

ENT-506

Agricultural Pests and Their Management

Aphid *Aphis gossypii* (Aphididae; Hemiptera)

Host Plants: Cotton, okra, Brinjal, Chilies, Guava

Identification

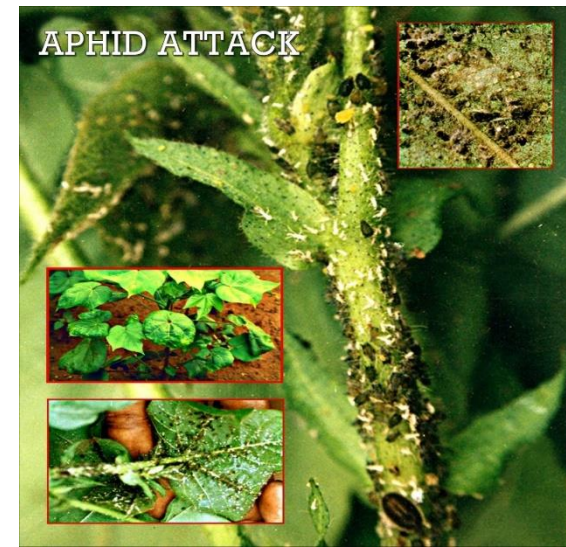
Adult:

- Small 2 mm long, Yellow or Greenish brown in color
- Soft-bodied insects, winged or wingless
- Pair or small tubular structure projecting out from dorsal surface of the posterior region of the body known as cornicals.
- Viviparous or parthenogenetically reproduced
- Aphids found in colonies



Damage

- Feed cell sap from tender and soft plant parts.
- Black sooty mold develops on honeydew secreted by aphids.
- Stunted growth, leaf curl up and wither.
- Gradual death of plants



ETL: spray on visible damage

Management

Cultural control

- Clean cultivation and removal of weeds
- Use of Cotton hairy varieties.

Biological control

- Use of predators LLB, and parasitoids like *A. mali*

Chemical control

Imidacloprid(20% SL)	200ml /acre
Thiamethoxam(25WG)	24g /acre
Bifenthrin(10% EC)	200ml /acre
Acephate(75% WP)	300g /acre



Jassid *Amarasca biguttula biguttula* (Cicadellidae; Hemiptera)

Host Plants: Cotton, potato, tomato, brinjal, okra, hollyhock, sunflower

Identification

Adult:

- Greenish yellow, winged, two black spots on tips of forewings , 3mm in size, jump on disturbance.

Egg:

- Yellowish white , 25-30 Egg , 4-11 days hatching

Nymph:

- greenish yellow and Wedge shaped , 5 instars

Damage

Both nymphs and adults suck the sap and inject toxins

- Tender leaves turn yellow with reddish spots
- leaf margins curl downwards (cup shaped appearance)
- brick red color “hopper burn”.
- Crop growth retarded.
- Boll formation reduced
- Lint quality deteriorated



ETL: 1 adult /nymph per leaf

Management

Cultural control:

- Clean cultivation and removal of weeds
- Use of Cotton hairy varieties

Biological control:

- Use of predators such as chrysoperla

Chemical control:

Dinutefuran(20SG)	100g /acre
Nitenpyram(10% AS)	200ml /acre
Acephate(75% WP)	300g /acre
Imidacloprid(20% SL)	200ml /acre



Whitefly *Bemisia tabaci* (Aleyrodidae; Homoptera)

Host Plants: Cotton, tomato, tobacco, sweet potato, cauliflower, okra etc

Identification

Adult:

Yellowish white, pure white wings, body yellow covered with white powder.

Egg:

Creamy white , 100-150 stalked Eggs , Hatching: 3-5 days

Nymph:

Pale yellow and wingless

Pseudopupa formation is a distinctive character of white fly.

Damage

Nymphs and adults suck the sap from the under surface of leaves.

- leaves turn yellow and fall off, development of sooty mold (photosynthesis interference)
- Injection of toxic saliva (physiological disorder).
- It also transmits the more than 50 viral diseases. (CLCV)



ETL: 5 adult or nymph per leaf

Management

Cultural control:

- Clean cultivation and removal of weeds
- Use of Cotton hairy varieties

Biological control:

- Use of predators such as chrysoperla & LLB
- Encarsia spp. Is good parasitoid.

Chemical control:

Flonicamid(50% WG)	60g /acre
Buprofezin(25% WP)	600g /acre
Pyriproxyfen(10.8% EC)	400ml /acre
Imidacloprid(20% SL)	250ml /acre
Diafenthiuron(500SC)	250ml/ acre
Spirotetramat(240SC)	120+250ml/acre
Acetamirprid(20% SP)	125g/acre



Thrips *Thrips tabaci* (Thripidae; Thysonoptera)

Host: Banana, Rose, Citrus , Cotton, Soybean, Beans

Identification

Adult:

Slender, yellowish brown, Size 1mm, Males are apterous while female have long, narrow wings with hair fringes (stripy).

Egg:

white kidney Shape, laid Inside the plants tissues.

Nymph:

Nymphs resemble the adults but are slightly smaller and wingless.

Damage

Both adults and nymphs cause damage to cotton plants.

- Attacked leaves become silvery white, wrinkle, and fall off.
- Crumpled cup shaped leave (upward)
- Plant bear very few balls.
- Cotton production is reduced.



ETL: 8-10 adult or nymph per leaf

Management

Cultural control:

- Clean cultivation and removal of weeds
- Use of Cotton hairy varieties

Biological control:

- Use of predators such as predatory mites

Chemical control:

Chlorfenapyr(10.8% EC) 200ml /acre

Acephate(75% SP) 330g /acre

Spintoram(125SC) 50ml /acre

*Solvigo(108SC) 500ml /acre

Dimethoate(40EC) 400ml /acre

Note: Solvigo= Thiamethoxam+abamectin



Spotted Bollworm *Earias Insulana*, *Earias vitella* (Noctudae; Lepidoptera)

Host plants: Cotton, bhendi, holly hock, *Hibiscus*

Identification

Adult:

Yellowish white, winged, 25 mm in size across wings.

E. insulana complete green forewings while *E. vitella* have longitudinal green band in the middle of forewing, hind wings straw color

Egg:

Colour: greenish blue No: 200-400 Eggs

Larvae:

6 instars, *E. Insulana* larvae is greenish white with black spots on body and orange dots on prothoracic segment. *E. Vittella* larva is brownish with a median longitudinal streak on dorsal side and ventral side usually pale yellow or greenish.

Pupa:

pupate on fallen leaves and plants.

Active period: March-Nov



Damage:

- boring of terminal portion (dying/withering)
- boring of squares, flowers, and fruits
- Feeding hole plugged by excreta
- Shedding of fruiting bodies
- premature bol opening
- lower ginning percentage

ETL: 3 larvae/25 plants

Management

Cultural control:

- Plough in or burn old crop debris.
- Use resistant varieties.

