Diaspididae ;
Homoptera
- Thrips ; *Rhipiphorothrips cruentatus* ; Thysanoptera ;
Thripidae
- Termite ; *Odonotermus obesus* ; Termitidae ; Isoptera
- Inflorescence caterpillar ; *Tirathaba mundella* ; Pyraulidae ;
Lepidoptera
- White grub ; *Leucopholis burmeisteri* ; Melolonthidae ;
Coleoptera

BLACK HEADED CATERPILLAR:

SYMPTOMS:

- ❖ The pest is seen in colonies in the innermost leaf axils at the base of spindle.
- ❖ Both nymphs and adults suck the span from the tender leaves and spindle resulting in necrotic patches which later turn brown.
- ❖ Subsequently the affected tissues dry up and break away leaving holes on the leaves.
- ❖ The continuous attack of the pest results in sickly and stunted appearance.

BIOLOGY:

Adults are reddish black in colour.

Nymph are pale green to brown in colour.

Total life cycle from egg to adult takes about 20 to 30 days.

INTEGRATED PEST MANAGEMENT (IPM) :

- ❖ Collect the beetles in the evening after premonsoon and kill them.
- ❖ Soil application of atrin chloradane at 50 kg/ ha (or) phorate 10 G 15 g/palm to the soil twice a year – repeat for 2-3 years continuously.
- ❖ Uproot the heavily infested palm and burn it.
- ❖ Placing phorate 10 % granules at 2 g / palm in perforated polythene bags in the innermost leaf axils of palms in the April is recommended.
- ❖ Timely application of insecticide.
- ❖ Soil application of phorate or quinalphos at 1 kg.a.i/ha twice in a year in May before the monsoon and again during September - October.
- ❖ Spathes showing external symptoms of infestation such as presence of frass outside should be opened and sprayed with malathion 0.1%.
- ❖ Proper agronomic practices should be done.
- ❖ Summer ploughing.
- ❖ Clean cultivation.
- ❖ Use resistant or less susceptible varieties.
- ❖ Drench the spindle with lindane 1.3 D at 2.5 g/ 2 litres of water.
- ❖ Spray crowns with BHC 50 % WP (250 g in 100 litres of water). The spray should be beach the leaf axils.
- ❖ Addition of organic amendments and antifeed ants such as neem and pongamia oil cake will give good results.
- ❖ Force open the spadia to remove the damaged inflorescence and burn.
- ❖ Prepare and keep the poison bait to control slugs as they are the predisposing factors.
- ❖ Conserve red ants as they are predators.
- ❖ Maintain proper drainage in the plantation area.

PESTS OF COFFEE

A.BORERS:

- 1.White borer: *Xylotrechus quadripes*: Cerambycidae: Coleoptera
- 2.Red borer: *Zeuzera coffeae*: Cossidae: Lepidoptera
- 3.Shot-hole borer: *Xylosandrus compactus*: Scolytidae: Coleoptera
- 4.Coffee bean beetle: *Araccerus fasciculatus*: Anthribidae: Coleoptera
- 5.Berry borer: *Hypothenemus hampei*: Scolytidae: Coleoptera
- 6.Leaf miner: *Melanogromyza coffeae*: Agromyzidae: Diptera
- 7.Snail: *Ariophanta soiata*: Ariophantidae: Gastropoda: Mollusca

B.SAP FEEDERS:

- 8.Green scale: *Coccus viridis*: Coccidae: Hemiptera
- 9.Brown scale: *Saissetia coffeae*: Coccidae: Hemiptera
- 10.Mealy bug: *Ferrisia virgata*: Pseudococcidae: Hemiptera

BERRY BORER:

- * The coffee berry borer is a small beetle native to Africa.
- * It is among the most harmful pest to coffee crops across the world where coffee is cultivated.

SYMPTOMS OF DAMAGE:

- * Dropping of tender berries.
- * Presence of small,round hole in the navek region of developed berry.
- * Damage to endosperm by making small galleries near the main tunnel.
- * Female adults tunnel in berry and attacks both immature and mature berries.
- * Increased vulnerability of infested ripe berries to fungal or bacterial infection.
- * Reduction in both yield and quality of coffee and cause yield loss of 30-35%.

BIOLOGY:

- * The female lays 2-3 eggs per day with egg period of 20 days.
- * Grub is white in colour with a brown head with a grub period of 10-26 days.
- * Adult is black beetle and male is wingless.
- * Lifespan of male is 40 days and female is 35-190 days.

IPM:

- * Carry out timely and thorough harvest.
- * Proper agronomic practices should be done.
- * Avoid gleanings as far as possible.
- * Pickup and destroy the gleanings.
- * Meticulously remove leftover berries.
- * Remove off season berries to save main crop.
- * Avoid excessive shade.
- * Prune plants properly to facilitate better ventilation and illumination.
- * Grow less susceptible and resistant varieties.
- * Release of parasitoids like Hymenoptera (wasps) will control berry borers.
- * Spray Endosulfan 35EC @ 340 ml/200 l or Lambda cyhalothrin 5EC @ 120-160 ml/200 l.
- * The approximate time for pesticide application is 120-150 days after flowering or at the time of pest incidence.
- * Set up traps with ethyl:methyl alcohol (1:1) to attract adults.
- * Set up baited traps in the pruned fields where the berry borers emerge from the berries.
- * While processing at the estate level dry coffee berries to the prescribed moisture level: Arabica/robusta parchment 10%, Arabica cherry 10.5% and robusta cherry 11.0%.

Pests of tea

- Tea looper; *Buzura suppressaria*; Geometridae; Lepidoptera
- Bunch caterpillar; *Andraca bipunctata*; Bombycidae; Lepidoptera
- Thrips ; *Scirtothrips bispinosus*; Thripidae; Thysanoptera
- Tea mosquito bug; *Helopeltis theivora*; Miridae; Hemiptera
- Yellow mite; *Polyphagotarsonomus latus*; Tarsonemidae; Acarina
- Red spider mite; *Oligonychus coffeae*; Tetranychidae; Acarina
- Pink mite or orange mite; *Acaphylla theae*; Eriophyidae; Acarina
- Shot hole borer; *Euwallacea fornicates*; Scolytidae; Coleoptera
- Purple mite; *Calacarus carinatus*; Eriophyidae; Acarina
- Cut worm; *Spodoptera litura*; Noctuidae; Lepidoptera

Tea looper

Symptoms:

- Young caterpillar feeds on young leaves and matured larvae prefer older leaves
- They made series of small holes along and a little away from margin
- In severe cases of attack, tea bushes completely denuded
- Female deposits up to 200 eggs in batches on the tree trunks

Biology:

- Egg period :7 to 10 days
- Larval period :4 to 5 weeks
- Pupal period :3 to 4 weeks
- Adult period :8 to 10 weeks

Integrated Pest Management (IPM):

- Adopt clean cultivation

- Proper agronomic practices should be done
- Collect and destroy the affected plants
- Training and pruning the affected plants properly to facilitate better ventilation
- Avoid excessive shade
- Affected plants should be uprooted
- Use judicious application of fertilizers
- Remove and burn the weeds
- Collect and destroy the caterpillar
- Use resistant or less susceptible varieties
- Spray endosulfon 0.07% or Phosalone 0.05% or Chlorpyriphos 0.05% or Dimethoate

SNAKE GOURD SEMILOOPER

Common name : Snake gourd semilooper

Scientific name : *Plusia peponis*

Family : Pyraustidae

Order : Lepidoptera

Symptoms

The caterpillar cuts the leaf lamina, folds it over the leaf and feeds from within the leaf roll.

Biology

- ❖ Egg: White spherical eggs laid singly on tender leaves
- ❖ Larva: Green in colour with longitudinal white stripe, humped last abdominal segments.
- ❖ Pupae: Pupation takes place inside the leaf fold.
- ❖ Adult: Brown moth with shiny brown forewings.

