



**FACULTY OF AGRICULTURAL SCIENCES & ALLIED INDUSTRIES**

## Lecture 14

### Major Pests of Cotton: Cotton Bollworms

1.	Spotted bollworms	<i>Earias vittella</i> & <i>E. insulana</i>	Noctuidae	Lepidoptera
2.	American bollworm/ Green bollworm	<i>Helicoverpa armigera</i>	Noctuidae	Lepidoptera
3.	Cotton pink bollworm	<i>Pectinophora</i> <i>gossypiella</i>	Gelechiidae	Lepidoptera

#### 1. Spotted bollworms:

*Earias vitella* & *E. insulana* (Noctuidae: Lepidoptera)

**Distribution and status:** Cosmopolitan.

**Host range:** Cotton, bhendi, holly hock, *Hibiscus cannabinus*, *Abutilon indicum*

**Damage symptoms:** In the beginning of the season, when the crop is a few weeks old, the small caterpillar on hatching out from the egg leads a free life for a few hours. Then it bores into top tender shoot, the portion of the shoot above the damage withers, droops and dries up. Depending upon the locality upto 50 per cent of the crop may be damaged in this manner. When the squares and bolls begin to develop, these caterpillars move from the shoots and start damaging bolls by making conspicuous holes into them. The squares and small bolls injured by the larvae drop away from the plants. The developing bolls are also damaged and some of the damaged bolls fall to the ground. The infested bolls, which are not shed, are destroyed by the larvae eating the seeds and filling them with excrement. Such affected bolls may open prematurely and badly.

**Bionomics:** *Earias vittella* has green forewings with white streak in each of them. *Earias insulana* has complete green forewings. Scattered, crown shaped, deep sky blue colour eggs are deposited singly on the shoot tips, buds, flowers, fruits. Egg period is 3 days. Larva is brown with dorsum showing a white median longitudinal streak; the last two thoracic segments and all the abdominal segments have two pairs of fleshy tubercles (finger shaped processes), one dorsal and the other lateral. *E. vittella* is without finger shaped processes. Larval period is 10-12 days. Pupation is outside the bolls in a tough, boat shaped, dirty white silken cocoon. Pupal period is 7-10 days.



*E.vitella*



*E.insulana*

## 2. American bollworm/Green bollworm:

*Helicoverpa armigera* (Noctuidae:Lepidoptera)

**Distribution and status:** Cosmopolitan. Major pest Host range: Sorghum, lablab, soybean, peas, sunflower, safflower, chillies, groundnut, tobacco, bhendi, maize, tomato.

**Damage symptoms:** The caterpillars feed on leaves, squares, flowers and small bolls. When the squares, flowers and bolls are attacked, they feed the internal content completely by thrusting their head inside leaving the rest of the body outside. The damaged squares and young bolls drop away from the plants. The developed bolls and open bolls are not attacked.

**Economic threshold level:** 10% of affected fruiting parts or bolls or one egg/plant or one larva/plant

**Bionomics:** Adult: Brown coloured moth with a 'V' shaped speck on forewing and dull black border on the hind wing. Eggs are laid on the host plants singly. The egg period is 7 days. Full grown larva is 2" long, greenish with dark brown gray lines and dark and pale bands. It shows colour variation from greenish to brown. The larval duration is 14 days. It pupates in soil for 10 days.



### Management of bollworms

- a. **Monitoring:** Pest monitoring through light traps, pheromone traps and in situ assessments by roving and fixed plot surveys has to be intensified at farm, village, block, regional and state levels. For bollworm, *H. armigera* management, an action threshold of one egg per plant or 1 larva/ plant may be adopted.
  
- b. **Cultural practices** • Grow Bt cotton viz., Bollgard I containing Cry 1 Ac protein that offers protection against American bollworm and Bollgard II containing Cry 2 Ab in addition to Cry 1 Ac which offers season long protection against Spodoptera and Helicoverpa • Grow Helicoverpa resistant varieties like L 1245, LD 135, Sujata, LK 861, Abadhita. • Grow spotted bollworm resistant varieties like L 1245, JK 119-25-54, BCS 10, BCS 10-75, FBRN 2-6, HAO 66-107-1/1, Hopi, Deltapine, LH 95, UK 48G 27, Sanguineum

Premonsoon sowing during 4th week of September significantly lower the bollworm damage in rainfed areas. • Synchronized sowing of cotton preferably with short duration varieties in each cotton ecosystem. • Avoid continuous cropping of cotton both during

winter and summer seasons in the same area as well as ratooning. • Avoid monocropping. Grow less preferred crops like greengram, blackgram, soyabean, castor, sorghum etc., along with cotton as intercrop or border crop or alternate crop to reduce the pest infestation. • Remove and destroy crop residues to avoid carry over of the pest to the next season, and avoid extended period of crop growth by continuous irrigation. • Optimize the use of nitrogenous fertilizers which will not favour the multiplication of the pest. • Judicious water management for the crop to prevent excessive vegetative growth and larval harbourage. •