Biological control:

Parasitoid wasp *Campoletis chlorideae*

Chemical control:

Deltamethrin(2.5% EC)	500ml /acre
Cypermethrin(10% EC)	500ml /acre
Lambda-cyhalothrin(2.5EC)	330ml /acre



Pink Bollworm *Pectinophora gossypiella* (Gelechiidae; Lepidoptera)

Host Cotton, bhendi, holly hock, *Hibiscus cannabinus*

Identification

Adult:

Dark brown, Winged with fringes and black spots on forewings, 8-9 mm in size across wing.

Egg:

creamy white , No: 150-250 Eggs

Larvae:

4 instars, 4th instar larve is pinkish.

PUPA: pupate in bolls, ground debris, fallen leaves.

Actaive period: March-Nov

Damage

- Rosette flowers formation
- Double seeds formation
- Shedding of squares, flowers,
- Reduce lint quality.



ETL: 5 larvae/100 bolls

Management

Cultural control:

- Plough in or burn old crop debris.
- Use resistant varieties.
- Grazing of harvested crop

Biological control:

Parasitoid wasp *Campoletis chlorideae*

Chemical control:

Triazophos(40%EC)	1000ml /acre
Spinetoram(125SC)	80ml /acre
Gama-cyhalothrin(60CS)	100ml /acre
Deltaphos(50%EC)	500ml /acre
Deltamethrin(2.5EC)	250ml /acre



American Bollworm *Helicoverpa armigera* (Noctuidae; Lepidoptera)

Host: Cotton, Sorghum, soybean, peas, sunflower, safflower, chilies, groundnut, tobacco, Okra, maize, tomato.

Identification

Adult:

Yellowish brown, black kidney Shape mark on underside of fore Wings



Egg:

White, dome Shape , 1000-1500 Eggs/female

Larvae:

Greenish with dark broken grey lines along the sides.



PUPA:

pupate in **soil**, dark brown.

Active period: March-Nov

ETL: 5 eggs/larvae per 25 plants



Damage

- Feed on leaves, squares, flowers and small bolls.
- Prominent hole in the bolls
- They feed the internal content completely by thrusting their head inside leaving the rest of the body hanging outside.
- Dirty faeces around the attacked bolls
- Fruit and flowers shedding



Management

Cultural control:

- Clean cultivation.
- Avoid alternate host plants
- Use resistant varieties.

Biological control:

Ichneumonid wasps (Biological control)

Chemical control:

Emamectin benzoate(19EC) 200ml /acre

Chlorantraniliprole(20% SC) 80ml /acre



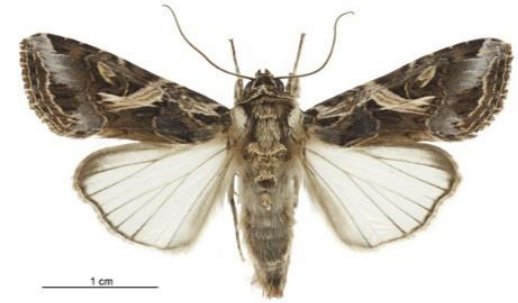
Army worm *Spodoptera litura* (Nuctuidae; Lepidoptera)

Host Plants: Grasses, cereals, vegetables, fruits, legumes, and weeds

Identification

Adult:

pale brown, a prominent white dot near the center of the front wings, forewings with greyish brown pattern. They are active at night, the wing-spread is about 1-1.5 inches



Larva:

Dull white or pale green in the start and later on greenish brown



Egg:

150 eggs, Lay singly in rows, Eggs round, greenish when freshly laid, Pale yellow-finally black

Pupa:

Brownish



ETL: on appearance



Damage:

- Freshly emerged larvae feed on tender leaves. As they grow, they feed on older leaves.
- Skeletonize the plants
- Prominent fecal pellets
- Field looks like grazed by animals in the end



Management

Cultural control:

- Clean cultivation.
- Avoid alternate host plants
- Use resistant varieties.

Biological control:

Apanteles parasitic wasps

Chemical control:

Lufenuron(50EC) 200ml /acre

Methoxyfenozide(240SC) 200ml /acre



Cotton Mealy Bug *Phenacoccus solenopsis* (Pseudococcidae; Hemiptera)

Host plants: Cotton, brinjal, okra, tomato, sunflower

Identification

Adult:

Scale insect about the size of a small red ant. Female wingless. White cotton like wax covers the female's reddish body.

Eggs:

Freshly laid eggs are orange but turn pink just prior to hatch.

Nymph:

Small, resembles with adult, lacking white cottony wax.

Damage

- Feeds on sap of the plants and release toxic substance.
- Also attack the roots at the junction of root and stem.
- Crinkled or twisted leaves and shoots, unopened flowers.
- Branched and unopened leaves, distorted or bushy shoots.
- White fluffy mass on buds, stems, fruits and roots.
- Presence of honey dew, black sooty mold, and ants.
- Small deformed fruits.



ETL: on appearance

Management

Cultural control:

Clean cultivation and removal of weeds.

Severely infested plants cut and burnt immediately.

Biological control:

Aenasius bambawalei

Chemical control:

Chlorpyrifos(40%EC)	1000ml
Profenofos(50%EC)	800ml
Bifenthrin(10%EC)	250ml



Sugarcane Stem Borer *Chilo infuscatellu* (Pyralidea; Lepidoptera)

Host plants: Sudan Grass , Millet , Pearl millet, Sorghum etc.

Identification

Adult:

Brown pale yellow, front wings brownish with dark spots along the outer margin.

Larvae:

Dirty white of pale yellow with 5 Longitudinal stripes. Head and Thorax dark brown

Pupa:

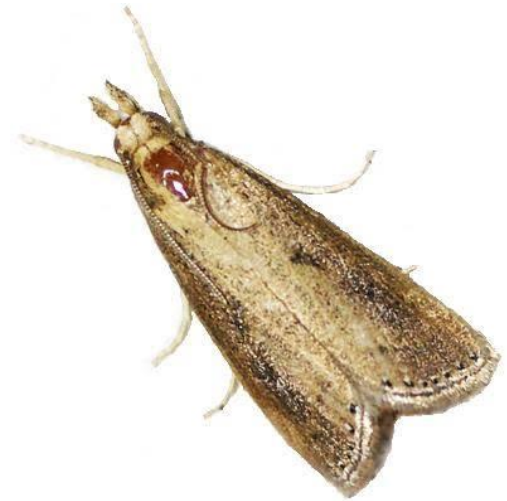
Dark reddish brown

Eggs:

Pale yellow when freshly laid.

Damage

After hatching young larvae feed on base of plants, central leaf whorl is cut by caterpillars, resulting in dry and wilting of leaves. The central dead shoot is also called dead heart.



ETL: 10% attacked plants

Management

Cultural control:

- Collect and destroy moths and egg clusters.
- Cut the attacked shoot at the ground level.
- Remove the dead hearts and kill the caterpillars with the help of sharp knife.
- The sugarcane tops should be removed and fed to cattle.
- Mechanically destroy the eggs of the borer.