Integrated pest management (IPM)

- ❖ Collect and destroy the caterpillar.
- ❖ Encourage the activity of *Apanteles taragamae*, *A. pulsiae*
- ❖ Spray the following pesticides
 - i. Malathion 50 EC @ 500 ml/ha
 - ii. Dimethoate 30 EC @500 ml/ha
 - iii. Methyl demeton 25 EC @500ml/ha
- ❖ Judicious application of irrigation and fertilizers.
- ❖ Collect infested fruits and dried leaves and burn in deep pits.
- ❖ Expose the pupae by ploughing and turning over soil after harvest
- ❖ Proper agronomic practices should be done.
- ❖ Avoid use of excessive “N” fertilizer.
- ❖ Use resistant (or) less susceptible varieties.
- ❖ Clean cultivation.

PESTS OF SENNA

1. Pod borer; *Etilella zinckenella*; Noctuidae; Lepidoptera
2. Leaf eating caterpillar; *Catopsilia pyranthi*; Noctuidae; Lepidoptera

POD BORER

SYMPTOMS OF DAMAGE:

- Feed on young leaves.
- Make minute holes on the pods.
- Attacks the seeds.

BIOLOGY:

- Egg – Small, elliptical, white, laid at junction of calyx and pod.
- Larva – Dorsally reddish pink and ventrally greenish.
- Adult – Greyish brown moth. Distinct pale white band present on the wings.

IPM:

- Adopt clean cultivation.
 - Adopt proper agronomic practices.
 - Collection and destruction of infested pods.
 - Hand picking and destruction of larva.
 - Spray application of NSKE 5%
 - Spray Bt- 0.1% at 50% flowering stage.
 - Field release of *Trichogramma chilonis* at 5cc/ha.
 - Use light trap at 1/ha.
 - Plant sanitation.
 - Crop rotation.
 - Summer ploughing.
 - Trap cropping.
-
- Use resistance varieties.
 - Timely harvest.
 - Remove hosts which are susceptible for the pests.

MANGO STEM BORER

Common name: Mango stem borer

Scientific name: *Batocera rufomaculata*

Family :Cerambycidae

Order :Coleoptera

SYMPTOMS:

- ❖ Grub tunnels in the sapwood on the trunk or branches
- ❖ Grub bore into the sap wood and making irregular tunnels
- ❖ Feeding the vascular tissues
- ❖ Interruption of nutrient and water transport on the tissue
- ❖ Drying of terminal shoot in early stage
- ❖ Frass comes out from several points and some times sap oozes out of the holes
- ❖ Wilting of branches or entire tree

BIOLOGY:

A single female is capable of laying upto 200 eggs

Egg period: 7-10 days

Grub period: 6-7 months (Linear, fleshy, apodous)

Pupal period: 3-6 months

Adult-Greyish beetle with two pink dots and lateral spine

INTEGRATED PEST MANAGEMENT:

- ❖ Remove and destroy dead and severely affected branches of the tree
- ❖ Remove alternate host, silk cotton and other hosts
- ❖ Clean cultivation should be done in orchard
- ❖ Summer ploughing the garden
- ❖ Create smoke by burning dry mango leaves
- ❖ Setup light traps in orchard
- ❖ Plant sanitation
- ❖ Padding with monocrotophos 36 WSC 10 ml in 2.5 cm/tree soaked in absorbent cotton
- ❖ Grow tolerant mango varieties viz., Neelum, Humayudin
- ❖ Swab coal tar + kerosene @ 1:2 or carbaryl 50 WP 20g /l (basal portion of the trunk- 3 feet height) after scraping the loose bark to prevent oviposition by adult beetles
- ❖ If infestations are severe then apply the copper oxychloride paste on the trunk of the tree
- ❖ Hook out the grub from the bore hole – apply monocrotophos 36 WSC 10 to 2 ml/ hole
- ❖ One celphos tablet (3g aluminium phosphide) per hole
- ❖ Apply carbofuran 3G 5g per hole and plug with mud

Pests of opium poppy

Major pests of opium poppy:

- Root weevil ; *Sternocarus fuliginosus* ; Curculionidae; coleoptera.
- Aphid; *Myzus persicae*; Aphididae; Hemiptera.
- Capsule borer; *Helicoverba armigera* ; Noctuidae; Lepidoptera.

Symptoms of capsule borer:

- It feed on flower heads and seed of flower heads.

Biology:

- Larva is greenish with dark brown grey lines along the sides of body.
- Adult moth is medium size; brown with “v” shaped speck and dull black border on the hard wings.

IPM:

- Clean cultivation.
- Hand picking of the larvae.
- Agronomic practise should be done.
- Summer ploughing.
- Set up sex pheromone trap at 12/ha.

- Use resistant varieties and less susceptible variety.
- Spray NPV 250 LE/ha.
- Use of Bt sprays formulation at 2g/2ml per litre of water.
- Use of egg parasitoids *Trichogramma chilonis* at 5cc/ha.
- Use recommended chemical at recommended dose.

Symptoms of Aphid:

- Nymph and adult suck the sap on leaves.

Symptoms of Root weevil:

- The grub feed on roots.

COFFEE WHITE BORER

Common name : Coffee white borer

Scientific name : *Xylotrechus quadrips*

Family : Cerambycidae

Order : Coleoptera

SYMPTOMS:

- ❖ Presence of ridges on the stem, yellowing of leaves, wilting of branches and occasional drying of plants are the symptoms caused by the grub.
- ❖ The grub tunnels into the mainstem and thick primary branches and bores into lower parts of stem and into the roots of Arabica causing extensive damage.
- ❖ Infested plants show visible ridges around the roots.
- ❖ Young plants (7-8 years old) die due to tunneling while older ones become unproductive if the attack is continuous.
- ❖ Tunnels are tightly filled with the excreta of the grubs.

BIOLOGY:

A single female is capable of laying up to 50 to 100 eggs.

Egg period : 8-10 days

Grub period : 8-9 months (Grub is white or yellowish in colour.)

Pupal period : 25-30 days

Adult beetles emerge during April to May (or) October to November.

Adult is a black, elongate beetle (2.5 cm) with grey colour on the head, thorax, elytra and characteristic white markings on the elytra.

Males are generally smaller than females.

INTEGRATED PEST MANAGEMENT (IPM) :

- ❖ Collection and destruction of infested plants.
- ❖ Trace, stump and uproot and burn borer infested plants during march to April and September to October.
- ❖ Application of lindane 20 EC at 1300 ml along with 100 ml sandovit in 200 litres of water by swabbing the main stem in October.
- ❖ Lindane should be sprayed on the plants.
- ❖ Maintain optimum shade on the estates.
- ❖ Every year looking for ridges on the main stem and thick primaries.
- ❖ Collars prune the infested plants, uproot and destroy the affected plants through burning.
- ❖ Remove the loose scaly bark of the main stem and thick primaries using coir glove or coconut husk to kill the eggs.
- ❖ Install light traps in June to July for destroying moths.
- ❖ Set up trap with ethyl : methyl alcohol (1:1) to attract the adults.
- ❖ Scrubbing during flight periods (March and September) to kill the eggs and grubs present in the bark region.
- ❖ Deep scrubbing should be avoided (sharp implement may injure the green wood and eventually kill the plant.
- ❖ Spraying the main stem and thick primaries with neem seed kernel extract may afford good control of the pest.
- ❖ Spray fungus *Verticillium lecanii*.
- ❖ For biological control release predator lady bird beetle *Cryptolaemus montrouzieri* in the infested coffee estates.
- ❖ Drench the soil around the base of the plants with lindane.
- ❖ Broadcast snail kill metaldehyde 10 to 15 kg/ acre.
- ❖ Use resistant or less susceptible varieties.
- ❖ Clean cultivation
- ❖ Remove the weeds from the estate and burn them.
- ❖ summer ploughing

PEST OF POLYHOUSE AND GREENHOUSE

Aphids; *Aphis gossypii*; Aphididae; Hemiptera

Whitefly; *Bemisia tabaci*; Aleyrodidae; Hemiptera

Gerbera thrips; *Thrips palmi*; Thripidae; Thysanoptera

Cucumber mites; *Tetranychus neocalidonicus*; Tetranychidae; Acarina

Citrus mealy bug; *Planococcus citri*; Pseudococcidae; Hemiptera

APHIDS:-

SYMPTOMS:-

- Nymph and adult suck the juice in plants and produce yellowing.
- Crinkling and curling of leaves are the typical symptoms.
- Severe infestation is seen in the under surface of leaves.

