INTEGRATED PEST MANAGEMENT IN COTTON
INTRODUCTION

• Major producers of Cotton: China, India, USA, Pakistan, Uzbekistan, Argentina, Australia, Greece, Brazil, Mexico, and Turkey.

• Cotton occupies 5% of the total cropped area.

• Consumes 55% pesticide share accounting for 40% of total production costs.

• Impact of insect pests and the increased agrochemical use in cotton production
Trends in Area, Production and Yield

Source: Cotton Corporation of India
State-wise production of cotton

- Gujarat: 35%
- Maharashtra: 21%
- Andhra Pradesh: 14%
- Haryana: 8%
- Madhya Pradesh: 6%
- Punjab: 7%
- Karnataka: 3%
- Rajasthan: 3%
- Others: 2%

Source: Ministry of Agriculture, GoI
Major pests of Cotton

**SUCKING PESTS**
- Leaf miner
- Leaf hopper
- Aphids
- Whitefly
- Thrips
- Mealy bug
- Flower midge
- Mirid bug
- Mites

**STAINERS**
- Red cotton bug
- Dusky cotton bug

**BOLLWORMS**
- American Bollworm
- Pink bollworm
- Spotted bollworm
- Foliage feeding insects
- Tobacco caterpillar
- Cotton leaf roller
Pest status

• **American boll worm**- India and other cotton growing countries

• **Pink bollworm**, *Pectinophora gossypiella*: America, Africa, Australia and Asia, Highly destructive in India and Pakistan.

• *Earias insulana and E. vitella*: North Africa, India, Pakistan and other countries.

• **Cotton leaf roller**, *Sylepta derogata*: Africa and in India it is an important sporadic pest.

• **Whitefly**, *Bemisia tabaci*: Northern and western regions of the Indian sub-continent

• **Leafhopper**, *Amrasca biguttula biguttula*: India and destructive pest of American cotton in North-Western regions.
Cont.…

• Aphids, *Aphis gossypii*: distributed worldwide and known as potential pest of cotton.


• Flower midge, *Dasineura gossypii*: severe incidence seen in farmer’s field at Hesarur (Taluk: Savanur District: Haveri) during 2009.
Leaf miner, *Liriomyza trifolii* (Agromyzidae: Diptera)

Adult is a small fly. Maggots mines into the leaves below epidermal layer in a zig zag manner and pupates in soil.
Infestation starts from the 2-3 leaf stage of the crop and continues up to 40 to 50 days.
Leaf hopper, *Amrasca biguttula biguttula* (Cicadellidae: Hemiptera)

- **Nymphs are flattened, pale yellowish green** Nymphal period occupies 7-21 days depending upon weather conditions
- **Adults are elongate and wedge shaped with pale green body.** Forewing and vertex have black spots.
Nature of Damage

• Both Adults & nymphs suck the sap from the lower surface of leaves.

• Inject toxin into plant tissues.

Symptoms

• Leaves turn pale yellow.
• The margin of the leaves start curling downwards and reddening.
Symptoms of damage

- Severe Infestation: Leaves get a bronze or brick red colour which typical “Hopper burn”.

- The margin of the leaves get broken and crumble into pieces when crushed.

- The leaves dried up and are shed and the growth of the crop is retarded.
Thrips, *Thrips tabaci*
Thripidae: Thysanoptera

- Eggs are minute, kidney shaped laid in slits in leaf tissues. IP: 5 days.
- Nymphs are creamy to pale yellow in color, resemble adults but wingless. NP: 5 days. Pupal period: 4-6 days.
- Adults are straw colored, yellowish brown and elongated.
Symptom of damage

- Shrivelling of leaves due to scrapping of epidermis and desapping
- Attacked terminal buds – have ragged edges
- Silvery shine on the under surface of leaves
Aphids, *Aphis gossypii* (Aphididae: Hemiptera)

- Small, greenish brown and soft bodied insects.
- both winged and wingless forms.
- Reproduction: Parthenogenetic and viviparous.
- Give birth to 8-22 nymphs per day.
- Nymphal period: 7-9 days.
- Adult period: 12-20 days.
Nature of Damage

- Both adults & nymphs suck sap from tender leaves, twigs & buds and weaken the plants.
- Indirectly decreases cotton fiber quality as a result of sticky cotton due to deposition of honeydew on open bolls.
- Complete reduction in reproductive growth.
Damaging symptoms

- Leaf crumbling and downward curling → Direct damage

Indirect damage

- Honey dew → encourages Sooty mold growth on leaves
- Black coating on boll & lint
- “Stickiness” of lint

Leaf crumbling and downward curling
Whitefly, *Bemisia tabaci* (Aleyrodidae: Hemiptera)

- Nymph: greenish yellow, oval in outline
- Adult: Minute with yellow body covered with a white waxy bloom
Damaging symptoms