Biological control:

7 spotted Lady Bird Beetle *Coccinella septempunctata*

Chemical control:

*Kwick(3% G)	10kg
Carbofuran(3% G)	14kg /acre
Fipronil(0.3% G)	8kg /acre
Phorate(5G)	15kg /acre
Imidacloprid(200SL)	200ml /acre
Monomehypo(5% G)	14kg /acre

Note: Kwick= Phorate+Carbofuran



Sugarcane Gurdaspur Borer *acigona steniellus* (Pyralidae; Lepidoptera)

Host plants: Wild grasses, Sugarcane

Identification

Adult:

Dull brown, hind wings whiter having 7 dark spots between veins along the outer margin.

Eggs:

White to pale creamy when freshly laid.

Larvae:

creamy white With 4 narrow longitudinal Reddish streaks and orange Head.

Pupa: more or less smoothy, yellowish brown

Damage

Young larvae enters in the top portion of the cane , through single hole, just above the node. They feed in groups making spiral galleries which runs upwards.



ETL: 10% attacked plants

Management

Cultural control:

- Infested parts are either cut, burnt or fed to the cattle.
- Earthing up of crop.
- Ploughing up of stubbles and stirring of soil to destroy hibernating larvae.
- Remove the dead hearts and kill the caterpillars with the help of sharp knife.

Biological control:

7 spotted Lady Bird Beetle *Coccinella septempunctata*

Chemical control:

Carbofuran(3%G)	14kg /acre
Fipronil(0.3%G)	8kg /acre
Phorate(5G)	15kg /acre
Imidacloprid(200SL)	200ml /acre
Monomehypo(5%G)	14kg /acre



Sugarcane root borer *Emmalocera depressella* (Pyralidae; Lepidoptera)

Host plants: Wild grasses, sugarcane

Identification

Adult:

Pale or yellow brown. Forewings pale of yellowish brown.

Eggs:

Scale like creamy white.

Larvae:

Creamy white with transverse grooves.

Pupa:

Yellow brown



Damage

- Larvae bore the plant tissues which are below ground.
- Drying up of inner whorls of leaves and formation of dead heart.
- The crop yield decreases to 10-15 %



ETL: 10% attacked plants

Management

Cultural control:

- Destroy the stubbles after harvesting the crop to kill the hibernating larvae.

Biological control:

Egg parasitoid *Trichogramma chilonis*

Chemical control:

Fipronil(0.3% G)	8kg /acre
Phorate(5G)	15kg /acre
Imidacloprid(200SL)	200ml /acre
Monomehypo(5% G)	14kg /acre

Sugarcane termite *Odontotermes obesus* (Termitidea; Isoptera)

Host plants: sugarcane

Identification

Adult: Adults are creamy white with darker heads

Eggs: Dull kidney shaped

Nymph: 4 instars

Damage: **ETL:** at appearance

- Workers attack the newly planted sets and effect the germination.
- They enter through the cut ends and enter in the soft tissues and feed on them.
- The termites enter the shoots canes and stubbles.

Management

Destroy the stubbles after harvesting the crop

Biological control:

Trichogramma chilonis

Chemical control:

Chlorpyrifos(40% EC) 1000ml/acre

Fipronil(0.3% G) 8kg/acre

*Lesenta(80% WG) 100g/acre

Note:Lesenta=Imidacloprid+Fipronil



Sugarcane Top Borer *Scirpophaga nivella* (Pyralidae; Lepidoptera)

Host plants: wild grasses, sugarcane

Identification

Adult:

Pure white, front wings long, hind wings shorter and white

Female with reddish brown anal tuft.

Eggs:

Oval, scale like, covered with yellow or reddish brown hairs.

Larvae:

Creamy white, dorsal vessel prominent

Pupa:

Brownish, abdominal tips broadly rounded.

ETL: 10% attacked plants



Damage:

- Larvae bore into leaves through midrib, consequently main stalk.
- It infest top portion of plants.
- In early stages young sugarcane plants have reddish streaks together with small holes.
- In later stages it cause “Bunchy top” which is crowding of leaves and twigs on shoot apex.

Management

Cultural control:

- Infested parts are either cut, burnt or fed to the cattle.
- Remove the dead hearts and kill the caterpillars with the help of sharp knife.

Biological control:

Parasitic wasp *Trichogramma japonicum*

Chemical control:

Carbofuran(3%G)	14kg /acre
Fipronil(0.3%G)	8kg /acre
Phorate(5G)	15kg /acre
Imidacloprid(200SL)	200ml /acre
Monomehypo(5%G)	14kg /acre



Sugarcane Leafhopper (Pyrilla) *Pyrilla perpusilla* (Lophopidae; Homoptera)

Host plants: wheat, barley, oat, sugarcane

Identification

Adult:

Straw colored body, wings light brown with dark spots on the wings.

Eggs:

Oval/rounded and pale-white, laid in clusters.

Nymph:

Greyish brown having two white prominent feather like filaments at the end of tail of its body.

Damage

- Sucking of sap from the leaves
- Leaves turn yellowish white and wither away due to heavy infestation.
- Secretion of honey dew results in black sooty mold.



ETL: 2 individuals per leaf

Management

Cultural control:

- Destroy the eggs
- Destroy the pest through hand nets

Biological control:

Use of predators such as *Brumus suturalis*

Chemical control:

Imidacloprid(200SL)	200ml /acre
Thiamethoxam(25WG)	24g /acre
Acetamiprid(20SP)	125ml /acre



Rice Stripped Stem Borer *Chilo suppressalis* (Noctuidae; Lepidoptera)

Host Plants: Rice, maize, oat, sorghum & milt

Identification

Adult:

Forewings are 11-14 mm long with ground color varying from dirty white to yellowish brown, variably with gray brown scale.

Eggs:

are scale like and translucent white to dark yellow. These naked cluster consist of nearly 60 overlapping.

Larvae:

Full grown larvae are yellow, with five, dim, longitudinal lines, and can grow to a length of about 25 mm.

Pupa:

Pupae are reddish brown with two ribbed crest on porontal margins 9-14 mm long.

ETL: 8-10 per plant



Damage:

- Symptoms vary, depending on the age of the plant.
- When young plants are attacked the first symptoms are the drying off of growing points and the surrounding leaves (“dead hearts”)
- In older plants 1st show yellow, dried out, their outer leaves curl the leaf sheath turn yellow and finally, the leaves fall off.

Management

- Flooding and harrowing or ploughing to turn in stubble and straw.
- Destruction of weeds etc.

Biological Control:

Paratheresia claripalpis

Chemical control:

*Padan(4%G)	9kg /acre
Monomehypo(5%G)	7kg /acre
*Kwick(3%G)	10kg /acre
Fipronil(0.3%G)	8kg /acre

Note: Padan= Cartap Hydrochloride

Kwick= Phorate+Carbofuran



Rice Leaf Folder: *Cnaphalocrocis medilalis* (Pyralidae; Lepidoptera)

Host plants: Rice, Sorghum, grassy weed's, cereals & food plants etc.