BIOLOGY:-

Nymph: Brown or blackish in color.

Adult: Yellowish brown color.

IPM:-

- ✓ Set up insect screens to exclude aphids, thrips and whiteflies.
- ✓ Use cultural practices like soil testing, sanitation.
- ✓ Allow proper ventilation.
- ✓ Maintenance of maximum and minimum temperature.
- ✓ Pasteurize the growing medium.
- ✓ Yellow sticky traps are effective.
- ✓ Use pepper spray for the incidence of pest.
- ✓ Use resistant varieties of plants.
- ✓ Keep the doors closed.
- ✓ Temperature and humidity should be maintained.
- ✓ Adopt proper timing of pesticidal application.
- ✓ Proper choice of pesticide.
- ✓ Proper pesticide application procedure.
- ✓ Cover the soil floor surface with concrete, black plastic or wood barrier.

Pests of Apple

COMMON NAME ORDER	SCIENTIFIC NAME	FAMILY
1. Apple clearwing moth Lepidoptera	<i>Synanthedon myopaeformis</i>	/sesiidae/
2. Rosy Apple Aphid	<i>Dysaphis plantaginea</i>	/aphididae / hemiptera
3. Tarnished Plant Bug	<i>Lygus lineolaris</i>	/miridae / heteroptera
4. Codling Moth Lepidoptera	<i>Laspeyresia pomonella</i>	/tortricidae /
5. Oriental Fruit Moth	<i>Grapholitha molesta</i>	// tortricidae / Lepidoptera
6. Plum Curculio /coleoptera	<i>Conotrachelus nenupar</i>	/curculionidae
7. Apple Maggot	<i>Rhagoletis pomonella</i>	/tephritidae / diptera
8. Variegated Leafroller	<i>Platynoda flavedana</i>	/tortricidae / Lepidoptera
9. Green Apple Aphid	<i>Aphis pomi</i>	/aphididae / hemiptera
10. White Apple Leafhopper	<i>Typhlocube pomaria</i>	/cicadellidae / homoptera
11. Green June Beetle	<i>Cotinis nitida</i>	/cetoniinae / coleoptera
12. Wooly Apple Aphid	<i>Eriosoma lanigerum</i>	/aphididae / hemiptera
13. Periodical Cicada	<i>Magicicada septemdecim</i>	/cicadidae / hemiptera
14. Roundheaded Appletree Borer coleoptera	<i>Saperda candida</i>	/cerambycidae /
15. Prionus Root Borers	<i>Prionus imbricornis</i>	/cerambycidae / coleoptera

Apple clearwing moth

(*Synanthedon myopaeformis*)

Symptoms:

- Larvae tunnel under the bark anywhere from below the crown area up to branches.
- They enter the trunk through burr knots, wounds, grafts, branch collars, pruning cuts, and wire damaged areas.
- Infested rootstocks appear swollen.
- Infestations have been found on rootstocks below the graft union and under burls or around cankers above the graft union.
- Top-grafted trees are more susceptible to attack and feeding by larvae can kill young trees.
- Infested trees are prone to drought stress which can contribute to death of trees.
- Adults feed on the flowers and tender fruits and suck the juice.
- The fruits and flowers become malformed.
- In highly infested orchards, damage can spread throughout tree canopies and central leaders of high-density plantings are heavily attacked after being pruned to control growth.

Biology

Larva: about 15 - 20 mm long, dirty white with reddish-brown head and thoracic shield behind head.

Pupa: 15 mm long, pale yellowish-brown.

Adult: 20-25 mm wing-span, slender dark blue-black body with orange-red band across the abdomen. Wings are transparent (lack scales), the front pair narrow, shiny and slightly dark; hind wings are much shorter

Apple clearwing moth has a 2-year life cycle. Adult flight begins in early June, peaks by mid July and ends in late August. Females feed on nectar for a few days before laying eggs. Eggs are laid singly in burr knots, pruning cuts and wounded bark on branches and trunks, and likely any other site that allows larvae to get under the bark. Larvae feed on sap between the bark and inner tissue (cambium layer) of trees for almost two years before pupation.

Larval feeding leads to the creation of shallow, irregular winding galleries just cutting into the wood, and about 20 – 25 mm long. Frass collects in feeding tunnels but is expelled by larvae in spring just before they pupate. The larvae over winter in the tunnels and pupate the following spring at the entrance of the tunnels. When the moths are ready to emerge (mostly in the morning), the pupae wriggle to the tunnel exit hole and extend out to allow the adults to emerge. The appearance of empty pupal cases sticking out of the bark is a useful indication of its presence. Counts of pupal cases can be used to estimate population density. There is one generation per year.

The adult moths bear a striking resemblance to small wasps. They have a black-and-yellow color pattern with clear wings. The wingspan is about 1 inch. The yellow band on the fourth abdominal segment is much wider on the female than on the male. The larvae vary from white to a light pink. The larval

head capsule is dark brown. Mature larvae are about 1/2 inch long.

IPM (Integrated Pest Management)

- ★ Collection and destruction of larvae and egg masses from the field.
- ★ Plant sanitation.
- ★ Proper planting to avoid production of burr knots below the graft union will prevent infestations.
- ★ White latex paint applied to the lower trunk before egg laying begins will reduce infestation levels significantly.
- ★ Check for larval infestations, examine the bases of trees for 2 to 3 mm-wide holes and tunnels under the bark, especially rootstocks that appear abnormally swollen.
- ★ Reduce the risk of infestations by minimizing wounds to trees, remove young trees with cankers, and seal wounds with wound-protecting products.
- ★ Two litre plastic bottle traps baited with grape juice are highly attractive to both male and female clearwing moths. Two litre honey buckets can be used instead of plastic bottles. Moths should be cleared out of traps regularly. A bait of 8 L Water + 1 L apple juice + 1 L vinegar + 100 g sugar has been found to be effective at reducing moth population. Clear out moths weekly and top up bait as needed.

- ★ Mating disruption with Isomate-P dispensers can be used for areas with very low levels of apple clearwing moth. The dispensers should be applied at 100/acre and hung at head height, 5-6 feet. These dispensers are often good for two years of control.
- ★ Use yellow sticky trap in the field to attract adult and kill.
- ★ Use resistant or less susceptible varieties.
- ★ Pheromone traps can be used to monitor adult emergence. Traps should be placed about 4 feet above the ground.
- ★ Burr knots can be controlled with plant growth regulators such as NAA.
- ★ Earwigs, ants, spiders and birds will feed on larvae. Downy woodpeckers can control root borers.
- ★ Natural enemies of plant-feeding mites like *Ambelacious fallacis* and *Zetzellia mali*, and the predaceous lady beetle, *Stethorus punctum*, feed on plant-feeding mites.
- ★ Entrust SC (250 mL/ha), Entrust 80W (75 g/ha), Success 480 SC (125 mL/ha), Delegate (420 g/ha) and Rimon 10EC (1.4 L/1000 L of water/ha) are registered for apple clearwing moth control.