- Curl upwards.
- Reduce plant vigour.
- Sooty mould growing on honeydew.
- Lint contamination with honeydew and associated fungi occur during heavy infestations after boll opening.
- Transmission of CLCV
Mirid bug, *Poppiocapsidea (=Creontiades) biseratense* (Miridae: Hemiptera)
Nature of damage

Both adults and nymphs - feed on flower buds, squares and small developing bolls
Damaging Symptoms

- Anthers damage
- Oozing out of yellow fluid from the buds
- Abnormal flower opening
- Flowers shedding
Deformed bolls

Parrot beaking symptom

Feeding punchers on bolls

Immature bolls damage

Deformed bolls
Mealy Bug, *Phenococcus solenopsis* (Pseudococcidae: Hemiptera)

- **Eggs**
- **Crawlers**
- **Female**
- **Male**
Nature of Damage

Congregate on different parts of the plants & depriving plants essential nutrients
Damaging Symptoms

- Sooty mold growth
- Retarded growth, late opening of bolls and drying of the plant
- Infested field
Flower midge, *Dasineura gossypii* (Cecidomyiidae: Diptera)

- **Egg:** Hyaline white elongate cylindrical inserted inside the tender squares.
- **Larvae:** Initially white transparent later become orange colour.
- **Pupation in a silken cocoon on bracts.**
- **Adults:** soft bodied orange colour weak flies.
Nature of Damage

Maggots feed upon the floral parts → Anthers and Stalk of Stamen
Symptoms

Flower bud dry up and disintegrate
Flower drop
Boll formation
Dusky cotton bug, *Oxycarenus hyalinipennis* (Lygaeidae: Hemiptera)

Adult and nymphs seen on the burst bolls
Suck the sap from immature bolls

Staining the lint and lowering the market value
Red cotton bug, *Dysdercus cingulatus* (Pyrrhocoridae: Hemiptera)

- Suck the sap from leaves and green bolls
- Low germination and less oil content.
- Red stained lint and rooting bolls.
- Bacterium *Nematospora gossypii* enters the site of injury and stains the fiber
American bollworm, *Helicoverpa armigera* (Noctuidae: Lepidoptera)
Colour morphs of *H. armigera*

Colour variation from greenish to brown
Larvae feeding on the squares, bolls by thrusting their heads alone inside and leaving the rest of the body outside.
Damaging symptoms:

- Boll showing regular, circular bore holes.
- Presence of granular faecal pellets outside the bore hole.
- A single larva can damage 30-40 bolls.
Spotted bollworm, *Earias vittella*
Spiny bollworm, *E. insulana* (Noctuidae: Hemiptera)
Damaging Symptoms

- Drying and drooping of terminal shoots during pre-flowering stage.
- Shedding of squares and young bolls.
- Flaring up of bracts during square and young boll formation stage.
- Holes on bolls and rotting of bolls.
Pink bollworm, *Pectinophora gossypiella* (Gelechiidae: Lepidoptera)

**Egg**: Pearly iridescent white flattened oval

**Adult**: small, deep brown moth, blackish spots on the forewing, hindwings are fringed with hairs.

**Larva**: first two instars are white, while after third instars pink in colour.

**Pupa**: 7-8 Days

**Life Cycle**

**Egg**: 3-4 Days

**Larva**: 12-15 Days

**Pupa**: 7-8 Days
Damaging Symptoms

Larva enter buds and feed on the Internal content

Rossetted flowers
Larvae feed by making circular holes on young bolls

Exit hole

Bad boll opening
They cut window holes (interlocular burrowing) in the adjoining seeds thereby forming “double seeds”
Tobacco caterpillar, *Spodoptera litura* (Noctuidae: Lepidoptera)

- Major and important chewing insect pests of cotton
- Egg: laid in masses which appear golden brown
- Larva: pale greenish with dark markings and gregarious in the early stages.
- Adults: forewing- brown colour with wavy white marking
- Hindwings- white colour with a brown patch along the margin
Damaging symptoms

Skeletonization by early instar larvae
Small holes on leaves by later instar larvae
Cotton Leaf roller, *Sylepta derogata* (Pyralidae: Lepidoptera)

- Leaves rolled in the form of trumpets fastened by silken threads
- Marginal portion of leaves eaten away
- Plants defoliated in severe attack
Red spider mite, *Tetranychus cinnabarinus* (Tetranychidae: Acarina)
Damaging symptoms

Leaves turn upward, size get reduced become brittle and the plant become stunted.

Squares and young bolls are shed.
Yellow mite, *Polyphagotarsonemus latus* (Tetranychidae: Acarina)

Egg: 2.06 to 2.53 days

Larva: 1.96 days

Adult
Damage and symptoms

Due to the feeding leaves turn upward, size get reduced become brittle and the plant become stunted.

Squares and young bolls are shed.

Under severe infestation seed cotton yield were reduced to 50 – 60%