Identification

Adults:

Golden or yellowish brown. Wings have 2-3 dark stripes.

Eggs:

Oval in shape, creamy white, laid in batches along the midrib of the leaf blade.

Larvae:

Light yellow or greenish yellow. Body turns green after larvae start feeding.

Pupa:

Newly light brown but later turns reddish brown

ETL: 10% damaged leaves at vegetative stage and 5% at flowering stage



Damage:

- Rice plant dries up with its high population density.
- The larvae feed on green mesophyll in the leaf. Results in white stripe in the leaf.
- Each larvae destroys a number of leaves during its growth.

Management

Cultural control:

- Trapping the moths by light trap.
- Removal of grassy weeds from rice field

Biological control:

- Frogs and toads are consider as predator of leaf folder.
- *Trichogramma* spp. Is effective parasitoid.

Chemical control:

*Padan(4%G)	9kg /acre
Monomehypo(5%G)	7kg /acre
Lambda-Cyhalothrin(2.5EC)	200ml /acre

Note: Padan= Cartap Hydrochloride



Rice Hispa *Dicladispa armigera* (Chrysomelidae; Coleoptera)

Host plant: Primarily rice, maize, sugarcane and other graminaceous crops and weeds.

Identification

Adult:

Small bluish black or dark blue beetle fringed with numerous short spines over the body.

Eggs:

Eggs are laid inside minute slits on the tender leaves generally toward the tip.

Grub:

Whitish yellow and flattened

Pupa:

Pupation takes place inside the tunnels.

ETL: 1-2 adults/hill



Damage

- Generally the plants are affected in young stage.
- Grub mines into the leaves and feed on green tissues between the veins.
- Adults also scarp green matter of tender leaves leaving only lower epidermis as white streaks parallel to midrib.

Management

Cultural control:

- Avoid over fertilization.
- Manual collection and killing of beetles – Hand nets.
- Leaf tips containing blotch mines should be destroyed.

Biological control:

Reduviid bug eats upon the adults.

Chemical control:

Quinalphos(25EC)	800ml /acre
Chlorpyriphos(20EC)	1000ml /acre
Carbofuran(3% G)	7kg /acre



Rice Yellow Stem Borer *Scirpophaga incertulus* (Pyralidae; Lepidoptera)

Host plants: Rice and wild grasses

Identification

Adult:

Bright yellowish forewings with a distinct black spot at the center.

Eggs:

Creamy white, oval shaped, covered with brownish hairs from the antennal tuft of females.

Larvae:

Pale or yellowish white, head capsule orange yellow. 4 instars

Pupa:

Yellowish white, tinged green.

ETL: 8-10 per plant



Damage

- Young larva penetrates the leaf sheath and goes down into the stem
- Destroy central growing leaf and cause dead heart
- At flowering stage, white ear heads stand erect and has no grains, known as milky or white ears

Management

- Removal and destruction of rice stubbles from field and also collection and destruction of egg masses.
- Collection & destruction of moths using light traps.
- Clipping of leaf tips of the seedlings at the time of transplanting.

Biological control:

egg parasitoid, *Trichogramma japonicum*.

Chemical control:

Monomehypo(5% G)	7kg /acre
*Kwick(3% G)	10kg /acre
Fipronil(0.3% G)	8kg /acre
*Padan(4% G)	9kg /acre

Note: Kwick= Phorate+Carbofuran

Padan=Cartap Hydrochloride



Rice White Stem Borer *Scirpophaga innotata* (Pyralidae; Lepidoptera)

Host plants: Rice and wild grasses

Identification

Adult:

Moth is slender, white in color with no black spot on the forewings

Eggs:

Creamy white, laid near the tip of leaf blades

Larvae:

Pale white or yellowish white

Pupa:

Pale white enclosed in a white silken cocoon.

Active period: April – November

ETL: 8-10 per plant



Damage

- Young larva penetrates the leaf sheath and goes down into the stem
- Destroy central growing leaf and cause dead heart
- At flowering stage, white ear heads stand erect and has no grains, known as milky or white ears

Management

- Removal and destruction of rice stubbles from field and also collection and destruction of egg masses.
- Destruction of moths using light traps.
- Clipping of leaf tips of the seedlings at the time of transplanting.

Biological control:

egg parasitoid, *Trichogramma japonicum*.

Chemical control:

*Padan(4% G)	9kg /acre
Monomehypo(5% G)	7kg /acre
*Kwick(3% G)	10kg /acre
Fipronil(0.3% G)	8kg /acre

Note: Padan= Cartap Hydrochloride

Kwick= Phorate+Carbofuran



Rice Pink Gramineous Borer *Sesamia inferens* (Noctuidae; Lepidoptera)

Host plant: Rice, maize oat etc.

Identification

Adult:

Moth is small, stout and straw coloured.

Eggs:

Yellowish, laid in 1-3 rows like beads on the inner surface of the leaf sheath.

Larvae:

Pink to purplish pink in color lighter on the ventral side, smooth and cylindrical with a reddish-brown head.

ETL: 8-10 per plant



Damage

- Feeding occurs within the rice stem or base of the panicle. When a stem is severed it wilts causing a dead heart.
- Feeding at the base of the panicles often causes the panicle to be cut leading to a wilted panicle called a whitehead.

Management

Cultural control:

- Removal and destruction of rice stubbles.
- Collection and destruction of moths using light traps.
- Clipping of leaf tips of the seedlings at the time of transplanting.

Biological control:

Larva is parasitized by *Apanteles flavipes*.

Chemical control:

Monomehypo(5%G) 7kg /acre

Fipronil(0.3%G) 8kg /acre

*Padan(4%G) 9kg /acre

Note: Padan= Cartap Hydrochloride



Rice White-backed Plant-hopper *Sogatella furcifera* (Delphacidae; Homoptera)

Host plants: Rice and wild grasses

Identification

Adult:

Straw coloured, wedge shaped with white back.

Eggs:

Laid in masses in leaf sheath

Nymph:

Greyish white and turns dark grey near maturity.

Damage

- Adult and nymphs suck cell sap from leaf surface
- Infested plants die without producing ears
- Attacked leaves turn yellow and later on rust red. Such rust red leaves in the field appear as red patches commonly called “Hopper burn”.



ETL:

Management

Cultural control:

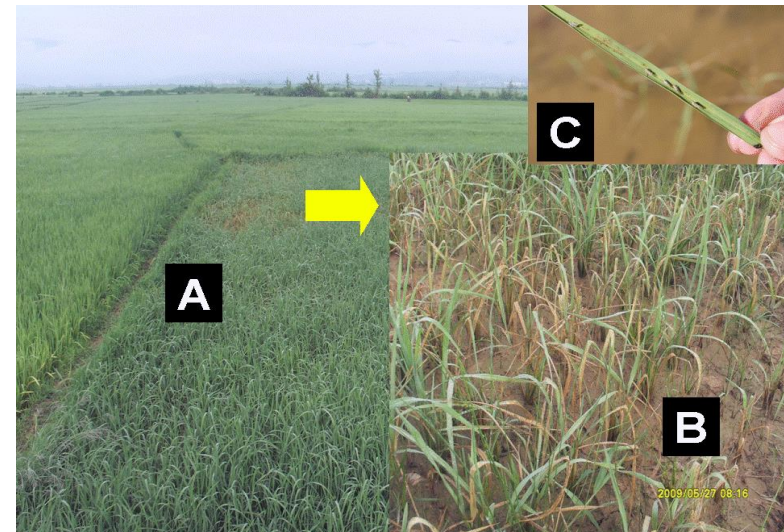
- Wild grasses must be removed.
- Plant spacing should be increased in infested area.
- Grow resistant varieties.