PEST OF MANGO

1. Mango hoppers - *Idioscopus niveosparsus* / Cicadellidae / Hemiptera
2. Mango fruit fly - *Bactrocera dosalis* / Tephritidae / Diptera
3. Mango stem borer – *Batocera rufomaculata* / Cerambycidae / Coleoptera
4. Mango nut weevil – *Sternochetus mangifera* / Curculionidae / Coleoptera
5. Mango flower webber – *Eublemma versicolor* / Noctuidae / Lepidoptera
6. Mango shoot webber / *Orthaga exvinacea* / Pyralidae / Lepidoptera

MANGO HOPPER (*Idioscopus niveosparsus*):-

SYMPTOMS:-

- ✓ Nymph and adult suck the juice in tender shoots, leaves and inflorescence.
- ✓ Severe infestation are flower drop and shedding of young fruits.
- ✓ In addition, hopper secrete honeydew from development of sooty mould.
- ✓ It affect the photosynthetic activity.
- ✓ Infestation of hopper leads to burn up appearance.
- ✓ Loss ranges from 25-60%.

BIOLOGY:-

- ✓ Egg period = 4-5days
- ✓ Nymph period = 8-12days
- ✓ Life cycle completed in 12-17days.

IPM:-

- ✓ Clean cultivation should be done in orchard
- ✓ Summer ploughing the garden
- ✓ Collect and destroy the affected fruits
- ✓ Proper training and pruning the mango trees
- ✓ Create smoke by burning the dry leaves
- ✓ Collection and destruction of hoppers by using insect net
- ✓ Set up light trap in the orchard
- ✓ Plant sanitation
- ✓ Keeping crushed ocimum leaves in water in vials at different sides of orchard
- ✓ Use methyl eugenol, citronella oil trap in orchard
- ✓ Predators like spiders play a major role in orchard

Pest of plum

1. *Sanjose scale – Q.perniciosus*

2. *Plum weevil – Amblyrrhinus oricollis*

3. *Plum beetle – Anomala lineatipennis*

4. *peach borer – Sphenoptera lafertei*

5. *Leaf curl aphid – Brachycaudus helichrysi / Aphididae / hemiptera*

Major pest of plum :

1 . Plum beetle – *Anomala lineatipennis*

Symptoms of damage :

- ❖ Adult beetle feed on upper epidermis of fresh and tender leaves, leaving behind only the network of veins.
- ❖ Adult beetle feed on leaves and fruits.
- ❖ Infestation of shoots results in loss of vigour and death of young trees or branches.
- ❖ Fruits with holes will be culled because of its unsightly appearance.
- ❖ Gum globules appear at the point of entrance on bark.

- ❖ Young grubs bore into fruits and feed inside bark and make irregular galleries.

Biology:

Dark green beetle with yellowish brown elytra.

Integrated pest management :(IPM)

- Collect and destroy infested plant parts along with weevil and beetles.
- Spray Carbery 50WP 0.1% or dust lindane 1.3 D at 25 kg/ha on foliage as soon as adults appear.
- Timely harvest. Collect and destroy affected shoots.
- Use resistant varieties.
- Proper agronomy practices.
- Proper training and pruning.
- Select nursery stock free from scale infestation.
- Spray application of systemic insecticide like Phosalone 0.05% fenitrothion 0.05% and Methyl demeton 0.025%.
- Field release of coccinellid predators like *Chilocorus nitrites* and parasitoid *Intarsia perniciosi*.
- Spray malathion 0.1%
- Spray application of following insecticides.
- Swab trunk with carbaryl 50wp at 0.2%
- Spray NSKE 3%
- Use yellow sticky traps at 15/ha to attract and kill insects.

- Set up methyl engenol 1% trap with Malathion 50 EC 1ml between 6-8Am.

PESTS OF JASMINE

1. Jasmine bud worm-Hendecasis duplifascialis / Pyraustidae / Lepidoptera
2. Gallery worm-Elasmopalpus jasminophagus / Phycitidae / Lepidoptera
3. Blossom midge- Contarina maculipennis / cecidomyiidae / Diptera
4. Leaf roller-Glyphodes unionalis / Pyraustidae / Lepidoptera
5. Sphinx mont-Acherontia styx / Sphingidae / Lepidoptera
6. Jasmine eriophyid mite-Aceria jasmini / Eriophyidae / Acarina
7. Flower thrips-Thrips orientalis / Thripidae / Thysanoptera
8. Leaf webworm-Nansionoe geometralis / Pyralidae / Lepidoptera

MAJOR PEST OF JASMINE

Commen name : Jasmine bud worm

Scientific name : Hendecasis duplifascialis

Family : Pyraustidae

Order : Lepidoptera

SYMPTOMS

Buds it bore holes and webbing.

Severe infestation bore hole the buds and shedding.

BIOLOGY

- Larva dark green with black head.
- Adult small white moth.

INTEGRATED PEST MANAGEMENT

- ❖ Cut and burn the affected branches.
- ❖ Collect and destroy the webbed leaves.
- ❖ Clean cultivation.
- ❖ Spray Dicofol 300 - 400 ml/ha on the upper and lower surface of the leaves.
- ❖ Avoid use of excessive Nitrogenous fertilizers.
- ❖ Summer ploughing.
- ❖ Use resistant or less susceptible varieties.
- ❖ Remove weeds regular agronomic practices.
- ❖ Plant sanitation.
- ❖ Judicious application of irrigation and fertilizers.
- ❖ Use recommended chemicals at recommended dose.

PESTS OF CITRUS

Citrus butterfly *Papilio demoleus* / Papilionidae / Lepidoptera

Citrus leaf miner *Phyllocnistis citrella* / Gracillidae / Lepidoptera

Fruit sucking moth *Othreis fullonica* / Noctuidae / Lepidoptera

O. meterna

O. ancilla

Stem borer *Indrabela tetraonis* / Cerambycidae / Coleopteran

Thrips *Thrips nilgriensis* / Thripidae / Thysanoptera

Aphids *Toxoptera aurantii* / Aphididae / Hemiptera

Scale *Plancoccus citri* / Pseudococcidae / Hemiptera

Citrus Butterfly

Scientific name: *Papilio demoleus*

Family : Papilionidae

Order : Lepidoptera

Symptoms:

- The citrus butterfly is widely distributed in India
- It is found on the citrus plant throughout the year
- The larva prefers light yellowish green tender leaves.
- Larva voracious feeder
- Severe infestation the entire trees defoliated.

Biology:

Egg period: 4-6 days (egg greenish yellow colour)

Larval period: 10-15 days (larva brownish black with white mark. Later stage green colour)

Pupal period: 7-12 days (Chrysalis)

Adult life cycle: 20-40 days (P.P – black butterfly with white markings)

P.d – dark brown swallow tail butterfly with pale yellow marking)

Integrated Pest Management:

- Hand picking and destruction of larva and pupa.
- Collection of dropped fruits
- Clean cultivation.
- Proper agronomic practices should be done.
- Judicious application of irrigation and fertilizers
- Adopt sprinkler irrigation in the field to kill the young larva.
- Training and pruning in the citrus orchard.
- Kept orchard in weed free condition.
- Orchard sanitation.
- Spray neem oil 3%
- Timely harvest
- Release the predators *Cryptolaemus montrouzieeri*.
- Release egg parasitoids *Trichogramma* sp.
- Spray Phosphomidon 0.05%
- Use recommended chemical chemical at recommended dose

PESTS OF CORIANDER

Cutworms *Agrotis* spp./ Noctuidae / Lepidoptera

Peridroma saucia

Nephelodes minians

Armyworm *Pseudaletia unipuncta* / pyranstidae / Lepidoptera

Aphids (Willow-carrot aphid) *Cavariella aegopodii* / Aphididae /

Hemiptera

Cutworms:

Scientific name : *Agrotis* spp.

