ISBN: 978-81-19149-94-0

13. Insect Pest of Vegetable Crops and Their Management

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Abstract:

Insect pests pose a significant threat to vegetable crops, impacting both yield and quality. These tiny marauders can devastate entire fields if left uncontrolled. Some common insect pests of vegetable crops include aphids, whiteflies, caterpillars, thrips, and beetles. Aphids and whiteflies are known for their ability to transmit plant diseases, while caterpillars, such as the infamous cabbage worm, chew through leaves and damage plants. Thrips cause stippling and discoloration, while beetles, like the Colorado potato beetle, devour foliage. Effective pest management is essential to protect vegetable crops. Integrated pest management (IPM) strategies combine biological, chemical, and cultural practices. These may include releasing natural predators, using insecticidal soaps or neem oil, crop rotation, and maintaining proper sanitation. Additionally, selecting pest-resistant crop varieties and employing physical barriers, like row covers, can reduce pest pressure. By integrating various control methods, farmers can minimize the impact of insect pests on their vegetable crops, ensuring healthier harvests and more sustainable agriculture.

13.1 Introduction:

Vegetable is a broad term that refers to the edible parts of plants, which are usually their leaves, roots, fruits, or seeds. Vegetables are a staple food across the world and are a fundamental part of modern agriculture. Vegetables are an important part of a healthy eating pattern and are excellent sources of many nutrients, including potassium, fiber, folate (folic acid) and vitamins A, E and C. These nutrients are vital for overall health and maintenance of body systems. India is the second largest producer of vegetables in the world (ranks next to China) and accounts for about 15% of the world's production of vegetables. Presently, India produces about 204.84 million metric tons of vegetables.

According to FAO (2021), India is the largest producer of ginger and okra among vegetables and ranks second in the production of Potatoes, Onions, Cauliflowers, Brinjal, Cabbages, etc. The major vegetable-producing states are Uttar Pradesh, Madhya Pradesh, West Bengal, Bihar, Gujarat, Odisha and Maharashtra. Though the vegetable requirement is 300g/day/person as recommended by dietician, we are able to meet only around 1/9th of that requirement. There have been various factors which are affecting the production of vegetables, one of the major factor is insect/pest attack on vegetables. Because of these insect/pest attacks farmers have to deal with heavy losses which indirectly causes decrease in production.

Major insects/pests infesting vegetables are Aphids, caterpillars, cutworms, grasshoppers and locusts, thrips, whiteflies, mites, etc. To attain relief from these insects/pests various IPM practices have been put forth.

13.2 Insect Pests of Solanaceous Crops (Tomato, Brinjal, Potato and Chillies):

13.2.1 Major Insect Pest of Tomato:

A. Tomato fruit borer
B. Leaf miner
C. Greenhouse whitefly
D. Fruit flies
E. Hadda beetles
F. Phytophagous mites
G. Thrips

A. Tomato Fruit Borer, *Helicoverpa armigera* (Noctuidae: Lepidoptera):

Figure 13.1: Tomato Fruit Borer

a. Identification:

- **Eggs:** yellowish white, ribbed, dome shaped and 0.4-0.5 mm in dia.
- **Larvae:** Newly emerged are yellowish white whereas older can be of many colors depending upon the food they consume. Full grown caterpillars are 40-48 mm long with whitish and dark gray longitudinal stripes.
- **Adults:** Medium sized stoutly built moths. Forewing is light yellow in males and brown in females. On the apical margin of forewings, wavy lines in the form of light black band are visible and a black spot appears on the upper side of the wing. On the tip of the abdomen there is a tuft of hairs in case of females, nevertheless, the tuft of hairs is absent in males.

b. Damage:

- Damage is caused by the larva

- Feed on the foliage, flowers, buds and fruits.
- Small green fruits are preferred
- Single larva can destroy many fruits
- The damage is more pronounced during March to June

c. Management:

- Deep summer ploughing to expose the pupae to the sunlight and natural enemies.
- African marigold as trap crop.
- Pheromone traps (5 traps/ ha) of moths for monitoring
- Spray of HaNPV @ 250 LE/ha at weekly intervals
- Bt formulation @ 0.5 Kg/ha.
- Periodic releases of egg parasitoid, *Trichogramma chilonis* or *T. pretiosum* @ 100000 /ha.
- Spray of NSKE @ 4.0 per cent
- Emergency spray of Imidacloprid 17.8% SL @ 0.03%, Emamectin benzoate 05 SG @ 0.002

B. Serpentine Leaf Miner, *Liriomyza trifolii* (Agromyzidae: Diptera):

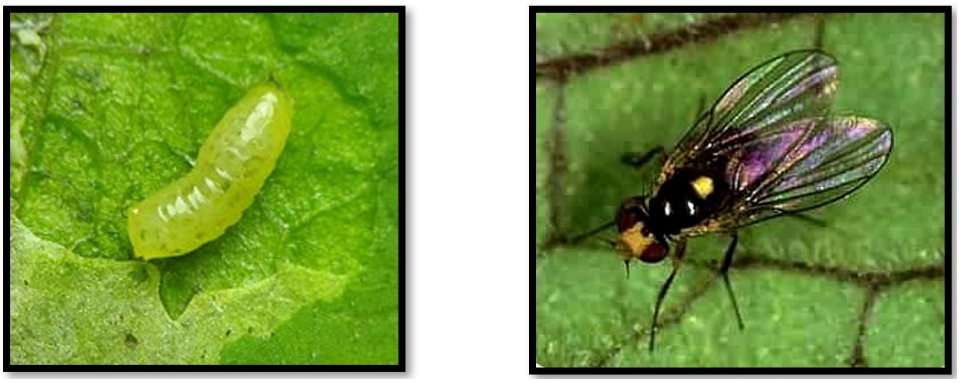

Figure 13.2: Serpentine Leaf Miner

Identification:

- Eggs: Newly laid eggs are white, translucent and turn opaque as the development advances.
- Larvae: The larvae are orange yellow, apodous. They move through peristaltic action between the two epidermis. Full-grown maggots are1.88 x 0.70 mm.
- Pupae: Orange yellow initially which turn dark-brown on maturity. They measure1.84 X 0.68 mm.
- Adults: The adults are minute grayish black flies with plum red eyes and a yellow spot on the scutellum. The females are bigger (2.01x0.61mm) in size than males (1.79x0.52 mm).

Damage:

- Damage is caused by the larvae
- Feed on the palisade mesophyll tissue in between the two epidermis of the leaf.
- Infested leaves become transparent papery in the mined areas
- Photosynthesis is reduced.
- The attack appears during April and is more pronounced from June onwards.

Management:

- Severely infested leaves should be removed and destroyed.
- NSKE @ 4.0 per cent along with sticker is effective.
- The pest can be controlled by spraying the crop with deltamethrin (0.0028%) or imidacloprid (0.0075%).
- Natural enemies especially larval and pupal parasitoids are active during July-August.

C. Greenhouse whitefly, *Trialeurodes vaporariorum* (Aleyrodidae: Hemiptera)

Figure 13.3: Greenhouse whitefly

Identification:

- Greenhouse whiteflies are small insects with white coloured wings
- The eggs are 0.2 to 0.25 mm x 0.08 to 0.12 mm
- Newly emerged nymphs are light yellow in colour
- Last nymphal instar is 0.70 to 0.90 x 0.40 to 0.60 mm

Damage:

- Caused by nymphs as well as adults
- Suck the cell sap from leaves
- Leaves turn yellow and dry away.
- Nymphs also excrete honey dew on which sooty moulds develops
- Photosynthesis of the plant is reduced.

Management:

- Protect the nursery by using nylon nets (200 mesh) for 25-30 days.
- The pest can be controlled by need based spraying of crop with imidacloprid (0.0075%) or deltamethrin (0.0028%).

D. Fruit flies, *Bactrocera tau* (Tephritidae: Diptera)

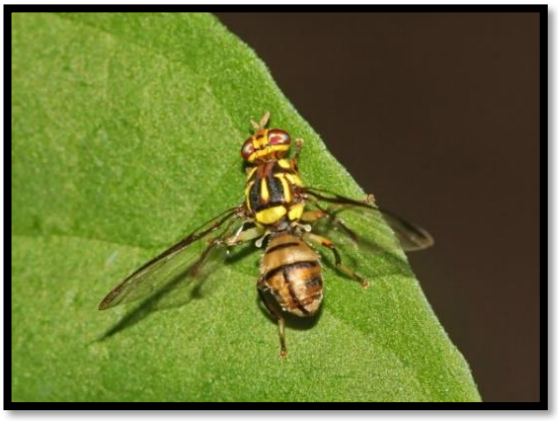

Figure 13.4: Fruit flies

Identification:

- Adults are light brown with lemon yellow curved vertical markings across the thorax • On the apical margin of the forewing, grayish brown patches are present.
- Larvae are pale or reddish white which tapers anteriorly.
- The pupa is barrel shaped with dull to reddish yellow in colour.

Damage:

Damage is caused by larvae which feed inside the fruit on fruit pulp and the fruit is rendered unfit for human consumption.

Management:

- Collect and destroy the fallen infested fruits regularly on campaign bases
- Apply poison baits (40 ml malathion + 200g gur / molasses per 20L of water) in the form of spray or bait stations.
- Mass trapping of adults using cue lure
- Larval parasitoid, Biosteres dacusii also attack the pest in nature.

13.2.2 Major Insect Pest of Brinjal:

A. Brinjal shoot and fruit borer
B. Brinjal stem borer
C. Brinjal lace wing bug
D. Brinjal hadda beetle
E. Leaf hoppers
F. Whitefly
G. Aphid

A. Brinjal shoot and fruit borer, *Leucinodes orbonalis* (Pyraustidae: Lepidoptera)

Figure 13.5: Brinjal shoot and fruit borer

Identification:

- Full grown caterpillars are 15-18 mm long and light pink in colour
- Moths are medium sized with white wings.
- Fore wings have conspicuous black and brown patches and dots.
- Hind wings are opalescent with black dots along the margins.
- Wing span is 22-26 mm.