Biological control:

White muscardine fungus *Beauveria bassiana* is helpful in spreading disease in hoppers.

Chemical control:

*Best Guard(70% WP)	200g /acre
Flonicamid(50% WG)	60g /acre
Lambda-Cyhalothrin(2.5EC)	200ml /acre
Best Guard =Buprofezin+Nitenpyram	



Maize Stem Borer *Chilo partellus* (Pyralidae; Lepidoptera)

Host plants: maize, sarkanda, jawar

Identification

Adult:

Adults are yellowish grey moths about 25 mm across the wing when spread.

Eggs:

Flat, oval and yellowish. They are in clusters form up to 20 eggs.

Larvae:

Larvae are dirty white with brown head having many dark spots on the body.

Pupa:

yellowish brown in color.

ETL: 5%



Damage:

- Caterpillars eating inside the stem.
- Weakening of plant.
- Dead heart is formed.

Management

Cultural control:

- Destroying the stubbles, weeds and other host.
- Removal of dead hearts and crop residues.
- Clipping of lower leaves of maize (up to 4th)

Biological control:

Release *Trichogramma chilonis* 1 lac/ ha.

Chemical control:

Carbofuran(3%G) 8kg /acre

*Kwick(3%G) 5kg /acre

Fipronil(0.3%G) 8kg /acre

Phorate(5G) 5kg /acre

Note: Kwick= Phorate+Carbofuran



Sorghum Shoot Fly *Atherigona soccata* (Muscidae; Diptera)

Host plants: Sorghum, maize, Rice, millet etc.

Identification

Adult:

- Looks like a small house fly.
- Head and thorax of the female are pale grey.
- Abdomen is yellowish with paired brown patches.
- Male is more blackish.

Eggs:

White and elongate in shape

Larvae:

8 -10 mm long and has a white or yellowish colour.

3 instars

Pupa:

reddish brown in color and & about 0.5 mm in length.

ETL: 10% dead heart



Damage

- Grub feed on the growing point of the shoot of the seedling. The result is a typical "dead heart".
- Also tillers may be attacked in severe infestation.
- Total loss in yield is as high as 60%
- Damaged leaf becomes thin and papery, wrapping around the other leaves.



Management

Cultural control:

- Early sowing = Low incidence of attack
- Remove dead hearts
- Tall varieties with yellow glossy stem
- Rotations with non-host crops

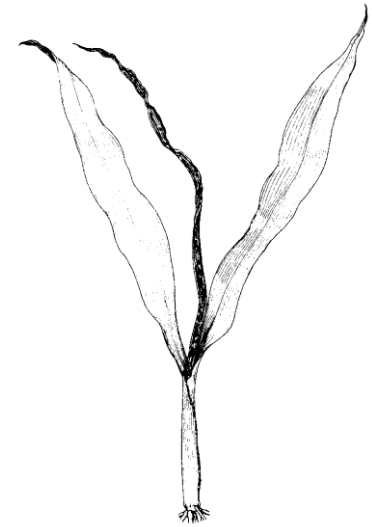
Biological control:

Green lace wing *Crysoperla carnea*

Chemical control:

*Polytrin-C(440EC)	150ml /acre
Lufenuron(50EC)	100ml /acre
Tebufenozide(200SC)	100ml /acre

Note: Polytrin-C= Profenofos+Cypermethrin



Sorghum Stem Borer *Chilo partellus* (Pyralidae; Lepidoptera)

Host plants: Jowar and maize, sugarcane

Identification

Adult:

- Moths have a wingspan of 20-30 mm
- Forewings pale brown, hind wings almost white in colour
- Males are smaller and darker than females.

Eggs:

Scale-like, about 1.5 mm across, creamy-white and laid in overlapping batches.

Larvae:

Body up to 25 mm long, creamy-white to yellowish-brown with a prominent reddish-brown head

Pupa:

Light yellow-brown to dark red-brown



Damage

- Larvae initially feed on tender leaf whorls
- Later bore and feed into the stems causing “dead hearts”
- Series of small holes in lines (pin holes) in younger leaves
- and/or patches of transparent leaf epidermis (window panes) in older leaves.

Management

Cultural control:

- Collection and destruction of stubbles
- Increase the seed rate to compensate the loss.
- Follow proper crop rotation (with non host crop).
- Use of light traps.

Biological control:

Egg parasitoid *Trichogramma chilonis*

Chemical control:

Carbofuran(3%G) 7kg /acre

Phorate(10G) 8kg /acre



Gram Cutworm *Agrotis flammatrix* (Noctuidae; Lepidoptera)

Host plants: Gram, potato, cucurbit, wheat seedlings

Identification

Adult:

Heavy bodied, greyish brown or wheat colour body.

Wavy lines on hind wings.

Eggs:

yellowish white

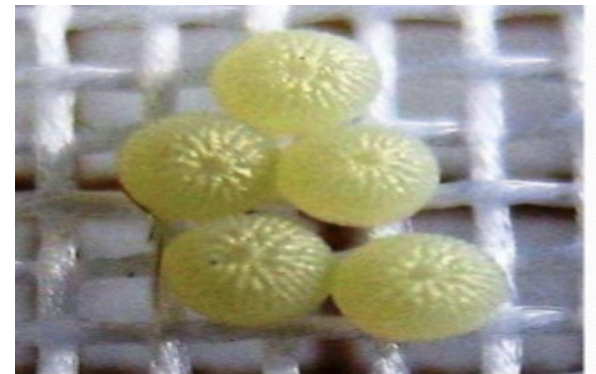
Larva:

Dark grey in colour

Pupa:

Dark grey

ETL: 10% at initial stage



Damage

- Caterpillar come out from their breeding site at night and become active.
- Cutting down the young plant of gram.
- Damage just above or slightly below the surface of soil.

Management

Cultural control:

- Hand hoeing.
- Clean cultivation.
- Use of light trap to kill moths, hand picking of larvae.

Biological control:

Trichogramma chilonis is used as parasitoid.

Chemical control:

*Polytrin-C(440EC)	500ml /acre
Lambda-Cyhalothrin(2.5EC)	250ml /acre
Chlorpyrifos(20EC)	1000ml /acre

Note: Polytrin-C= Profenofos+Cypermethrin



Gram Pod Borer *Helicoverpa armigera* (Noctuidae; Lepidoptera)

Host plants: Gram, cabbage cotton and many others

Identification

Adult:

Yellowish brown to orange brown, black kidney shape mark on underside of fore Wings

Egg:

White, dome Shape , 1000-1500 Eggs/female

Larvae:

Freshly emerged yellowish white, coloration varies with diet ranges from bluish green to brownish red.