Family : Noctuidae

Order : Lepidoptera

Symptoms:

- Stems of young transplants or seedlings may be severed at soil line.
- if infection occurs later, irregular holes are eaten into the surface of fruits.
- larvae causing the damage are usually active at night and hide during the day in the soil at the base of the plants or in plant debris of toppled plant.
- larvae are 2.5–5.0 cm (1–2 in) in length; larvae may exhibit a variety of patterns and coloration but will usually curl up into a C-shape when disturbed.
- Cutworms have a wide host range and attack vegetables including asparagus, bean, cabbage and other crucifers, carrot, celery, corn, lettuce, pea, pepper, potato and tomato

Biology:

Egg period: 2-7 days (pale yellow colour)

Larval period: 12-16 days (larva light brown colour)

Pupal period: 7-10 days (dirty brown coccon)

Adult period: 15-24 days

Integrated Pest Management:

- Hand –pick and destroy the larvae – morning and evening hours on cracks and crevices in the field.
- Use resistant varieties.
- Remove all plant residue from soil after harvest or at least two weeks before planting.
- Plough the soil during summer months to expose larvae and pupae – avian predators.
- Light trap at 1/ ha.
- Pheromone traps at 12/ ha to attract male moths.
- Poison bait: Rice bran 12.5 Kg +Molasses or Brown sugar 2.5Kg + Carbaryl 50 WP
- 1.25 Kg – Mix the ingredients well – Keep around the field in the evening hours
- Irrigate in day time to expose larvae for avian predators.
- ETL: 2 larvae/ metre row.
- Proper agronomic practices should be done.
- Set up bird perches at 8-10 per acre.
- Yellow sticky trap 10-12 per ha.
- Spray NSKE 5% .
- Spray neem oil 3%.
- Judicious application of fertilizers.
- Use recommended chemicals at recommended dose.

PEST OF BETELVINE

Aphid / *Aphis gossypii* / Aphididae / Hemiptera

Whitefly/*Aleurocanthus nubilans* /Aleyrodidae /Hemiptera

Whitefly/*Aleurocanthus rugosa* / Aleyrodidae / Hemiptera

Whitefly /*Dialeurodes pallida* /Aleyrodidae/ Hemiptera

Scale / *Lepidosaphes cornutus* / Coccidae / Hemiptera

Mealy bug/*Ferrisia virgata*/Pseudococcidae /Hemiptera

Mealy bug/*Pseudococcus sp*/Pseudococcidae /Hemiptera

Mealy bug/*Geococcus cibus*/Pseudococcidae/Hemiptera

Bug / *Disphinctus politus* / Miridae / Hemiptera

Bug / *Disphinctus measarum* / Miridae / Hemiptera

Bug / *Cylopelta siccifolia*/ Pentatomidae / Hemiptera

Termite / *Odontotermes obesus* / Termitidae / Isoptera

Green looper / *Synechia sp* / Geometridae / Lepidoptera

Green looper / *Popillia chlorion* / Rutelinae /Coleoptera

Leaf eating caterpillar /*Spodoptera litura*/ Noctuidae/ lepidoptera

SYMPTOMS

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

Both nymph and adults desap the tender shoot and leaves

It 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.

BIOLOGY

Egg period - 10 to 20 days

Nymphal period - One week

Adult period - 7 to 10 days

Egg is black color

Adult is wingless and greenish to black color

IPM (Integrated Pest Management)

Use resistant varieties or use free from pest and diseases varieties

Soak the seed vines for about 30 minutes in Bordeaux mixture

0.5 %

During winter season avoid frequent irrigation.

Remove the affected vines away from the garden and burn them

Application of *Trichoderma viride* @ 5 g/vine.

Training is done at every 15 - 20 days interval depending upon the growth of vines.

Apply 150 kg N/ha/year through Neem cake

Spray Chlorpyrifos 20 EC 2 ml/lit

Spray NSKE 5 %

Clip off excess infested leaves

Spray 0.2 % Ziram or 0.5% Bordeaux mixture after plucking the leaves after the first appearance of the symptom.

Don't apply any soil insecticides after flowering

Agronomic practice should be done

PESTS OF CURRY LEAF

- 1) Psyllid bug ; *Diaphorina citri* ; Psyllidae ; Hemiptera
- 2) Citrus butterfly ; *Papilio demoleus* ; Papilionidae ; Lepidoptera
- 3) Bark borer ; *Indarbela tetraonis* ; Cossidae ; Lepidoptera
- 4) Citrus black fly ; *Aleurocanthus woglumi* ; Aleyrodidae ; Hemiptera
- 5) Leaf roller ; *Tonica zizyphi* ; Oecophoridae ; Lepidoptera

CITRUS BUTTERFLY :

SYSTEMIC POSITION :

COMMON NAME : Citrus butterfly

SCIENTIFIC NAME : *Papilio demoleus*

FAMILY : Papilionidae

ORDER : Lepidoptera

SYMPTOMS :

- *Papilio demoleus* is a common and widely spread [swallowtail butterfly](#).
- The butterfly is also known as the common lime butterfly, lemon butterfly, lime swallowtail, small citrus butterfly.
- The leaves are eaten commonly by the caterpillars.
- Caterpillars prefer on light green tender leaves.
- Feeding voraciously and leaving only the mid-ribs.
- Severe infestation the entire tree gets defoliated.

BIOLOGY :

- No of generations per year: Eight.
- Egg period : 3.1 to 6.1 days.
- Larval period : 12.9 and 22.7 days.
- Pupal period : 8.0 to 22.4 days.
- Adult period : 4 to 6 days with average of 5.1 days.

INTEGRATED PEST MANAGEMENT (IPM) :

- Hand-picking of caterpillars and spraying with [Endosulfan](#) 35 EC (2 ml/10 litres of water) were the recommended means of pest control by Indian government agencies and agricultural colleges,^[17] however, Endosulfan has since been banned by the [Supreme Court of India](#)
- *Trichogramma Chilonis* and *Telenomus* sp. are egg parasitoids on lemon butterfly and as high as 75.9% egg parasitism was recorded
- Dipel (*Bacillus thuringiensis* Berl.) spray at 0.05% gives good control of the pest.
- Entomopathogens like bacterium *Serratia marcescens* and fungus *Fusarium* sp. also killed the pest population substantially.
- Some plant extracts like Pipal (*Ficus religiosa*), Beshram (*Manchoria hastaefolia*), *Parthenium hysterophorus*, Neem (*Azadirachta indica*) and *Datura* (*Datura stramonium*) significantly (52.8%) reduced PDL larval population.
- Similarly the plant products allitin, replin, margosol and neem guard @ 1% aqueous extract gave >75% pest control in citrus.
- The leaf extracts of *Eucalyptus globulus* and *Ageratum conyzoides*, clove extracts of *Allium sativum* cause morphological abnormalities in PDL 5th instar larvae and thus are useful botanicals in the pest management.
- Similarly, spraying with aqueous extract of neem seed kernel @ 0.5% twice at 8 days interval is effectively checks the pest population as it has strong antifeedant and repellent activity.

PESTS OF MORINGA

1. Moringa Budworm- *Noorda moringae*/Crambidae/Lepidoptera.

2. Bud midge-*Stictodiplosis moringae*/Cecidomyiidae/Diptera.

LEAF FEEDERS

3. Leaf caterpillar- *Noorda blitealis*/Pyraustidae/Lepidoptera.

4. Hairy caterpillar-*Eupterote mollifera*/Eupterotidae/Lepidoptera.

SAP FEEDERS

5. Aphids-*Aphis gossypii*/Aphididae/Hemiptera.

6. Scale insects- *Ceroplastodes cajani*/Diaspididae/Hemiptera.

BORERS

7. Pod fly-*Gitona distigma*/Drosophilidae/Diptera.

8. Stem borer-*Batocera rubus*/Cerambycidae/Coleoptera.

MAJOR PEST OF MORINGA

Common name: Moringa Budworm

Scientific name: *Noorda moringae*

Family : Crambidae

Order : Lepidoptera

SYMPTOMS OF DAMAGE.

- Larvae bore into flower buds and cause shedding of buds up to 75%.

BIOLOGY

- Egg period=3-4 days.
- Larval period=8-16 days.
- Pupal period=6-10 days.
- Adult period=10-28 days.

