

## Lecture No 24

### PESTS OF CRUCIFEROUS VEGETABLES

Crucifers are attacked by several pests among which diamondback moth is the most challenging and destructive as it has developed resistance to more than 40 insecticides. Aphids and mustard saw fly are equally destructive under North Indian conditions.

Major pests			
Diamond back moth	<i>Plutella xylostella</i>	Plutellidae	Lepidoptera
Leaf webber	<i>Crociodolomia binotalis</i>	Pyraustidae	Lepidoptera
Cabbage semilooper	<i>Tirchoplusia ni</i>	Noctuidae	Lepidoptera
Cabbage butterfly	<i>Pieris brassicae</i>	Pieridae	Lepidoptera
Cabbage borer	<i>Hellula undalis</i>	Pyraustidae	Lepidoptera
Mustard sawfly	<i>Athalia lugens proxima</i>	Tenthredinidae	Hymenoptera
Cabbage aphid	<i>Brevicoryne brassicae</i>	Aphididae	Hemiptera
Cabbage flea beetle	<i>Phyllotreta cruciferae</i>	Chrysomelidae	Coleoptera
Minor pests			
Painted bug	<i>Bagrada hilaris</i>	Pentatomidae	Hemiptera
Cutworms	<i>Agrotis ipsilon</i>	Noctuidae	Lepidoptera

#### Major pests

##### 1. Diamond back moth: *Plutella xylostella* (L.) (Plutellidae: Lepidoptera)

**Distribution and status:** World - wide

**Host range:** Serious pest of Cabbage and cauliflower, but also feeds on other crucifers and solanaceous plants.

#### Damage symptoms

First instar larvae mine epidermal surface of leaves producing typical white patches. Larvae, second instar onwards feed externally making holes on the leaves and soil them with excreta. Heavy infestations leave little more than the leaf veins.



**ETL:** 20 larvae/10 plants

#### Bionomics

Yellowish, pinhead sized eggs are laid singly or in batches of 2-40 on the underside of leaves. A female may lay 18-356 eggs in her life time. Egg period 2 - 9 days. Larva: 8-12 mm

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long, pale yellowish green in color, pointed at both the ends with fine erect black hairs scattered over the body. Larval period 8 -16 days. Pupa is a barrel shaped silken cocoon which is open at both the ends and is attached to the leaf surface. Pupal period 4-5 days. Adult: Small, greyish brown having pale whitish narrow wings with inner margins yellow. Three pale whitish triangular markings on hind margins of each forewing are prominent. At rest, a dorsal median patch of three diamond shaped yellowish white spots clearly visible by joining both forewings. Hind wings have a fringe of long hairs. Adult moth may live for about 20 days. Total life cycle is completed in 15-18 days. There are several generations in a year.



**Management**

- Grow mustard as trap crop. Raise 2 rows of mustard for every 25 rows of cabbage. Sow first mustard crop 15 days prior to cabbage planting or plant 20 days old mustard seedling at the time of cabbage planting. Plant 35 days old cabbage seedlings.
- Install pheromone trap to monitor DBM adults @ 5 /ha and 25/ha for mass trapping
- Apply *Bacillus thuringiensis* formulation @1 g/L or NSKE 4% spray. Alternate Bt. sero types *kurstaki* (B.t.k.) and *aizawai* (B.t.a.)
- Reduce insects colonising on mustard to prevent defoliation of the entire plant by applying dichlorovos 350 at 10 or 15 days interval starting from 15 days after sowing.
- Conserve larval parasitoids viz., *Cotesia plutellae* in plains and *Diadegma semiclausum* in hills. Release 40,000 adults / ac, five times @ 8,000 adults/release commencing from 20 days after planting. Also encourage other parasitoids like *Apanteles sicarius*, *Tetrastychus sokolowski* (larval) *Diadrumus collaris* (larval pupal) and *Brachymeria excarinata* (pupal parasitoids)
- Depending upon the pest intensity, spray any of the following insecticide with 500 - 1000 L water/ha primordial or head initiation stage. Mix teepol or sandovit 0.5 ml/Lt of water whenever sprays are made
- **Note:** Primordial formation takes place between 17 and 25 days after planting, depending on variety.