Damage:

- Damages the crop from seedling stage till the harvest
- In young plants, the caterpillars result in dead hearts
- Later on they bore into flower buds and fruits
- Enter from under the calyx, seal the hole with excreta
- The damaged flower buds are shed without blossoming
- Fruits show circular exit holes.
- These fruits become unfit for human consumption and lose market value
- Infestation up to 70 per cent may be recorded

Management:

- Install pheromone trap @12/ha.
- Encourage the activity of larval parasitoids: *Pristomerus testaceus*, *Cremastus flavoorbitalis.*
- Avoid use of synthetic pyrethroids and Avoid using insecticides at the time of fruit maturation and harvest.
- Spray any one of the following chemicals starting from one month after planting at 15 days interval Azadirachtin 1.0% EC (10000 ppm) 3.0 ml/lit., Emamectin benzoate 5 % SG 4 g/10 lit., Flubendiamide 20 WDG 7.5 g/10 lit.

B. Brinjal stem borer, *Euzophera perticella* (Phycitidae: Lepidoptera)

Figure 13.6: Brinjal stem borer

Identification:

- The eggs are cream coloured, scale like
- Full grown caterpillars are 16-18 mm in length and light brown in colour.
- Pupae are dark brown.
- Moths are medium sized, fore wings are pale rufous with distinct dentate vertical black lines
- Hind wings are whitish in colour.
- Wing expanse is 26 and 32 mm in male and female of, respectively.

Damage:

- Damage is caused by the caterpillars
- Feed inside the stem
- Bore in to the stem and move down ward
- The attacked plants wither and wilt, growth remains stunted and bear less fruits
- Infestation is generally seen in the late stage of the crop.

Management:

- Check the infestation at the initials stage by uprooting and destroying the infested plants.
- Release 1st instar larvae of green lace wing bug (*Chrysoperla carnea*) @ 10,000 Nos./ha.
- Parasitoids like *Pristomerus testaceous* and *P. euzopherae* are active in nature.

C. Brinjal lace wing bug, *Urentius hystricellus* (Hemiptera: Tingidae)

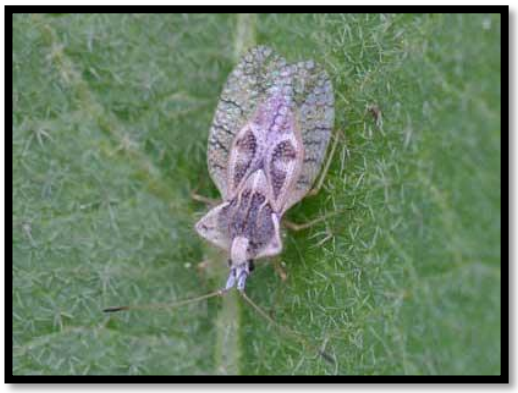

Figure 13.7: Brinjal lace wing bug

Identification:

- Nymphs are about 2 mm, pale, stoutly built with prominent spines.
- Adults are about 3 mm, straw coloured dorsally and dark brown to black ventrally.
  - Females are oval and males are elongated.
- Pronotum and elytra are reticulated
- Coastal area is hyaline with strong spines on the outer margins.
- Hind wings are whitish and transparent

Damage:

- Both adults and nymphs cause the damage by sucking the cell sap from leaves.
- Infested leaves show yellowish spots
- Excreta impart mottled appearance to the infested leaves.
- Young nymphs feed gregariously on the lower surface of the leaves
- Inject some toxic saliva.
- Under severe infestation upto 50% of the crop may be destroyed.

Management:

- Spray dimethoate 30 EC @ 1 lit/ha or methyl demeton 25 EC @ 1 lit/ha

D. Brinjal hadda beetle, *Epilachna vigintioctopunctata* (Coleoptera: Coccinellidae)

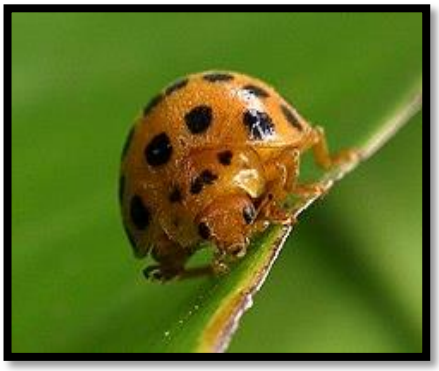

Figure 13.8: Brinjal hadda beetle

Identification:

- The grubs are about 6mm, yellow, with six rows branched spines.
- Beetles measure about 8 to 9 mm in length and 5 to 6mm in breadth.
- *vigintioctopunctata* beetles are deep copper coloured having 14 black spots on each elytron whose tip is somewhat pointed.

Damage:

- This pest beetles as well as grub scrape the chlorophyll from the epidermal layers of the leaves.
- They eat up regular areas of the leaf tissue, leaving parallel bands of uneaten tissue in between. The leaves, thus, present a lace like appearance.
- They turn brown, dry up, fall off and completely skeletonize the plants.

Management:

- Collect damaged leaves with grubs and egg masses and destroy them. Shake plants to dislodge grubs, pupae and adults and destroy.
- Conserve natural enemies in brinjal ecosystem.
- Use malathion 50EC @ 2ml/lit of water at 15 day intervals.