Adult is small in size with dark brown fore wings and white hind wings with dark brown border.

INTEGRATED PEST MANAGEMENT

- Collection and destruction of affected plants parts.
- Clean cultivation.
- Proper agronomic practices should be done.
- Plough around trees to expose to kill pupae.
- Summer ploughing.
- Training and pruning the dried parts of plants.
- Use resistant or less susceptible varieties.
- Remove weeds.
- Plant sanitation.
- Judicious application of irrigation and fertilizers.
- Set up light trap 1/ac.
- Use larval parasites like *pristomeres sp* , *chelonussp*, *Perrilampus sp*.

- Spray carbaryl 50 WP 1.0 kg or endosulfan 1.0 L in 500 to 700 ml of water per ha.

PESTS OF MORINGA

1. Moringa Budworm- *Noorda moringae*/Crambidae/Lepidoptera.
2. Bud midge-*Stictodiplosis moringae*/Cecidomyiidae/Diptera.

LEAF FEEDERS

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Perrilampus sp.
- Spray carbaryl 50 WP 1.0 kg or endosulfan 1.0 L in 500 to 700 ml of water per ha.

PESTS OF OIL PALM

A. BORERS :

1. Rhinoceros beetle - *Oryctes rhinoceros* / Dynastidae / Coleoptera
2. Red palm weevil - *Rhynchophorus ferrugineus* / Curculionidae / Coleoptera

B. SUBTERRANEAN PESTS :

3. Termite - *Odontotermes sp* / Termitidae / Isoptera
4. White grub - *Apogonia sp* / Melolonthidae / Coleoptera
Adoretus sp

C. LEAF FEEDERS :

5. - *Eumeta sp* / Psychidae / Lepidoptera
6. Nettle caterpillar - *Thosea andamanica* /
7. - *Darna jasea* / Limacodidae / Lepidoptera
8. Leaf caterpillar - *Spodoptera litura* / Noctuidae / Lepidoptera

D. SUCKING PESTS :

9. Spindle bug - *Carvalhoia arecae* / Miridae / Hemiptera
10. - *Chrysomphalus aonidum* / Diaspididae / Hemiptera
11. Mealy bugs - *Dysmicoccus brevipes* / Pseudococcidae / Hemiptera
12. - *Palmiculator sp* / Pseudococcidae / Hemiptera

MAJOR PEST

Major pest in oil palm is "RHINOCEROS BEETLE"

Common name : Rhinoceros beetle

Scientific name : *Oryctes rhinoceros*

Family :

Order :

SYMPTOMS OF DAMAGE :

- Adult beetles bore into the palms and chew the tender tissues.
- The attacked frond when fully opened shows characteristic triangular cuts.
- Spindle to break and droop.
- Entry holes - presence of chewed-up tissues.
- Infested leaves - shortened, broken and distorted.
- Fruits - the upper portion of the bunch get underdeveloped and dried.
- Damage to the heart of the palm - way for the entry of fungi and bacteria,
- Induce rotting in the bud.
- Fully opened fronds showing characteristic diamond shaped cuttings
- Holes with chewed fibre sticking out at the base of central spindle.
- Damage by the pest leads to 10 to 15% loss in yield.

BIOLOGY :

Egg: Oval creamy white egg in manure pits or decaying vegetable matter at a depth of 5 to 15 cm. Female laid 140 to 150 eggs. (Egg periods is 8 to 18 days)

Grub: Grub is stout, sluggish, white "C"-shaped with pale brown head and found at a depth of 5 to 30 cm.(6 months)

Pupa: Grub pupates in earthen cells at a depth of 0.3 to 1 m.(15 days)

Adult: Adult beetle is stout, brownish black or black and has a long horn projecting dorsally from the head in male. Horn is short in female.(2-3 months)

INTEGRATED PEST MANAGEMENT (IPM) :

- Remove and burn all dead coconut trees in the garden (which are likely to serve as breeding ground) to maintain good sanitation.
- Collect and destroy the various bio-stages of the beetle from the manure pits (breeding ground of the pest) whenever manure is lifted from the pits.
- At every harvest iron hook out and kill the adults beetle.
- Incorporate the entomopathogen i.e., fungus (*Metarrhizium anisopliae*) in manure pits to check the perpetuation of the pest.
- Clean cultivation.
- Proper agronomic practices should be done.
- Judicious application of irrigation and fertilizers.
- Use resistant or less susceptible varieties.
- Use recommended chemicals
- Mixing sand with Carboral dust (1:1) 100 gram / palm.
- Drench manure pits with Chlorpiriphos or Carboral 0.1% at the breeding place (cow dung) to kill the larva.
- Soak castor cake at 1 kg in 5 l of water in small mud pots and keep them in the coconut gardens to attract and kill the adults.
- Change this slurry once in month.
- Treat the longitudinally split tender coconut stem and green petiole of fronds with fresh toddy and keep them in the garden to attract and trap the beetles.
- Examine the crowns of tree at every harvest and hook out and kill the adults.
- For seedlings, apply 3 naphthalene balls/palm weighing 3.5 g each at the base of inter space in leaf sheath in the 3 inner most leaves of the crown once in 45 days.
- Set up light traps following the first rains in summer and monsoon 200 period to attract and kill the adult beetles.
- Field release of Baculovirus inoculated adult rhinoceros beetle @ 15/ha reduces the leaf and crown damage caused by this beetle.
- Apply mixture of either neem seed powder + sand (1:2) @150 g per palm or neem seed kernel powder + sand (1:2) @150 g per palm in the base of the 3 inner most leaves in the crown
- Place phorate 10 G 5 g in perforated sachets in two inner most leaf axils for 2 times at 6 months intervals.
- Set up rhinolure pheromone trap @ 1/ 2 ha to trap and kill the beetles.
- Recently baculovirus of *Oryctes* has been successfully used for the biological suppression of the pest.

CITRUS FRUIT SUCKING MOTHS

1. Citrus fruit sucking moths

Othreis fullonica / *O. ancilla* / *O. materna* / Noctuidae /
Lepidoptera

SYMPTOMS:

- Adult pierce the fruit sucks the juice causing rotting and dropping.
- It also attacks pomegranate, mango and grapes.

BIOLOGY:

- Spherical eggs are laid singly on the weed host.
- Larva orange blue and yellow spots on velvety dark speckled on the body.
- Pupation inside in the leaf fold.

Integrated pest management (IPM):

- ❖ Destroy the weed host *Tinospora cardifolia*.
- ❖ Collection of dropped fruits.
- ❖ Clean cultivation.
- ❖ Proper agronomy practices should be done.
- ❖ Use light trap (or) food lure to attract moths.
- ❖ Apply smoke to prevent adult moth.
- ❖ Bag the fruits with polythene bags punctured at the bottom.
- ❖ Training and pruning the citrus orchard.
- ❖ Trap crop – growing tomato crop in orchards to attract the adult moth.
- ❖ Plant sanitation.
- ❖ Use resistant varieties.
- ❖ Summer ploughing.
- ❖ Bait with fermented molasses + Malathion 1ml/lit.

- ❖ Use recommended chemicals at recommend dose.

PESTS OF GARLIC

1. Onion fly: *Delia antiqua*: Muscidae: Diptera
2. Earwig: *Anisolabis stoli*: Forficulidae: Dermaptera
3. Thrips: *Thrips tabaci*: Thripidae: Thysanoptera
4. Legume pod borer : *Helicoverpa armigera*: Noctuidae: Lepidoptera
5. Leaf eating caterpillar : *Spodoptera litura*: Noctuidae: Lepidoptera

THRIPS

- They have a very small, slender insects that cause severe damage to onions and garlic.
- They are more prevalent and injurious.

SYMPTOMS OF DAMAGE:

- Nymphs and adults congregate in dense masses in the narrow spaces between the axils of the inner leaves.
- Faded and curled leaf tips and blighted.
- Plants faded up.
- Entire field show a silvery appearance on severe infestation.
- Reduced bulb size.
- Reduction of yield and quality of bulbs.