Whitish or dark grey longitudinal strips along the sides.

PUPA:

pupate in **soil**, dark brown.

Active period: March-Nov

ETL: 5 eggs/larvae per 25 plants



Damage

- Skeletonization of leaves – feeding chlorophyll only leaving veins by young larvae, Defoliation
- Feeds flower and green pods & Foliage.
- In green pods – make circular holes and feed the grains and make empty.

Management

Cultural control:

- Timely sowing
- Use of tolerant varieties
- Clean cultivation.
- Use of light trap to kill moths, hand picking of larvae.

Biological control:

Ichneumonid wasps (Biological control)

Chemical control:

Polytrin-C(440EC)	500ml /acre
Chlorantraniliprole(20%SC)	40ml /acre
Novaluran(10%EC)	300ml /acre



Citrus Mealy Bug *Planococcus citri* (Pseudococcidae; Homoptera)

Host plants: guava, banana, mango & all citrus

Identification

Adult:

- Female 3mm in size, wingless orange-brown body covered with white cottony wax. Small waxy filament appear along the margins of oval body
- Male reddish brown, narrower than female, winged without white cottony wax covering.

Nymph:

Yellowish with red eyes, slightly covered with white cottony wax

Eggs:

Yellow to amber, oblong, laid in clusters in white fluffy ovisac.

ETL: 1 adult/nymph per leaf



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Damage

- The insects feed on cell-sap and plant become pale yellowish leaves premature leaf drop and stunted growth.
- Also attack on the roots. In severe infestation plants develop shallow roots and fall off.
- Honeydew secretion results in black sooty mold.

Management

Cultural control:

- The infested shoots should be cut and destroyed.
- Plants with infested roots should be pulled off.
- Weeds acts as additional host and these must be removed.

Biological control:

Cryptoleamus montruzieri 10 beetles per plant

Chemical control: per 100 L of water

Chlorpyrifos(40EC)	150ml
Profenofos(500EC)	200ml
Bifenthrin(10% EC)	250ml
Emamectin benzoate(19EC)	200ml



Citrus Red Scale *Aonidiella aurantii* (Diaspididae; Homoptera)

Host plants: Citrus , Mango and rarely Roses.

Identification

Adult:

- Female is 1.5-2 mm in length, wingless and lack of legs.
- Male smaller about 1-1.3, have wings folded back on the body.

Nymph:

- The first instar is mobile to find feeding site, other instar are immobile.
- The crawler are oval and white, later become round and greyish to red as they molt.

Egg:

No eggs laid, female bear live young called crawlers.

ETL: 25% fruit infestation



Photo: © IPM for Citrus, University of California



Damage

- Feed on juice and devitalize the plants.
- They inject a toxic substances in plant sap.
- In severe infestation, all the leaves turn pale.
- The market value is decreased by infested plants.

Management

Cultural control:

- Infested parts clipped off and destroyed.
- Water logging and other stress condition should be avoided.

Biological control:

Chilocorus cacti is a predator of red scale

Chemical control: per 100 L of water

Chlorpyrifos Methyl(50%EC)	150ml
Profenophos(500EC)	200ml
Paraffinic Petroleum Oil	782g/L



Guava Fruit Fly *Bactrocera dorsalis* (Tephritidae; Diptera)

Host plants: Mango, peach ,guava ,papaya and apricot

Identification

Adult:

Size about 8mm, two yellow stripes on thorax, dark T-shaped marking on abdomen, hyaline wings.

Egg:

White, elongate and elliptical

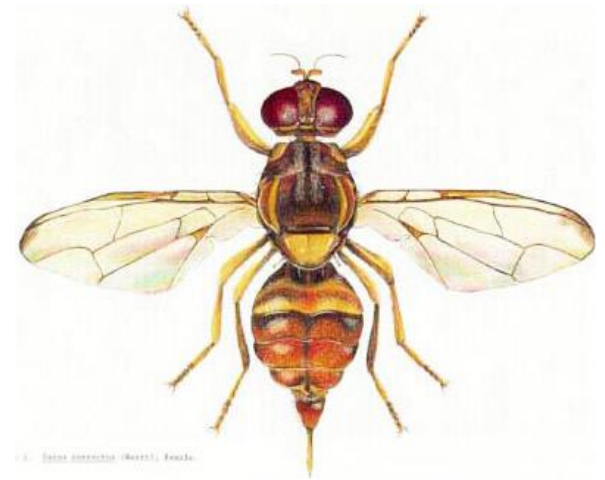
Larvae:

Creamy white, 10mm in size.

Pupa:

Ranges in color from dull red or brownish yellow.

ETL: 10% at initial fruits



Damage

- Adult fruit flies damage the fruit where they lay their eggs causing discoloration.
- The maggots bore into the fruit cause extensive rotting and dropping of fruit.
- Damaged fruits are unfit for human consumption.

Management

Cultural control:

- Collect and destroy fallen and infested fruits.
- Summer ploughing to expose pupa.

Biological control:

Parasitoid wasp, *Diachasmimorpha kraussi*

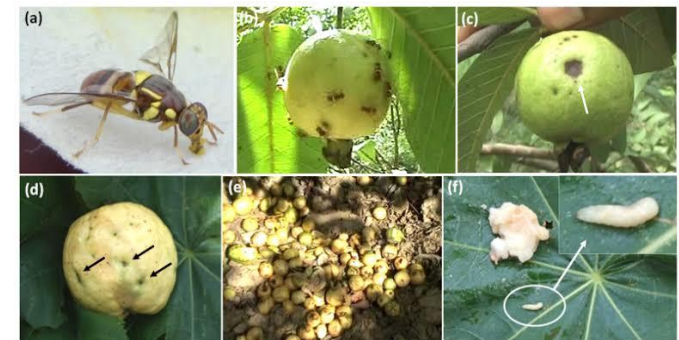
Chemical control: per 100 L of water

Trichlorphon(SP80) 100g

Spinosad(0.02% Concentrate Bait) 0.5L+3.5-4.5L water

*Laser(25EC) 250ml

Note: Laser= cypermethrin+dimethoate



Citrus whitefly *Dialeurodes citri* (Aleyrodidae; Hemiptera)

Host plants: banana, olive, jasmine

Identification

Adult:

1.2 to 1.4 mm long, creamy white, coated with white powdery wax. Two pairs of white scaly wings.

Nymph:

Flat and oval, pale yellow with purple eyes.

Eggs:

Smooth and pale yellow, attached to leaves on a stalk, ovoid or pear-shaped.

Pseudo-pupa:

Distinct 'Y' shape on the pseudo-pupa

ETL: 5-10 per leaf



Damage

- Sucks the cell sap from leaves and curl over and fall off.
- The honeydew excretion causes black sooty mold. This fungus covers the leaves and stop photosynthesis.