• Azadirachtin 0.03% 2.5-5.0 L	• Lufenuron 5.4 EC 600 ml
• Chlorantraniprole 18.5 SC 50 ml	• Indoxacarb 14.5 SC 200-265 ml

	or 15.8 SC ml 265
• Chlorfenapyr 10 SC 750-1000 ml	• Metaflumizone 22 SC 750-1000 ml
• Diafenthiuron 50 WP 600 g	• Novaluron 10 EC 750 ml
• Emamectin benzoate 5 SG 150-200 g	• Pyridalyl 10EC 500-750 ml
• Fipronil 5 SC 800-1000 ml	• Spinosad 2.5 SC 600-700 ml
• Flufenoxuron 10 DC 400	• Thiodicarb 75 WP 1.0-1.3 g
• Quinalphos 25 EC 1000 ml	

**2. Leaf webber: *Crociodolomia binotalis* (Pyraustidae : Lepidoptera)**

**Distribution and status:** Regular pest of minor status but occasionally reach serious proportions

**Host range:** Cabbage, radish, mustard and other cruciferous plants.

**Damage symptoms**

Young larva feeds gregariously on leaves, later webs together the leaves and feeds. Due to gregarious feeding, rotting of cabbage heads and cauliflower curds are common. Regular pest of minor status but occasionally turn to serious proportions.



**Bionomics**

Female moth lays 40-100 eggs on underside of the leaves. Egg period 5-15 days. Larva: with red head, brown longitudinal stripes and rows of tubercles on its pale violet body. Larval period 24-50 days. Pupates in soil, pupa is an earthen cocoon. Pupal period 14-40 days. Adult: Small pale brown with forewing having distinct wavy lines and prominent wavy spots. Hind wings semi-hyaline. Life cycle is completed in 43-82 days. More than one generation may be completed in the season.



### Management

1. Spray phosalone 50 EC 1.0 L, fenvalerate 20 EC or cypermethrin 10 EC or deltamethrin 28 EC 250 ml, cartap hydrochloride 50 SP 500 ml, spinosad 45 SC 125 ml/ha or azadirachtin 0.03% 2.5-5.0 L/ha. Do not repeat the insecticides with similar mode of action.
2. The pest is regulated by two larval parasitoids viz., *Microbracon mellus* and *Apanteles crocidolmiae*

### 3. Cabbage semilooper: *Tirichoplusia ni* (Noctuidae: Lepidoptera)

**Distribution and status:** USA, India and Sri Lanka

**Host range:** Cabbage, tomato and other cruciferous vegetables.

#### Damage symptoms

Caterpillars start scrapping and feeding on the leaves initially and later defoliate entire plant leaving midribs and main veins. More damage is evidenced in nurseries than in main field.



#### Bionomics

Eggs are greenish white, spherical and sculptured and are laid singly on ventral surface of leaves. Adults are stout moths. Head and thorax grey in colour, while abdomen is white with basal tuft of hairs. Pupation takes place in thintransparent cocoons on ventral surface of leaves. Life cycle occupies on month.



#### Management

1. Hand pick and destroy caterpillars
2. Use light trap to attract and kill adults
3. Spray quinolphos 0.5% or endosulfan 0.1 % or malathion 0.1 %

#### 4. Cabbage butterfly: *Pieris brassicae* (Pieridae: Lepidoptera)

**Distribution and status:** Throughout India

**Host range:** cabbage, cauliflower, knol-khol and it may also attack turnip, radish, sarson, toria (*Brassica campestris*) and other cruciferous plants

#### **Bionomics**



Full-grown pale yellow larva becomes greenish and measures 40-50 mm in length. In adults, the wings are pale white, with a black patch on the apical angle of each fore wing and a black spot on the costal margin of each hind wing. The females have two conspicuous black circular dots on the dorsal side of each fore wing. Males are smaller than the females and have black spots on the underside of each fore wing

The butterflies are very active in the field and lay, on an average, 164 yellowish conical eggs in clusters of 50-90 on the upper or the lower side of a leaf. Egg period is 3-17 days. The caterpillars feed gregariously during the early instars and disperse as they approach maturity. They pass through five stages and are full-fed in 15-40 days. The larvae pupate at some distance from the food plants, often in barns or on trees. The pupal stage lasts 7-28 days. The butterflies live for 3-12 days and the pest breeds four times during October-April.