BIOLOGY:

- Nymph is pale yellow.
- Adult is pale yellow to light brown with fringed wings and long hairs.

IPM:

- Clean cultivation.
- Adopting proper agronomic practices.
- Grow less susceptible and resistant varieties.
- Grow Ooty-1 garlic which is resistant to thrips.
- Overhead irrigation and rainfall provide some suppression of thrips population.
- Avoid excess nitrogen.
- Avoid close planting.
- Avoid planting onions near the grain fields.
- Natural enemies including Predaceous mites, minute pirate bugs and lacewings are released.
- Spray Dimathoate 2 ml or Methyl demeton 2 ml or Phosphomidon 1 ml or Acephate 1g/l.
- At spraying ,focus the spray fluid at the whorls of the plant.

PESTS OF TURMERIC

1. Rhizome scale ; *Aspidiotus hartii* ; Diaspididae; Hemiptera
2. Thrips ; *Panchaetothrips indicus* ; Thripidae ; Thysanoptera
3. Leaf roller ; *Udaspes folus* ; Hesperidae ; Lepidoptera
4. Leaf weevil ; *Hedychrous rufofaciatus* ; Curculionidae ; Coleoptera
5. Rhizome maggot ; *Eumerus albifrons* ; Syrphidae ; Diptera

LEAF ROLLER

SYMPTOMS OF DAMAGE:

- Leaves become folded or rolled longitudinally.
- Presence of greenish larva inside.
- Complete defoliation of leaves.

BIOLOGY:

- Larva- Smooth, green with black head and constricted neck.
- Adult- Brownish black butterfly with eight white spots of different sizes on each forewing and a large white patch on each hind wing.

IPM :

- Adopt clean cultivation.
- Avoid close planting.
- Plant sanitation
- Use healthy pest and disease free rhizome
- Use optimum irrigation
- Use optimum fertilizer dose.
- Use tolerant resistant varieties.
- Spray Carbaryl 50WP 1Kg.
- Spray malathion 50EC 300ml.
- Spray quinalphos 25 EC 600ml/acre.
- Spray NSKE 5% + Teepol 0.05%

PESTS OF CLOVE

1. Black scale: - *Saisstia nigra* / Diaprididae/Hemiptera
2. Masked scale: - *Mycetaspis personata*/ Diaprididae/Hemiptera
3. Stem borer: - *Sahyadrassus malabaricus* / Pyraustidae / Lepidoptera
4. Green scale: - *Lecanium sp* / Diaprididae/Hemiptera
5. Mealy bug: - *Pulvinaria psidii* / Psuedococcidae / Lepidoptera
6. Chilli thrips: - *Scirtothrips dorsalis*/ Thripidae / Thysanoptera

SCALE INSECTS:

SYMPTOMS:

- Many species of scale insects infest clove seedlings in the nursery and sometimes young in the field.
- It infest tender leaves shoots and twigs.
- Sooty mould fungus is observed on leaves due to honey dew secretion

BIOLOGY:

- Female adult is black colour.

IPM:

- Removal of affected leaves and branches will prevent the spread.
- Spray qunalphos 0.1% the bore hole and inject the same into the bore hole after removing the frass.
- Swab the basal region of main stem with carbaryl and keep the basis free of weed
- Removal of affected leaves
- Plant sanitation
- Collection and distruction of affected plant parts.
- Clean cultivation.
- Use resistant or less susceptible varieties.

- Judicious application of fertilizers and irrigation .
- Removal of affected branches
- Spray dimethonate or methldemeton 2ml/lit

Pests of cashew

Cashew:

Common name: Cashew.

Scientific name: *Anacardium occidentale*.

Family: Anacardiaceae.

Major pests: Stem and root borer, Tea mosquito bug, Leaf miner,
Apple and nut borer.

Minor pests: Thrips, Leaf and blossom webber and Mealy bug.

Yield reduction: 30-40%.

Pests of cashew:

1. Common name: Stem and root borer.
Scientific name: *Plocaederus ferrugineus*.
Family: Cerambycidae.
Order: Coleoptera
2. Common name: Tea mosquito bug.
Scientific name: *Helopeltis antonii* sign.
Family: Miridae
Order: Heteroptera.
3. Common name: Apple nut borer.
Scientific name: *Thylocoptila panrosema*.
Family: Pyralidae.
Order: Lepidoptera.
4. Common name: Thrips.
Scientific name: *Rynchothrips raoensis* (Flower thrips)
Selenothrips rubrocinctus (Foliage thrips)
Family: Thripidae.
Order: Thysanoptera.
5. Common name: Mealy bug.
Scientific name: *Ferrisia virgata*.
Family: Pseudococcidae.
Order: Hemiptera.
6. Common name: Leaf miner.
Scientific name: *Acrocercops syngamma*.
Family: Gracillariidae.
Order: Lepidoptera
7. Common name: Leaf and blossom webber.
Scientific name: *Lamida monoculalis*.
Family: Pyraustidae.
Order: Lepidoptera.

Major pest of cashew:

Common name: Stem and root borer.
Scientific name: *Plocaederus ferrugineus*.
Family: Cerambycidae.
Order: Coleoptera.

- It is the most serious pest of cashew as its damage results in death of trees.
- It is an internal tissue borer and infestation was up to 40% in different periods and severely attacked trees die within a period 2 years causing substantial tree loss.
- The infestation by the pest is more severe in neglected plantations.
- Two other species of stem borers viz., *P. obesus* Gahan and *Batocera rufomaculata* also infests cashew trees.
- The *Plocaederus* sp. are encountered as primary pests.

Symptoms of damage:

- Stem borer infection could be easily identified by the presence of small bore holes at the collar region.
- Extrusion of frass (like coarse dust powder) through the holes at the collar region.
- Oozing of gum at the base of cashew tree trunk.
- The grubs that hatch out bore into the bark and feed on the sub-epidermal and vascular tissues.
- Extensive tunneling in the stem and root region and the tissues are tunneled 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 and finally leads to the death of the tree.
- Affected trees also tilt on one side due to loss of anchorage, if the injury severe on anchoring roots.

Identification of pest:

- The borer has one generation per year. The adult is a medium sized (25-40mm long), reddish-brown long horned beetle.
- They prefer to lay eggs on old trees (>4-5 years old) that have rough bark with more cracks, on trees either damaged by stem borers in the previous season or by physical actions like heavy pruning.

- The eggs are laid into the live tissues in the crevices of the loose dark in the trunk or exposed portion of the roots above the soil.
- The eggs are whitish , ovoid in shape measuring about 3mm in length(looks like rice grain).
- The eggs hatch out as tiny grubs ,which bore into the fresh tissues of the bark.
- The grubs feed inside the tissues for 4-7 months. the grown up grubs are off-white in colour measuring about 7-10cm in length.

Biology :

Egg period = 4-7 days (The female beetle lays 60-90 eggs and white colour)

Grub period = 4-7months(grub is white colour)

Total life period = 45-65 days

Management:

IPM-Integrated Pest Management

- Remove the volunteer(self-sown) neem plants in and around cashew plantations.
- Proper monitoring of the pest situation is very important.
- Three spray schedules should be followed
 - (1) First spray: Monocrotophos 1.5ml of water(0.05%) or Lamda cyhalothrin at 0.003% during new flushing stage(Nov-Dec)
 - (2) Second spray: Carbaryl 50% WP at 2g 1litre of water (0.1%) or Chlorpyriphos(0.05%) at flowering stage (Dec-Jan)
 - (3) Third spray: Repeat the first spray at the initial fruiting stage (Feb-Mar)
- Spray well in advance before the insect inflicts damage to the crop.through foliar coverage s 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 9am or after 4pm in order to save non target pollinators.
- The eggs of the mosquito bug are naturally parasitized by Telenoums sp. And Erythmelus helopeltidis.