Management

Mechanical control:

- The effected shoots should be clipped off or destroyed.
- Water logging or any other stress condition should be avoided.



Biological control:

Parasitoid wasp *Encarsia lahorensis*.

Chemical control: per 100 L of water

Acetamiprid (20% SP)	125g
Nitenpyram (10% SL)	100ml
Matrine (0.5% AS)	500ml



Citrus psylla *Diaphorina citri* (Psyllidae; Hemiptera)

Host plants: Orange, jasmine

Identification

Adult:

- Adult is small(4mm long),brown and white patches on body.
- Tail end of the body being turned upward.
- Wings are membranous.

Nymph:

The nymphs are flat, louse-like.

Five nymphal instars with light yellow color.

Egg:

Pale yellow small eggs laid on young foliage.

ETL: 6/leaf



Damage

- Suck cell sap from tender parts of plant.
- Yellowing of plant leaves and twigs.
- In case of severe infestation leaves curled up.
- Pre-mature fruit dropping and defoliation.
- Sooty mold on sugary secretions
- Vector of citrus greening disease.

Management

Mechanical control:

- Infested shoots should be clipped off or destroyed.
- Water logging & other stress condition should be avoided.

Biological control:

Parasitoid wasp *Tamarixia radiata* feeds on nymph

Chemical control: per 100 L of water

Bifenthrin (10%EC)	60ml
Polytrin-C (440EC)	250ml
Imidacloprid (20%SL)	40ml
Spinosad (24%SC)	40ml



Citrus Caterpillar *Papilio demoleus* (Papilionidae; Lepidoptera)

Host plant: Lemon

Identification

Adult:

- Adult is large beautiful butterfly 28mm in length, commonly known as lemon butterfly.
- Black wings ornamented with numerous yellow spots.
- Thorax and head are black in color.

Caterpillar:

Yellowish green and horn like structure

Egg:

Pale yellow small and round eggs laid on young foliage.

ETL:



Damage

- Larvae feed on fresh leaves and terminal shoots.
- They feed on mature leaves and sometimes plant may be foliated.
- Heavily attacked plants bear no fruits.



Management

Mechanical control:

Hand picking and destruction of larvae.

Biological control:

Yellow wasp (*Polistes hebreus* F) Preying mantis (*Creobrator gemmatus*) and spider.

Chemical control: per 100 L of water

Galafos (2.5% EC) 250ml

Bifenthrin (10% EC) 40ml

Betacyfluthrin (25% EC) 50ml

Note: Galafos = Chlorpyrifos + dimethoate



Citrus leaf miner *Phyllocnistis citrella* (Phyllocnistidae; Lepidoptera)

Host plants: Lemon, lime, orange

Identification

Adult:

- Tiny moth, smooth head, body silvery white in colour.
- Fore and hindwings with fringes of hairs.
- Antennae backward

larvae:

Minute, greenish yellow and located inside the leaf mine

Eggs:

Eggs present under the leaf from which are larvae hatches that burrows into the leaf.

ETL: 10% affected leaves



Damage

- Larvae makes mines in the leaves.
- Only infest the younger leaves and curling of leaves
- The bark and wood are cut right up to the center and the branches are cut into two bite they dry up above the point of girdling.

Management

Mechanical control:

- Hand picking and destruction of larvae.
- Pheromone traps for adults.

Biological control:

Tiny nonstinging wasps - *Cirrospilus* and *Pnigalio* species.

Chemical control: per 100 L of water

Novastar (50EC)	50ml
chlorantraniliprole(20% SC)	15ml
Spinosad (48% EC)	20ml
Cyromazine(70WP)	30g

Note: Novastar= Bifenthrin+abamectin



Mango leaf hopper *Amritodus atkinsoni* (Cicadelli; Hemiptera)

Host plants: guava, apple.

Identification

Adult:

- 5mm long, greenish brown with small broad head and tapering body.
- Central longitudinal narrow dark streak on the scutellum absent.

Eggs:

Female insert eggs singly in the tissues of panicles, unopened flowers and young leaves.

Nymph:

Elongated, more active and pale yellow in colour.

ETL: 5/leaf(in summer)1/ leaf(in winter)
10/inflorescence



Damage

- Adults and nymph suck sap from inflorescence and tender shoots. Flowers wither, turn brown and fall off without fruits setting
- Nymphs de-sap fruit bearing portion.
- Secrete honey dew as a result sooty mould caused and less photosynthesis



Management

Cultural control:

- Removal of alternate host plants
- Avoid excess use of nitrogenous fertilizer

Biological control:

Predators *Mallada boninensis* and *Chrysopa lacciperda*

Chemical control: per 100 L of water

Imidacloprid(200SL)50ml

Lambda-cyhalothrin(2.5EC)50ml

Bifenthrin(10EC)20ml



Mango mealy bug *Drosicha mangifera* (Margarodidae; Hemiptera)

Host plants: Guava, citrus

Identification

Adult:

- Female wingless, oval, flattened, body covered with white mealy powder.
- Male winged, forewings black, hindwings modified as halteres, body crimson.

Egg:

100-200 eggs in cottony egg sac.

Nymph:

Newly hatched nymphs are yellow to orange

Pupa:

Pupation occurs only in males.

ETL: on appearance



Damage

- Nymphs and adults suck cell sap causing tender shoots and flowers dry
- Heavy infestation can cause defoliation and even death of the plant
- Honey dew that attracts ants and sooty mold.

Management

Cultural control

- Removal weeds from orchard.
- Ploughing of orchard during summer season.
- Apply sticky bands like track-trap on main stem to prevent crawlers of mealy bugs reaching the bunch.

Biological control:

Parasitic wasp

Chemical control: per 100 L of water

Dimethoate(30EC)	200ml
Profenofos(500EC)	200ml
Chlorpyrifos(40EC)	150ml



Woolly Apple Aphid *Eriosoma lanigerum* (Aphididae; Homoptera)

Host plants: Apple, pear and crab-apple

Identification

Adult:

- About 1.8mm in size, female body is reddish to purple in color covered with white cottony wax.
- Only males are winged

Nymph:

Wingless, reddish to purple in color. 4 instars

Eggs:

No eggs, females produce off-springs by parthenogenesis.

Active period: March-September.

ETL: On appearance



Damage:

- Aphids suck the cell-sap from twigs and roots underground.
- Woolly wax residues on the bark, branches and especially around old pruning wounds.
- Swellings or galls produced in roots and twigs making tree susceptible to canker.
- Black sooty mold occurs due to honeydew.
- Heavily infested trees developing a shallow fibrous root system and yellow foliage.

Management

Cultural control:

- Wounds should be covered or painted.
- Prefer WAA-resistant rootstocks.
- Physically remove the aphids colonies.