#### **Damage symptoms**

The caterpillars alone feed on leaves, young shoots and green pods. When young, they feed gregariously but the grown-up caterpillars migrate from one field to another. The first instar caterpillars just scrape the leaf surface, whereas the subsequent instars eat up leaves from the margins inwards, leaving intact the main veins. Often, entire plants are eaten up.

#### **Management**

1. When in the gregarious stage, the caterpillars can be easily controlled by picking and destroying the infested leaves.
2. The grown-up caterpillars should be controlled with malathion 5 per cent @ 37.5 kg



per ha or by spraying 1.25 L of endosulfan 35 EC or 500 ml of dichlorvos 76 SC in 600-900 L of water per ha.

3. Conserve larval parasitoid *Apanteles glomeratus* (Braconidae) in the natural populations.

#### 5. Cabbage borer: *Hellula undalis* (Pyraustidae: Lepidoptera)

**Distribution and status:** Worldwide, this is sporadic but occasionally serious

**Host range:** cabbage, cauliflower, radish, knoll-khol, beet root and the weed *Gynadropis pentaphylla*

#### Damage symptoms

Larva aborts head formation. Caterpillars first mine the leaves later feed on leaves, shoots sheltered within silken passage and finally bore into the stems. They prevent head initiation causing multiple shoots or heads.



#### Bionomics



Female moth lays oval shaped eggs singly or in clusters on the undersurface of the leaves or some other parts of the plant. Eggs are pearly white when laid which turns pink next day and later brown. Egg period 2-3 days. Larva: Pale whitish-brown in colour with 4-5 purplish brown longitudinal stripes. Larval period 7-17 days. Pupa is a cocoon. Pupal period 6 days. Adult: Pale greyish brown. Forewings have grey wavy lines, a pale apical spot and pale edged dark moon shaped (lunule), hind wings pale dusky with slight fuscous suffusion

on apical area. Life cycle is completed in 15-25 days.

#### Management

Same as for leaf webber

#### 6. Mustard Sawfly: *Athalia lugens* (Tenthredinidae: Hymenoptera)

**Distribution and status:** Widely distributed in Indonesia, Formosa, Myanmar and the Indian Sub-continent.

**Host range:** Mustard, toria (*Brassica campestris*), rapeseed, cabbage, cauliflower, knolkhol, turnip, radish, etc

#### Bionomics



Dark green larvae have 8 pairs of abdominal prolegs. There are five black stripes on the back, and the body has a wrinkled appearance. A full-grown larva measures 16-18 mm in length. The adults are small orange yellow insects with black markings on the body and have smoky wings with black veins. The mustard sawfly breeds from October to March and undergoes pupal diapause during summer. The adults emerge from these cocoons early in October. They live for 2-8 days and lay 30-35 eggs singly, in slits made with saw like ovipositors along the underside of the leaf margins. Egg period is 4-8 days and the larvae feed exposed in groups of 3-6 on the leaves during morning and evening. They remain hidden during the day time and, when disturbed, fall to the ground and feign death. There are 7 instars with a larval period of 16-35 days. Pupation is in water proof oval cocoons in soil and the pupal period is 11-31 clays. Lifecycle is completed in 31-34 days. It completes 2-3 generations from October to March.

#### Damage symptoms

The grubs alone are destructive. They bite holes into leaves preferring the young growth and skeletonize the leaves completely. Sometimes, even the epidermis of the shoot is eaten up. Although the seedlings succumb; the older plants, when attacked, do not bear seed.

#### Management

1. Give first irrigation 3-4 weeks after sowing as it reduces the bug population significantly. (ii) Spray 1.0 L of malathion 50 EC or 625 ml of endosulfan 35 EC or quinalphos 25 EC in 500-600 L of water per ha once in October and again in March-April.
2. Conserve larval parasitoid *Perilissus cingulator* Morby (Ichneumonidae) and the bacterium, *Serratia marcescens* Bizio (Enterobacteriaceae)

### 7. Cabbage aphid: *Brevicoryne brassicae* (Aphididae: Hemiptera)

#### Damage symptoms

Colonies of aphid are found on tender shoots and suck sap from plant tissues. In case of severe infestation plants may completely dry up and die away. On larger plants, feeding damage results in curling and yellowing leaves, stunted plant growth, and deformed heads. White cast skin will be present at the base of the plant.