13.2.3 Major Insect Pest of Potato:

A. Potato tuber moth
B. Tobacco caterpillar
C. White grub
D. Green peach aphid
E. Whitefly

A. Potato tuber moth, *Phthorimaea operculella* (Gelechiidae: Lepidoptera)

Figure 13.9: Potato tuber moth

Identification:

- Egg: Laid singly on the ventral surface of foliage and exposed tuber
- Larva: Yellow coloured caterpillar with dark brown head
- Pupa: Pupation occurs within a cocoon among the trash, clods of the earth in the field
- Adult: Small narrow winged moth, greyish brown forewings and hind wings are dirty white

Damage:

- Larvae which mine the leaves, petiole and terminal shoots causing wilting.
- After tuberization, the larvae enter into the tubers and feed on them.
- Bore the tubers in stores also
- Larvae tunnel into the pulp which ultimately becomes unfit for use as seed or for human consumption.
- The infested tubers are further exposed to microbial infection which leads to rotting.
- The extent of damage to stored tubers varies from 20 - 85 per cent

Management:

- Plant tubers slightly deeper (10 cm) and follow proper earthing up
- Intercropping with chillies, onions or peas.
- Harvested potatoes should be lifted to cold stores immediately.
- If cold store facilities are not available, only healthy tubers should be stored.
- Cover the stored tubers with 2.5 cm layer of chopped dry leaves of Lantana or Eucalyptus or Eupatorium below and above the potato
- Mass trapping of adults with sex pheromones
- Under field conditions more than 20 traps/ha (sometimes up to 40 traps/ha) are required

- Spray of crop with quinalphos (0.375 kg a.i./ha) or acephate (0.5Kg a.i./ha)
- In stores dusting the tubers with 5% malathion or 1.5 5 quinalphos dust @ 125g dust/100 Kg of potatoes.
- Alternatively, dipping of tubers before storage with 0.0028% deltamethrin
- Bacillus thuringiensis has also been reported to suppress this pest.

B. Tobacco caterpillar, *Spodoptera litura* (Noctuidae : Lepidoptera)

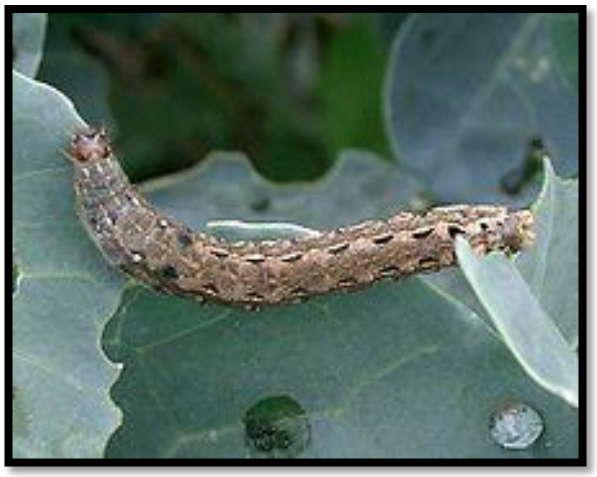

Figure 13.10: Tobacco caterpillar

Identification:

- Egg: Masses appear golden brown
- Larva: Pale greenish with dark markings
- Adult: Forewings are brown in colour with wavy white marking, hind wings are white in colour with a brown patch along the margin

Damage:

- The young larvae first feed gregariously and scrape the leaves
- Older larvae spread out and may completely devour the leaves resulting in poor growth of plants.

Management:

- Plough the soil to expose and kill the pupae
- Grow castor along border and irrigation channel as trap crop
- Flood the field to drive out the hibernating larvae
- Set up light trap @1/ha
- Pheromone traps (Pherodin SL) @ 15/ ha to attract male moths
- Collect and destroy egg masses in castor and tomato

- Hand pick grown up larvae and kill them
- Spray Sl NPV @ 1.5X1012 POBs/ha + 2.5 Kg crude sugar + 0.1 % teepol

C. White grubs *Holotrichia sp* (Scarabaeidae : Coleoptera)

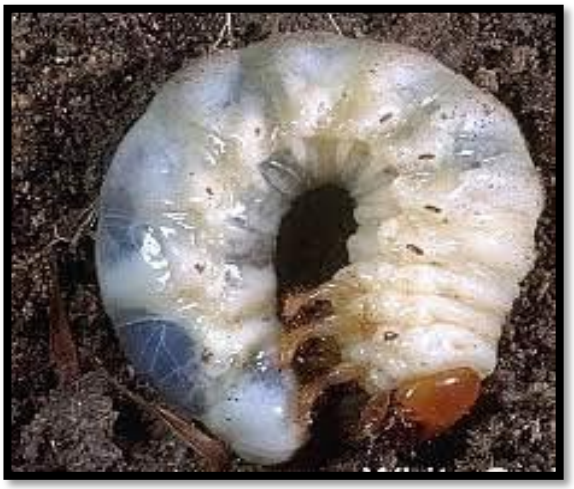

Figure 13.11: White grubs

Identification:

- Larva: "C" shaped grub
- Adult: Brown beetle with pale prothorax

Damage:

- Grubs feed on roots and tubers
- Grubs feed voraciously during night time

Management:

- Summer ploughing to expose pupae
- Dust Quinalphos 5% @25 kg/ha at 10 days after first summer rain
- Set up light trap @1/ha between 7 PM and 9 PM
- Handpick adult beetles in the morning

13.2.4 Major Insect Pest of /Chillies:

A. Chilli thrips
B. Green peach aphid
C. Tobacco cutworm
D. Gram caterpillar

A. Chilli thrips: *Scirtothrips dorsalis* (Thripidae: Thysanoptera)

Figure 13.12: Chilli thrips

Identification:

- Nymph: Are small, linear, easily fragile abdomen with straw yellow colour
- Adult: Fringed wings

Damage:

- The infested leaves develop crinkles and curl upwards
- Elongated petiole
- Buds become brittle and drop down
- Early stage, infestation leads to stunted growth and flower production, fruit set are arrested

Management:

- Inter crop with agathi (*Sesbania grandiflora)* to provide shade which regulate the thrips population
- Treat seeds with imidacloprid 70% WS @ 12 g/kg of seed
- Apply carbofuran 3% G @ 33 kg/ha or phorate 10 % G @ 10 kg/ha or
- Apply or Spray any one of the following insecticide Acetamiprid 20 SP 1.0g/10lit or Fipronil 5% SC 1.5 ml/lit or Spinetoram 11.7 SC 1.0 ml/lit.

13.2.5 Insect Pests of Cruciferous crops (Cabbage, Cauliflower and Broccoli)

A. Diamond back moth
B. Cabbage head borer
C. Cabbage butterfly
D. Cabbage green semilooper

E. Tobacco caterpillar
F. Cabbage aphid
G. Mustard aphid

A. Diamond back moth: *Plutella xylostella* (Yponomeutidae : Lepidoptera)

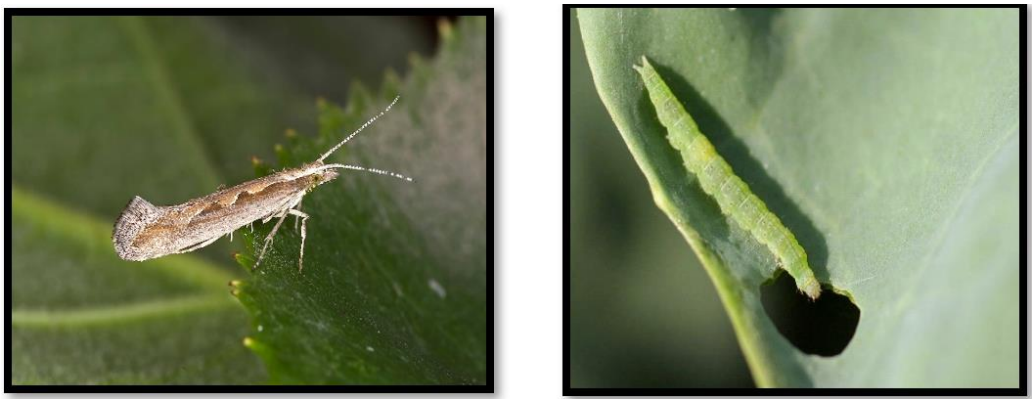

Figure 13.13: Diamond back moth

Identification:

- Egg: Minute yellow coloured eggs laid singly or in groups on the upper surface of leaves
- Larva: Pale yellowish green caterpillar
- Pupa: Pupation takes place on the foliage in a transparent cocoon
- Adult: Small greyish brown moth. Forewings have three white triangular spots along the inner-margin. Adult folds the wings that appear with triangular markings, opposite wing with diamond shape.

Damage:

- Young caterpillars cause small yellow mines on leaves
- Scrapping of epidermal leaf tissues producing typical whitish patches on leaves
- Full-grown larvae bite holes in the leaves and feeds on curd
- The infestation is more severe in dry season, when it causes growth retardation (under sized heads).

Management:

- Remove and destroy all debris and stubbles after harvest of crop
- Grow mustard as trap crop at 2:1 ratio (cabbage: mustard) to attract DBM for oviposition at least 10 days ahead of planting of main crop
- Spray mustard crop with dichlorvos 76 WSC 0.076% to avoid dispersal of the larvae
- Pheromone traps @12/ha

- Crop rotation with cucurbits, beans, peas, tomato and melon
- Larval parasitoid: *Diadegma semiclausm* @1,00000/ha (Hills–below 25–27ºC) *Cotesia plutellae* (plains) at 20000/ha release from 20 days after planting
- *Bacillus thuringiensis var kurstak*i 2g/lit
- Neem seed kernel extract 5%
- Spray any of the insecticides Spinosad 2.5%SC 1.2ml/lit or Emamectin benzoate 5SG 4g/10lit.

