

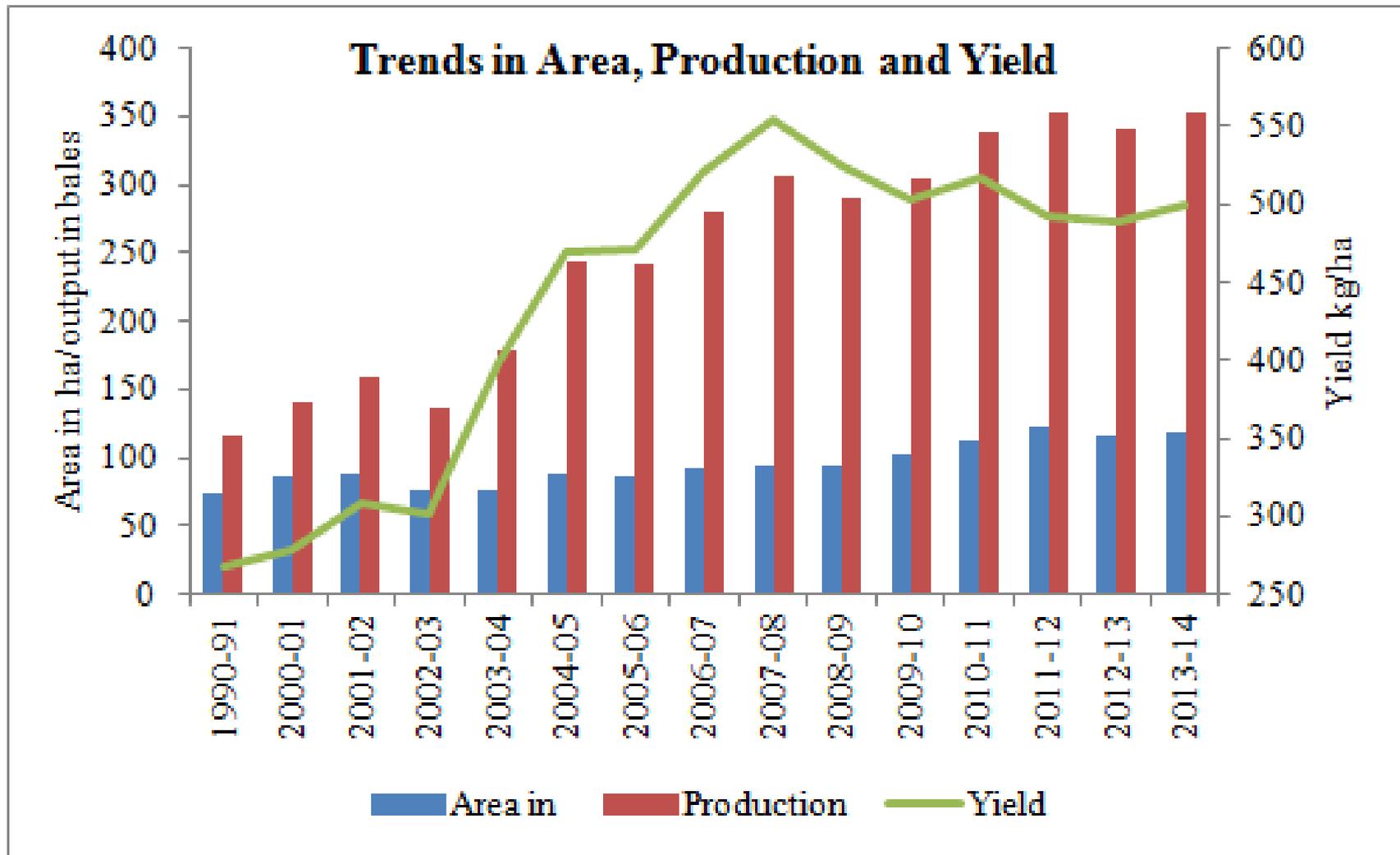


# **INTEGRATED PEST MANAGEMENT IN COTTON**

# INTRODUCTION

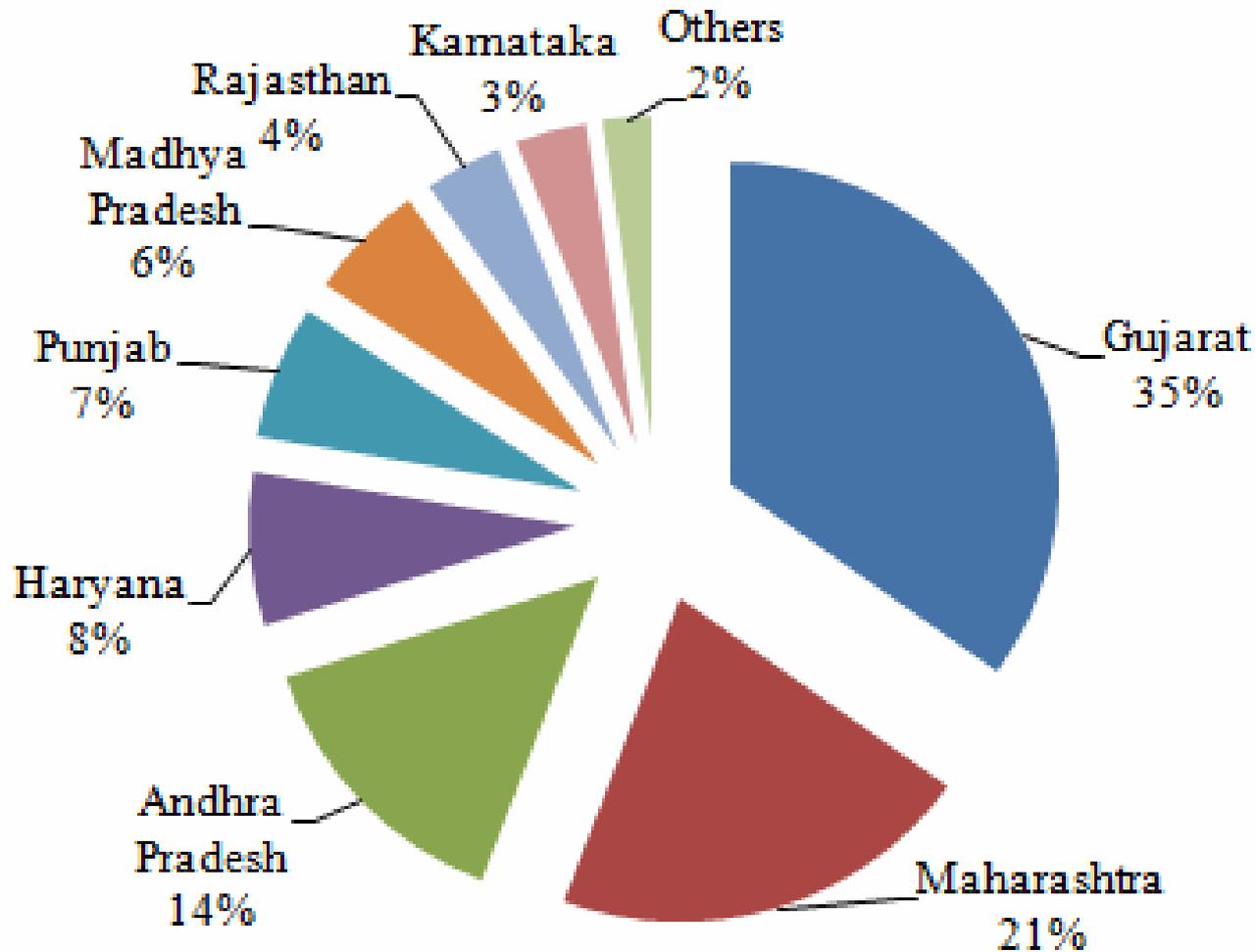
- **Major producers of Cotton: China, India, USA, Pakistan, Uzbekistan, Argentina, Australia, Greece, Brazil, Mexico, and Turkey.**
- **Cotton occupies 5% of the total cropped area.**
- **Consumes 55% pesticide share accounting for 40% of total production costs.**
- **Impact of insect pests and the increased agrochemical use in cotton production**