- Spiders such as *Oxyopes schireta*, *Phidippus patch* and *Hiyllus* sp. are efficient predators and feed on nymphs and adult mosquito bug.
- Red ants *Oecophylla smaragdina* should be encouraged in cashew plantations as it will repel the tea mosquito bug.
- During the out-break situation ,the management programme should be launched on large scale community basis.
- Removal or destruction of dead and dried inflorescence.
- Spray carbaryl 50 WP 0.1% (@2g/lit)at the time of fruit setting.
- Avoid spraying same insecticides in repeatedly.
- The infested portion of the plant parts like leaves, inflorescence and twigs with mealy bug colonies should be pruned and destroyed.
- Fallen leaves under the tree canopy should be collected and burnt to avoid further spread of the pest.
- Free from weeds and alternate hosts.

PESTS OF CROTON

Crop : Croton

Scientific name : *Codiaeum variegatum*

Family : Euphorbiaceae.

Major pests : Mealy bug ,brown scale ,croton caterpillar.

Minor pests : spider mites.

Yield reduction :45%.

PESTS OF CROTON

1.Mealy bug - *Planococcus liacinus* / Pseudococcidae / Hemiptera.

2.Brown scale - *Saissetia coffeae* / Coccidae / Hemiptera.

3.Croton caterpillar - *Achaea janata* / Noctuidae / Lepidoptera.

4.Spider mites - *Tetranychus urticae* / Tetranychidae / Acarina.

MAJOR PEST OF CROTON

1.Common name :Mealy bug

Scientific name : *Planococcus liacinus*

Family :Pseudococcidae

Order :Hemiptera.

SYMPTOMS OF DAMAGE

- The nymph and adults of mealy bug infests under side of leaves ,base of the petioles and nodes of tender shoots.
- Infested plants give withering appearance.
- Besides causing direct damage ,the bugs excrete copious amount of honey dew on which sooty mould was develops which impairs normal photosynthetic activity.
- Yield loss observed under severe outbreak conditions.

BIOLOGY

- EGG PERIOD =Within a day they hatch into crawlers.[eggs are amber in colour] .

- NYMPHAL PERIOD =26-45 days.
- ADULT PERIOD =15-20 days.
- TOTAL LIFE PERIOD =45-65 days.

INTEGRATED PEST MANAGEMENT

- Maintain adequate shade.
- Collection and destruction of affected plant parts.
- Clean cultivation.
- Proper agronomic practices should be done.
- Summer ploughing.
- Training and pruning the dried parts of the plants.
- Use resistant or less susceptible varieties.
- Remove weeds.
- Plant sanitation.
- Judicious application of irrigation and fertilizers.
- Use recommended chemicals at recommended doze.
- Avoid use of excessive nitrogenous fertilizers.
- Destroy nests of red ants and cock tailed ants.
- Dust quinolphos 1.5% or methyl parathion 2% malathion 5%.
- Spray the affected patches with quinolphos 25 EC 2ml or fenthion 100 EC 1ml per liter of water.
- Conserve natural enemies like predatory lady bird beetle *Cryptolaemus montrouzieri*.
- Release parasitoids like *leptomastix dactylopii*.

Pests of Sapota

- 1. Sapota Leaf Webber (or) Chickoo Moth –**
Nephoteryx eugraphella; Pyraustidae; Lepidoptera;
- 2. Bud Worm –** *Anarsia ehippias*; Gelechiidae; Lepidoptera;
- 3. Fruit Fly –** *Bactrocera dorsalis*, *B.zonata*; Tephritidae;
Diptera;
- 4. Stem Borer –** *Plocaederus ferrugineus*; Cerambycidae;
Coleoptera;
- 5. Hairy Caterpillar –** *Metanastria hyrtaca*; Lasiocampidae;
Lepidoptera;
- 6. Spiraling Whitefly –** *Aleurodicus dispersus*; Aleyrodidae;
Hemiptera;
- 7. Mealy Bug –** *Ferrisia virgate*; Pseudococcidae; Hemiptera;
- 8. Leaf Miner –** *Acroercops syngamma*; Gracillaridae;
Lepidoptera;
- 9. Leaf Twisting Weevil –** *Apoderus tranquebaricus*;
Curculionidae; Coleoptera;
- 10. White Fly –** *Trialeurodes ricini*; Aleyrodidae; Hemiptera;
- 11. Guava Scale –** *Chloropulvinaria psidii*; Diaspididae;
Hemiptera;

Sapota Leaf Webber (or) Chickoo Moth:

Symptoms

- Most serious pest of sapota.
- Leaves webbed together in a bunch by larvae, chlorophyll scrapped and leaves reduced to a network of veins.
- Flower buds and tender fruits are bored.
- Severe infestation: leaves are withered and dried.

Biology

- Egg period – 3-5 days [pale yellow color].
- Larval period – 17-30 days [pink to grey color].
- Pupal period – 7-11 days [brown color].
- Adult period – 8-10 days [small to medium sized, brown color moth].

Integrated Pests Management [IPM]

- Collection and destruction of affected leaves.
- Clean cultivation.
- Summer ploughing.
- Setup sex pheromone traps.
- Collect and burn the affected leaves.
- Proper agronomic practices should be done.
- Use resistant sapota varieties.
- Plant sanitation.

- Predators like spiders play a major role.
- Light traps can be set in orchards.
- Training and pruning the sapota trees.
- Release egg parasitoids *Trichogramma sps.*
- Spray NSKE 5%.

PESTS OF RUBBER

A. BORERS

1. Rubber bark caterpillar – *Aetherastis circulate*

2. *Comocritis cuanobactra (pieri)*

Family: Yponomeutidae

Order : Lepidoptera

3. *batocera rufomaculata*

B. SAP FEEDERS

4. *Aspoditous destructor*

5. *Parasaissetia nigra*

C. LEAF FEEDERS

6. Basket worm - *Acanthopsyche snelleri*

Family: Psychidae

Order : Lepidoptera

7. Weevils – *Apoderus chrysochlorus*

Family: Curculionidae

Order : Coleoptera

Rubber bark caterpillar – *Aetherastis circulate*

Symptoms of damage:

- ✓ Larva feeds on bark under the web.

Biology

- Larva : Bright red, flat around 25mm long
- Adult : small, white and black spotted moth.

Comocritis cuanobactra (pieri)

Symptoms of damage:

- ✓ Galleries on the bark.

Biology

- Larva : pale yellow, about 12 mm long.

Basket worm - *Acanthospsyche snelleri*

Symptoms of damage:

- ✓ Larva – wounds on the newly tapped surface from which latex flows.

Biology

- Larva – in a bag or case.
- Adult – Female : wingless and reniform.

Weevils – *Apoderus chrysochlorus*

Symptoms of damage:

- ✓ Adult – Twisting of leaf tips.

Biology

- Adult – Reddish brown weevil.

IPM:

SCALE INSECT:

- ❖ Spray Malathion 0.05%

MEALY BUG

- ❖ Spray Malathion 0.05% Or fish oil rosin soap 1 kg in 40 litres of water.

TERMITES

- ❖ Drench the soil at the base affected plants with 1% solution of chlorophyriphos.
When mulches is present, spray mulches also.

WHITE GRUBS

- ❖ Incorporate phorate 10G at 10 kg /ac or lindane 1.3 at 40 kg /ac in the at the time of bed preparation.

GALLERY MAKING CATERPILLAR

- ❖ Spray a mixture of carbaryl 50 WP 0.05% and 0.2% lindane 20 EC 10 ml /1 on the trunk region with wetting agents like teepol.

SLUG

- ❖ Broadcast 2 to 5% metaldehyde bait pellets or distribute meta briquetter on the ground in infested areas or paint the base of the stem with metaldehyde or spray metaldehyde or 0.1 % one day old suspension or sprinkle phorate 10 G granules in the infested areas at the base of plants.