B. Cabbage head borer, *Hellula undalis* (Pyralidae: Lepidoptera)

Figure 13.14: Cabbage head borer

Identification:

- Caterpillars: Creamy yellow with a pinkish tinge and has seven purplish brown longitudinal stripes.
- Moths are slender, pale yellowish-brown, having grey wavy lines on the fore wings. Hind wings are pale dusky

Damage:

- Damage is caused by the caterpillars.
- Caterpillars first mine into leaves and feed on the chlorophyll
- Later on feed on the leaf surface sheltered within the silken passage.
- As they grow bigger they bore into the heads of cabbage and cauliflower.
- When the attack is heavy, the plants are riddled with caterpillars

Management:

- Collect and destroy mechanically caterpillars in the early stages of attack
- *Bacillus thuringiensis* @ 2g/lit at primordial stage
- Cartap hydrochloride @ 500g/ha or malathion 50 EC @500ml/ha
- The pest can also be controlled by spraying the crop with malathion @ 0.1 per cent.

C. Cabbage butterfly, *Pieris brassicae* (Pieridae: Lepidoptera)

Figure 13.15: Cabbage butterfly

Identification:

- Larva: Velvetty bluish green in colour with black dots, Yellow dorsal and lateral stripes covered with white hairs.
- Pupa: chrysalis which takes place in leaves and stem
- Adult: White butterfly

Damage:

- Young caterpillars feed gregariously and skeletonise leaves
- Late instars disperse and move to adjacent plants/ fields and feed on the leaves voraciously.
- Plants are sometimes completely defoliated resulting in heavy yield losses

Management:

- Collect and destroy caterpillars in the early stage of attack
- Conserve parasitoids like *Cotesia glomeratus*
- Spray insecticides like quinalphos 25 EC @1000 ml
- Collection and destruction of the egg masses and early gregarious caterpillars
- NSKE @ 4.0 % and Bt @ 500g/ha are also effective.
- Need based spraying of the crop with insecticides like malathion (0.05%) or cypermethrin (0.01%).
- In nature, Cotesia glomerata has been reported as major mortality factor of this pest.

D. Cabbage semilooper, *Thysanoplusia orichalcea* (Noctuidae: Lepidoptera)

Figure 13.16: Cabbage semilooper

Identification:

- Larvae: plump and pale green having three pairs of prolegs and are generally found mixed with the caterpillars of *P. brassicae*
- Adults: light brown with a golden patch on each fore wing and measures about 42 mm across the wings.

Damage:

- Larvae cause the damage by biting round holes into the leaves

Management:

- Hand pick and destroy the caterpillars
- Set up light trap @1/ha
- Spray insecticides like malathion 50EC @ 0.1% ha

13.2.6 Major Insect Pests of Cucurbit crops (cucumber, melons, gourds and squash)

A. Fuit flies
B. Pumpkin beetles
C. Stem gall fly
D. Snake gourd semilooper
E. Bottle gourd plume moth
F. Pumpkin caterpillar
G. Leaf miner

A. Fruit flies: *Bactrocera cucurbitae* (Tephritidae: Diptera)

Figure 13.17: Fruit flies

Identification:

- Eggs: Laid singly in clusters on fruits
- Larva: Dirty white apodous maggot
- Pupa: Pupate in soil

Damage:

- Maggots feed on the pulp of the fruits
- Oozing of resinous fluid from fruits
- Distorted and malformed fruits
- Premature dropping of fruits and also unfit for consumption

Management:

- Collect infested and fallen fruits and bum in deep pits.
- In endemic areas, change the sowing date as the fly population is low in hot dry conditions and at its peak during rainy season
- Expose the pupae by ploughing and turning over soil after harvest
- Use ribbed gourd as 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), and lactic acid to trap flies.
- Use poison baiting in severe infestation
- Mix methyl eugenol + malathion 50 EC at 1:1 ratio and keep 10 ml of the bait in polythene bags @ 25/ha.
- Use fly trap
- Keep 5 g of wet fishmeal in polythene bags (20 x 15cm) with six holes (3 mm dia)
- Add 0.1 ml of dichlorvos.

B. Pumpkin beetles: Red Beetle: *Aulacophora foveicollis,* Purple bettele:*A. cincta,* Ash beetle:*A. Intermedia*

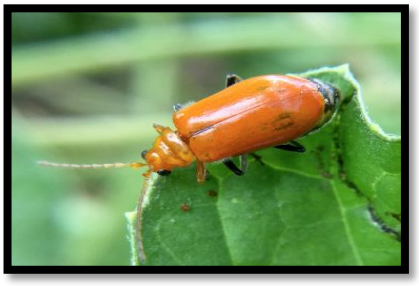

Figure 13.18: Red Beetle: *Aulacophora foveicollis* (Chrysomelidae: Coleoptera)

Identification:

- Grub: Freshly hatched dirty white, fully grown grub creamy yellow in colour
- *Aulacophora foveicollis:* red in colour

A. cincta: grey in colour having glistening yellow red border
A. intermedia: blue in colour

Damage:

- Grubs feeds on the roots, stem and fruits touching the soil
- Adult feeds on leaf and flowers.