# Bt cotton- World scenario



Source: Cotton Corporation of India

# State-wise production of cotton



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.
- **Mealy bug, *Phenacoccus solenopsis***: Asia countries- **India and Pakistan**. In 2006, it appeared in Punjab, Haryana, Rajasthan, Maharashtra and Gujarat. Epidemic form in 2007 and 2008.
- **Mirid bug, *Poppiocapsidea (=Creontiades) bisaratense***: appearing on Bt Cotton from **Karnataka** since 2005. Regular pests in Tamil Nadu, Andhra Pradesh and Maharashtra.
- **Flower midge, *Dasineura gossypii***: severe incidence seen in farmer's field at Hesarur (Taluk: Savanur District: **Haveri**) during 2009.

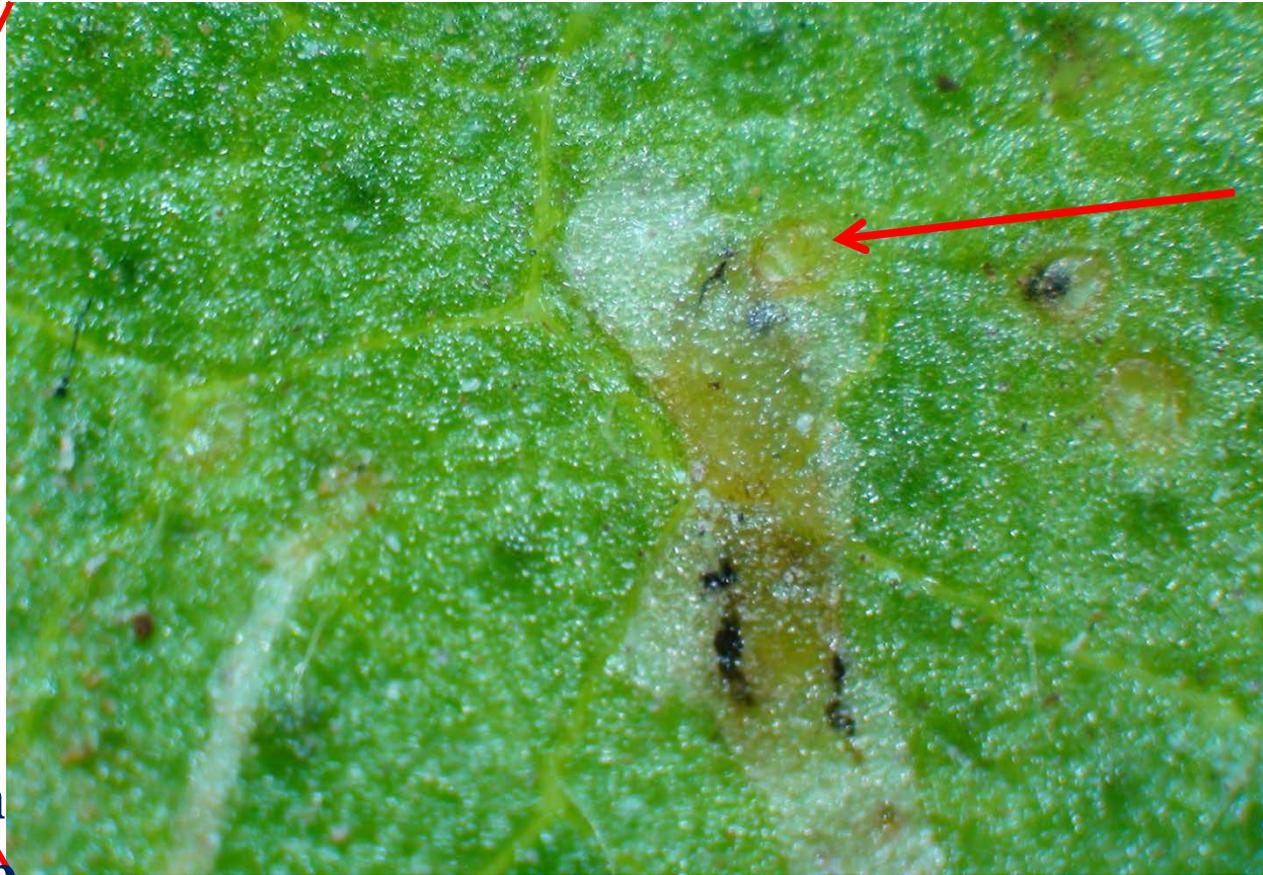
# Leaf miner, *Liriomyza trifolii* (Agromyzidae: Diptera)