Biological control:

Predator *Aphelinus mali*

Chemical control: per 100 L of water

Cypermethrin (10% EC) 250ml

Imidacloprid (5% EC) 50ml

Malathion (50EC) 800ml



Red/Date Palm Weevil *Rhynchophorus ferrugineus* (Curculionidae; Coleoptera)

Host plants: Date palm and other palms including ornamental palms

Identification

Adults:

40mm long, body reddish brown with dark spots, having a long snout.

Larvae:

Legless grubs, 45-50mm in length, uniformly pale yellow body with dark brown head.

Pupa:

Pupate in cocoons made up of coarse palm fibers, located in the damaged tissues of palm.

Eggs:

Female lays 200-300 whitish, slendrical, smooth eggs in holes in the trunk, petioles and in wounds.

ETL:



Damage

- Grubs bore in soft inside of palms as well as feed on the leaves and wounds.
- Presence of tunnels on the trunk and base of fronds.
- Gnawing sound due to feeding by grubs inside.
- Oozing out of thick brown fluid from the tunnels with fermented odor.
- Breaking of the trunk or toppling of the crown in case of severe and prolonged infestation.



Management

Cultural Control:

- ✓ Destroy infested stems by cutting and burning them, and
- ✓ Treat cuts or wounds with an insecticide

Biological control:

Earwigs *Chelisochea moio*, eat the eggs and larvae

Chemical control:

- ✓ Dimethoate (30EC) 400ml/25L water
- ✓ Carbaryl (50WP) 250g/25L water
- ✓ 1-2 Aluminum Phosphide put into the holes



Brinjal Lace-wing Bug *Urentius sentis* (Tingidae; Hemiptera)

Host Plants: Brinjal

Identification

Adult:

- Adult color is straw on the dorsal side and black color on the ventral side.
- On the pronotum and wings there is network of marking and veins Size is 3mm.

Egg:

Shining white nipple shaped.

Nymph:

2mm long, pale ochraceous with very prominent spines.

ETL: 2-3 larva per plant or 10% leaflets in central damage



Damage

- The adult and nymph suck the sap from leaves and cause yellowish spots.
- Black scale like excreta deposited them.
- Mottled appearance to the leaves.
- When attack is sever 50% crop is damage.

Management

Cultural Control

- Grow plants that are well adopted to the conditions of site.
- Replacing the plants that are performing poorly.

Biological Control

Wasp, Lady bird beetles, and green lace wing larvae.

Chemical Control:

*Fiproxy(11% WP) 200g /acre

*Supextin(12% WP) 100g /acre

Note: Fiproxy=Lambda-cyhalothrin+clofentezine,

Supextin=Emamectin benzoate+Lambda-cyhalothrin



Cabbage Butterfly *Pieris brassicae* (Pieridae; Lepidoptera)

Host Plants: Cabbage and other cruciferous plants.

Identification

Adult:

- Butterfly is yellow white.
- Female larger with 2 black spots on the upper side of each forewing.
- Male smaller with 2 black spots on the underside of each forewing.

Egg:

Pale white or yellow, conical in shape.

Larva:

Pale yellow when young, later turns greenish yellow

It heads is black, 40 to 50mm long.

Pupa:

Greenish yellow.

ETL: 20 larva per 10 plants



Damage

- Damage is caused by the caterpillars.
- The 1st instar caterpillar just scrape the leaf.
- Later instar caterpillars feed on plant leaves and heads.
- Entire plants are eaten up.
- The effected plant head is not of the normal size.

Management

Cultural control:

- Destruction of crop stubbles.
- Handpicking and mechanical destruction of caterpillar during early stage.

Biological control:

Chemical control:

Quinalphos(25EC)	1000ml /acre
Triflumuron(20%SC)	200ml /acre
Cypermethrin(50%EC)	900ml /acre



Brinjal Fruit Borer *Leucinodes orbonalis* (Pyralidae; Lepidoptera)

Host plants: Brinjal, potato

Identification

Adult:

- White with pale brown or black spots on dorsal side of thorax and abdomen.
- Wings white with apical and anal margins fringed with small hairs.

Eggs:

Creamy white, turns reddish brown before hatching.

Larvae:

Light pink in colour

Pupa:

Reddish brown enclosed in tough boat shaped silken cocoon.

ETL: 5% damaged fruit



Damage :

- Caterpillar bore into fruit and feed inside it. single caterpillar may destroy 4-6 fruits.
- Attacked fruit called as “KANA” in Punjabi and has low or no market value.
- Also bore into tender shoots and flower

Management

Cultural control:

- Intercropping with cowpea , maize etc.
- Destruction of dried shoot tips and bored fruits.

Biological control:

Egg parasitoid *Trichogramma chilonis*

Chemical control:

Spinosad(24SC)	40ml /acre
Chlorantraniliprole(20SC)	40ml /acre
Flubendiamide(48% SC)	20ml /acre
Emamectin Benzoate(19EC)	200ml /acre



Brinjal Stem Borer *Euzophera perticella* (Pyralidae; Lepidoptera)

Host plants: Brinjal, potato, chili

Identification

Adult:

Greyish brown, forewings with transverse lines and white hindwings.

Eggs:

Creamy scale-like, laid singly/in batches on young leaves petioles and branches.

Larvae:

Creamy white with few bristle-like hairs, body taper posteriorly.

Pupa:

Pupate in cocoon inside larval tunnel

ETL: 5% stem damage



Damage

- Larvae bores into main stem of young and old plants and moves downwards.
- Top shoot of young plants crump and wither.
- Older plants become stunted.
- Distinct thickening of stem at the entry point.

Management

Cultural control:

- The wither plant should be uprooted and burnt.
- When the attack is serious, the ratooning of brinjal crops should be discontinued.

Biological control:

Larval parasitoids *p.euzopherae*

Chemical control:

Fenpropathrin(30EC)

300ml /acre

Emamectin Benzoate(1.9%EC)

100g /acre

Thiodicarb(75WP)

625-1000g /acre



Til Hawk Moth *Agrius convolvuli* (Sphingidae; Lepidoptera)

Host plants: Sesame, sweetpotato

Identification

Adult:

- Heavy bodied moth, reddish-brown with stoutly built body
- Fore wings have mixture of dark-brown and grey pattern, yellowish spots on each wings.

Eggs:

Globular, greenish when freshly laid but turn yellow later.

Larva:

Body plump with pleasant mixture of soft colour
Horn like projection on hind end of abdomen.

Pupa:

Slenderical body and small.

ETL: 5 adults or nymphs/plant



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Damage

- The larvae are voracious feeder on leaves
- Defoliate the leaves
- The moth is also harmful as it sucks honey from the honey combs in apiaries till it is stung to death by the bees

Management

Cultural control:

- Ploughing of soil in the winter to kill the hibernating larvae
- Hand picking and destruction of larvae

Biological control:

Agriommatus acherontiae is parasite on egg

Apanteles acherontiae is parasite on larvae

Chemical control:

Profenophos(50%EC) 200ml /acre

Lambda-Cyhalothrin(5%EC) 100ml /acre

Trizophos(40%EC) 100ml /acre

Quinalphos(25%EC) 200ml /acre