Management:

- Plough the fields just after harvesting destroy the hibernating adults
- Collect and destroy adult beetles
- Spray malathion 50 EC @ 500 ml

C. Stem gall fly: *Neolasioptera falcata* (Cecidomyiidae: Diptera)

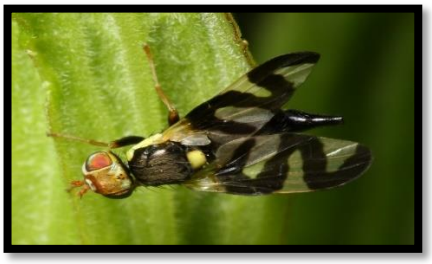

Figure 13.19: Stem gall fly

Identification

- Adult: slender dark brown mosquito like fly

Damage

- Maggots bore into the distal shoot and form galls

Management

- Spray insecticide Malathion 50 EC @ 500 ml

D. Snake gourd semilooper: *Plusia peponis* (Noctuidae: Lepidoptera)

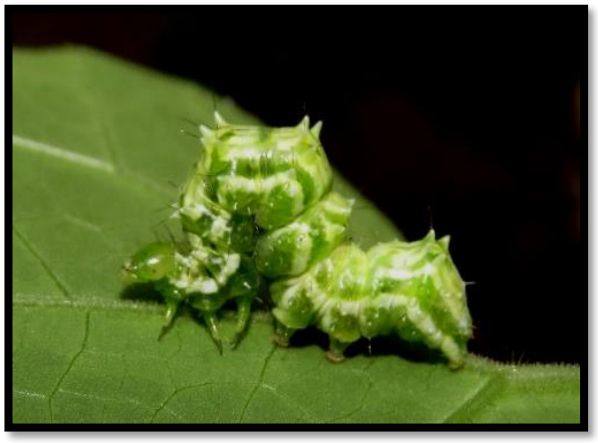

Figure 13.20: Snake gourd semilooper

Identification

- 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

Damage

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

Management

- Collect and destroy the caterpillars

- Encourage activity of *Apanteles taragamae, A. plusiae*
- Spray Malathion 50 EC @500 ml/ha

E. Bottle gourd plume moth: *Sphenarches caffer* (Pterophoridae: Lepidoptera)

Figure 13.21: Bottle gourd plume moth

Identification

- Egg: Eggs are laid singly on buds and leaves
- Larva: Small, cylindrical and yellowish green with short spines all over body
- Pupa: Greenish brown pupa
- Adult: Slender moth with lobed wings, fringed with scales

Damage

- Larva feeds on leaves making small holes

Management

- Collect and destroy larvae and pupae
- Spray Malathion 50 EC @500 ml/ha

13.2.7 Major Insect Pests of Okra:

A. Shoot and fruit borer
B. Okra fruit borer
C. Stem weevil
D. Red cotton bug
E. Whitefly

F. Jassids
G. Aphids
H. Leaf roller

A. Shoot and fruit borer: *Earias vitelli* (Nolidae: Lepidoptera)

Figure 13.21: Shoot and fruit borer

Identification:

- Egg: Sculptured egg and sky blue in colour
- Larva: Brownish with white streaks dorsally and pale yellow ventrally
- Adult: Forewing are pale with a wedge shaped green band in the middle

Damage:

- Terminal shoots wither and droop
- Shedding of buds and flowers
- Bore hole in fruits and fee
- Deformed fruits

Management:

- Set up pheromone trap @ 12/ha.
- Collection and destruction of affected fruits.
- Release of egg parasite *Trichogramma chilonis* @ 1.0 lakh/ha.
- Release of 1st instar larvae of green lacewing predator *Chrysoperla carnea* @ 10,000/ha.
- spray *Bacillus thuringiensis* @ 2 g/lit or spray any one of the following insecticide Emamectin benzoate 5 % SG 3.0 g/10 lit or Azadirachtin 5% Neem Extract Concentrate 5.0 ml/10 lit.

B. Okrafruit borer: *Helicoverpa armigera* (Noctuidae: Leidoptera)

Figure 13.22: Okrafruit borer

Identification:

- Eggs: Are spherical in shape and creamy white in colour, laid singly
- Larva: Shows colour variation from greenish to brown
- Pupa: Brown in colour, occurs in soil, leaf, and pod
- Adult: Female brownish yellow stout moth, Male is pale greenish in colour with V shaped markings

Damage:

- Feed on the flowers
- Circular boreholes on fruits
- Larva thrust only part of their body inside the fruit feed

Management:

- Collect and destroy the infected fruits and grown up larvae
- Grow simultaneously 40 days old American tall marigold and 25 days old tomato seedling at 1:10 rows to attract *Helicoverpa* adults for egg laying.
- Setup pheromone trap with Helilure at 15/ha
- Six releases of *T. chilonis* @ 50,000/ha per week coinciding with flowering time
- Release *Chrysoperla carnea* at weekly interval at 50,000 eggs or grubs/ha from 30 DAS
- Spray HaNPV at 1.5x1012 POB/ha along with cottonseed oil 300 g/ha to kill larva

C. Stem weevil: *Pempherulus affinis* (Curculionidae: Coleoptera)

Figure 13.23: Stem weevil

Identification:

- Grubs: Creamy yellow, apodous
- Adults: Dark greyish brown with pale cross bands on elytra

Damage:

- Grub feed on stem and galls are formed in the stem and petiole
- Adults feed on leaf buds and terminal shoots

Management:

- Soil application of Carbofuran 3 G at 30 kg/ha on 20 DAS and earthed up.
- Basal application of FYM 25 t/ha or 250 kg/ha of neem cake.