#### Management

1. Set up yellow sticky trap @ 10 / ha.
  2. Spray any one of the following:
    - Dimethoate 30 EC 1000 ml/ha
    - Methyl demeton 25 EC 1000 ml/ha
    - Monocrotophos 36 WSC 625 ml/ha
    - Neem oil 2.0 L/ha
    - Azadirachtin 0.03% 2.5-5.0 L/ha
- Aphid skin is covered with waxy filaments and for better adherence on aphid body, add wetting agent in spray fluid.



### 8. Cabbage flea beetle: *Phyllotreta cruciferae* (Chrysomelidae: Coleoptera)

**Distribution and status:** Europe, USSR, North and South America, Australia, Japan and India.

**Host range:** Mustard, raya, taramira, toria, radish, turnip, cabbage, cauliflower, knoll-khol dahlia, sweet sultan, antirrhinum and sweet peas.

#### Damage symptoms

Adult beetle feeds on the leaves by making round holes. The stem, flower and even pods may also be attacked. Decaying odour is emitted by the cabbage plants.



#### Bionomics

The female beetle lays 50-80 creamy white eggs singly in the soil around the host plants. Egg period 5 -10 days. The larva is dirty white in colour and 5mm in length. Larval period 9-15 days. Pupal period 2-4 days. Adult beetle is metallic blue with greenish hue. Beetle measures 1.8 -2.0 mm. There are 7-8 generations in a year.





**Management**

Spray 2.5 kg of carbaryl 50 WP or 2 L of endosulfan 35 EC in 750 litres of water per ha.

**Minor pests**

- **Painted bug:** *Bagrada hilaris* (Pentatomidae: Hemiptera)
- **Cutworms:** *Agrotis ipsilon* (Noctuidae: Lepidoptera)
- **Thrips:** *Thrips tabaci* (Thripidae: Thysanoptera)
- **Aphid:** *Myzus persicae*, *Liaphis erysimi* (Aphididae: Hemiptera)

**Questions**

1. First instar larvae of ----- mine epidermal surface of leaves producing typical white patches on cabbage - **Diamond back moth**
2. What is the ETL for diamond back moth ----- - **2 larvae / plants**
3. Name the two larval parasitoids of diamond back moth ----- and -----  
**Cotesia plutella** , **Diadegma semiclausum**
4. Due to gregarious feeding of this pest, rotting of cabbage heads and cauliflower curds are common.
  - a. Diamond back moth
  - b. **Leaf webber**
  - c. Head borer
  - d. Aphid
5. Scientific name of cabbage head borer is ----- **Hellula undalis**
6. ----- is the pest of cabbage that prevent head initiation causing multiple shoots or heads. **Head borer**
7. White cast skin of this pest will be present at the base of the plant.
  - a. Diamond back moth
  - b. Leaf webber
  - c. Head borer
  - d. **Aphid**
8. Name the wetting agent in the spraying fluid - **Teepol** and **Sandovit**
9. How much wetting agent can be used with water whenever sprays are made - **0.5 ml / lit of water**
10. Wetting agent may be added in spray fluid for better adherence on aphid body because the skin is covered with \_\_\_\_\_ **waxy filament**
11. How many yellow sticky trap can be installed /ac to attract aphid population
  - a. 3
  - b. **4**

- c. 5    d. 6
- 12.----- adult has a fringe of long hairs on hind wing - **Diamond back moth**
13. Mustard crop can be used as trap crop in cabbage field to attract ----- **Diamond back moth**
14. *Plutella xylostella* belongs to the family
- |                       |                  |
|-----------------------|------------------|
| a. <b>Plutellidae</b> | b. Noctuidae     |
| c. Gelichida          | d. Gracillaridae |
15. How many pheromone trap can be installed / ac to attract the diamond back moth
- |             |      |
|-------------|------|
| a. 3        | b. 4 |
| c. <b>5</b> | d. 6 |