- c. **Biological control** • Application of nuclear polyhedrosis virus (NPV) at  $3 \times 10^{12}$  POB /ha in evening hours at 7th and 12th week after sowing. • Conservation and augmentation of natural predators and parasites for effective control of the pest. • Inundative release of egg parasite, *Trichogramma* spp., at 6.25 cc/ha at 15 days interval 3 times from 45 DAS, egg-larval parasitoid, *Chelonus blackburnii* and the predator *Chrysoperla* 1,00,000/ha at 6th, 13th and 14th week after sowing. • ULV spray of NPV at  $3 \times 10^{12}$  POB /ha with 10% cotton seed kernel extract, 10% crude sugar, 0.1% each of Tinopal and Teepol for effective control of *Helicoverpa*. NOTE: Dicofol, endosulfan, methyl demeton, monocrotophos and phosalone are comparatively safer to *Chrysoperla* larva recording low egg mortality.
- d. Chemical control During the early stages of square formation, apply endosulfan 35 EC @ 0.2 l/ha. During bolling and maturation stage, apply any one of the following insecticides per ha; phosalone 50 EC 2.5 L quinalphos 25 EC 2.0 L, carbaryl 50 WP 2.5 kg (1000 L of spray fluid/ha)

### 3. Cotton pink bollworm:

*Pectinophora gossypiella* (Gelechiidae: Lepidoptera)

**Distribution and status:** India, Pakistan, Africa, Australia, Asia. Major pest

**Host range:** Cotton, bhendi, holly hock and other malvaceous plants.

**Damage symptoms:** The caterpillars feed on flower buds, flowers and bore into bolls. When they bore into flower buds, they feed on developing anther and style and occasionally on ovary. When they are found in flowers, the flowers do not open and give rosette appearance. The young bolls, when attacked, are shed after a few days, but the larger bolls remain on the plant. Locules are damaged and interlocular burrowing can be noticed. Seeds are destroyed and lint gets stained. The aperture through which they make their entry into the boll is closed, and it becomes difficult to differentiate between a healthy and infested boll.

**Bionomics:** Larva: Varies in general color; young larva white and late instar almost black, brown or green to pale or pink with several dark and light alternating bands running the entire length. Adult: Small moth, brown or dull yellow or olive grey with dark spots on the forewing.



### **Management**

- Use pheromone trap @ 12/ha to monitor the adult moth activity
- Collect and destroy the shed fruiting parts at weekly intervals
- Crush the pink bollworm larvae in the rosette flowers
- Spray endosulfan 2.0 L /ha in the early stages of square formation.

- Durign bolling and maturation stage, spray fenprothrin 30 EC 250-340 ml or fenprothrin 10EC 750-1000 ml or triazophos 40 EC 1.5 - 2.0 L or cypermethrin 10 EC 500-700 ml or 25 EC 180-250 ml or phosalone 35 EC 2.0 L or quinalphos 20 AF 1.75 - 2.5 L in 1000 L of water/ha
- Spray triazophos 40 EC 2.0 L and endosulfan 35 EC 2.0 L in alternation even after 100 DAS in problem areas.

#### • **Integrated pest management of cotton pests**

- ✓ Remove cotton crop and dispose off the crop residues as soon as harvest is over. o Avoid staking of stalks in the field.
- ✓ Avoid ratoon and double cotton crop. o Adopt proper crop rotation. Use optimum irrigation and fertilizers.
- ✓ Synchronize the sowing time in the villages and complete the sowing within 10 to 15 days.
- ✓ Grow one variety throughout the village as far as possible.
- ✓ Avoid other malvaceous crops in the vicinity of cotton crop.
- ✓ Timely earthing up and other agronomic practices should be done.
- ✓ Hand pick and burn periodically egg masses, visible larvae, affected and shed squares, flowers and bolls and squash pink bollworm in the rosettes.
- ✓ Use locally fabricated light traps (modified Robinson type) with 125 Watt mercury lamps to determine the prevalence of pests and their population fluctuation.
- ✓ The magnitude of the activity of the moths of the cotton pink bollworm, the cutworm (*Spodoptera litura*) and the American bollworm can be assessed by setting up the species-specific sex pheromone trap each at the rate of 12 per ha.
- ✓ Apply chemical insecticides only when it is absolutely necessary and when pest population damage crosses ETL.
- ✓ Intercropping with pulses viz., cowpea, greengram, blackgram and soybean reduce the population of sucking pests of cotton, viz., aphid and leaf hopper. Also, the bollworm incidence is low. Besides, the highest activity of natural enemies viz., spiders and predatory lady bird beetles are significant.
- ✓ Grow resistant cultivars like G 27, LD 135, Lohit, Abadhita, MCU 7, Sujata, Digvijay, Sanguineum