D. Red cotton bug: *Dysdercus cingulatus* (Pyrrhocoridae: Hemiptera)

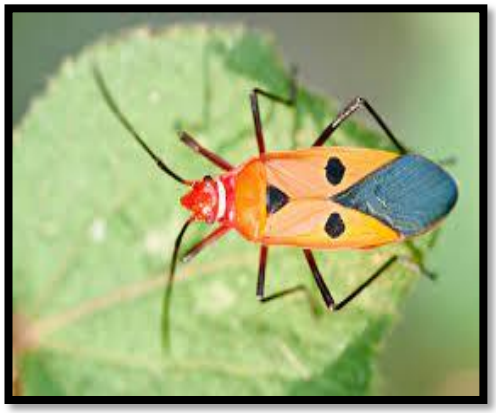

Figure 13.24: Red cotton bug

Identification:

- Nymphs and Adults: Reddish bugs with white bands on the abdomen and black markings on the wings

Damage:

- Infested seeds become discoloured and shrivelled

Management:

- Conserve the biocontrol agent *Harpactor costalis* predaceous on nymph and adult
- Spray phosphamidon 40 SL @ 600 ml/ha

E. Whitefly: *Bemisia tabaci* (Aleyrodidae: Hemiptera)

Figure 13.25: Whitefly

Identification:

- Nymph: Greenish yellow, oval in outline
- Adult: Minute insects with yellow body covered with a white waxy bloom

Damage:

- Chlorotic spots on the leaves which latter coalesce forming irregular yellowing of leaf tissue
- Severe infestation results in premature defoliation
- Development of sooty mold
- Vector of yellow vein mosaic virus

Management:

- Spray any of the following insecticide Quinalphos 25 EC @ 2.0 l/ha or Phosalone 35 EC @ 2.5 l/ha

13.2.8 Major Insect pests of Onion and Garlic:

A. Onion thrips
B. Onion maggot or onion fly
C. Leaf eating caterpillars (cutworms, tobacco caterpillar, fruit borer)

A. Onion thrips, Thrips *tabaci* (Thripidae: Thysanoptera)

Figure 13.26: Onion thrips, Thrips

Identification:

- Eggs are tiny, kidney shaped and white in colour
- Nymphs and adults are slender, fragile and yellowish in colour
- Adults have fringed wings heavily with fine hairs.
- Males are 0.8-1.0 mm long while the females are 1.0-1.2 mm long

Damage:

- Damage is the caused by the adults as well as nymphs by lacerating the epidermis of the leaf and lapping the exuding sap.
- The affected leaves show silvery white blotches which later become brownish and get distorted form tip down ward, wilt and ultimately dry up.
- Heavy infestation at seedling stage results in retardation of growth and severe scarring of leaves which out rightly kill the seedlings. In case of heavy infestation at later stage the bulbs remain undersized and get distorted in shape.
- Attacked plants do not form bulbs and the flowers do not set seed. In Hawaii *T. tabaci* is known to act as a vector of the streak virus disease of peas and yellow spot disease of pine apple.

Management:

- Grow resistant verities of onion like White Persia, Grano, Sweet Spanish, Crystal Wax etc:
- The pest can also be controlled by spraying the crop with any of the insecticides like malathion @0.05% and dimethoate @ 0.03%
- After the application of insecticides observe a waiting period of 7 days

B. Onion maggot or onion fly, *Delia antiqua* (Anthomyiidae: Diptera)

Figure 13.27: Onion maggot or onion fly

Identification:

- Eggs are elongate in shape and white in colour
- Maggots are also white in colour and 18 mm in length when full grown
- Adult flies are slender about 6 mm in length and greyist in colour having large wings.

Damage:

- The maggots bore into the bulbs causing the plants to become flabby and yellowish. They mine thought the small bulbs completely, leaving only the outer sheath and thus causing a thin stand of the crop in the field.
- Larger bulbs are attacked by many maggots at a time by making cavities. The larger bulbs may not be destroyed by the attack but are subsequently rotten in the storage. It has been observed that onion maggots cause the initial damage which leads to the development of soft rot of onion caused by *Bacillus carotovorus.*

Management:

- Treat soil with phorate 10 G followed by irrigation
- Spray the crop with malathion @ 0.05% at 15 day interval is also effective.

C. Leaf eating caterpillars:

a. **Cutworms**, ***Agrotis ipsilion*** **(Noctuidae: Lepidoptera)**

Figure 13.28: Cutworms

Identification:

- Black with pale mid-dorsal stripes. Head is pale-brown
- Fore wing is pale brown with dark purplish brown along costal end. Hind wing is white with brown tinge. Male has bipectinate antenna and female has filiform antenna

Damage:

- Young larva feeds on tender foliage and grown up larva cuts the stem at collar region.

Management:

- Fork soil during summer months to expose larvae and pupae to avian predators
- Install light traps during summer to attract adult moths
- Install pheromone traps @ 5/ha to monitor and attract male moths
- Install sprinkler irrigation system to irrigate in day time to expose larvae for predation by birds
- In endemic areas, apply NSKE 5%, or neem oil 5 L in 500 - 750 L of water per ha. Focus nozzle at the collar region and apply insecticides during evening hours.

13.3 References:

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