**Adult is a small fly. Maggots mines into the leaves below epidermal layer in a zig zag manner and pupates in soil.**



## Damaging Symptoms



**Infestation starts from  
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

# Damaging symptoms



## 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.



Colonies on undersurface of leaves



# Damaging symptoms



→ Direct damage



Leaf crumpling and downward curling

↓ Indirect damage



Honey dew → encourages Sooty mold growth on leaves



Black coating on boll & lint  
“Stickiness” of lint

# Whitefly, *Bemisia tabaci* (Aleyrodidae: Hemiptera)

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



# Damaging symptoms

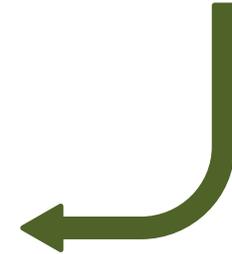
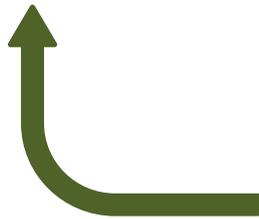
- **Curl upwards .**
- **Reduce plant vigour.**
- **Sooty mould growing on honeydew.**
- **Lint contamination with honeydew and associated fungi occur during heavy infestations after boll opening.**
- **Transmission of CLCV**



**Mirid bug,**  
*Poppiocapsidea (=Creontiades) biseratense*  
**(Miridae: Hemiptera)**



**Life stages**



# Nature of damage



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



# Damaging Symptoms



**Abnormal flower opening**



**Anthers damage**



**Oozing out of yellow fluid from the buds**



**Flowers shedding**



**Feeding punchers on bolls**



**Parrot beaking symptom**



**Immature bolls damage**



**Deformed bolls**

# Mealy Bug, *Phenacoccus 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**

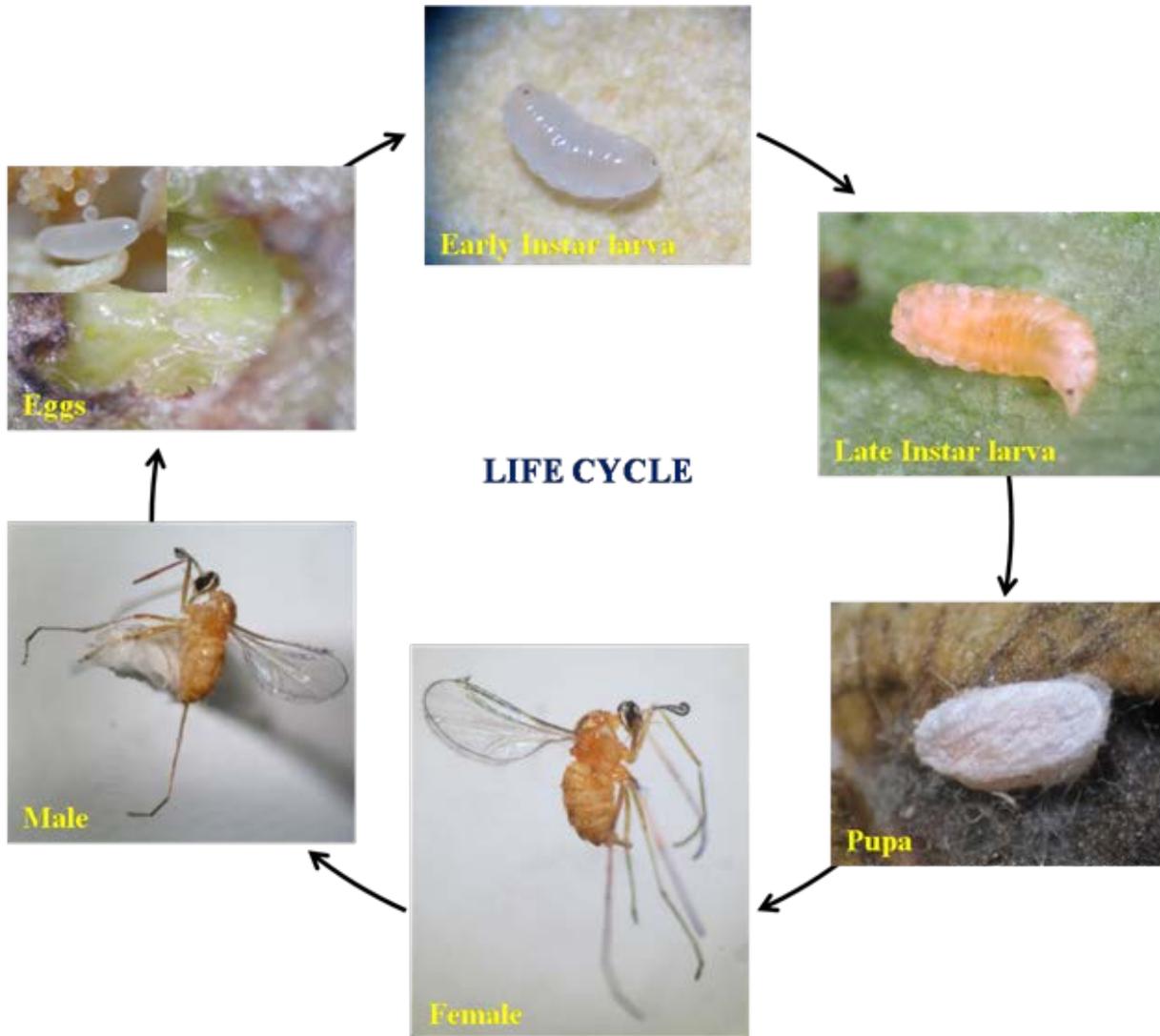


**Infested field**



**Retarded growth, late opening of bolls and drying of the plant**

# Flower midge, *Dasineura gossypii* (Cecidomyiidae: Diptera)



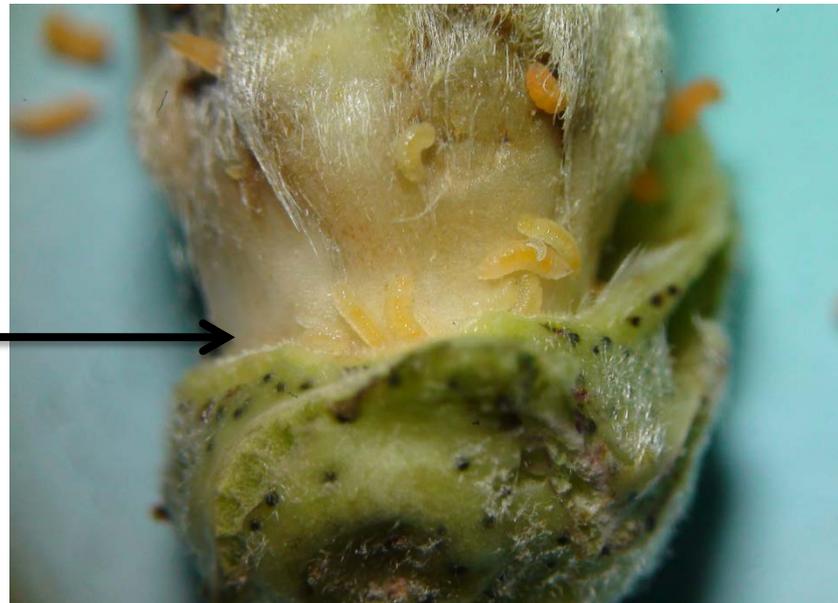
- **Egg:** Hyaline white elongate cylindrical inserted inside the tender squares.
- **Larvae:** Initially white transparent later become orange colour.
- **Pupation** in a silken cocoon on bracts.
- **Adults :** soft bodied orange colour weak flies.



# Nature of Damage

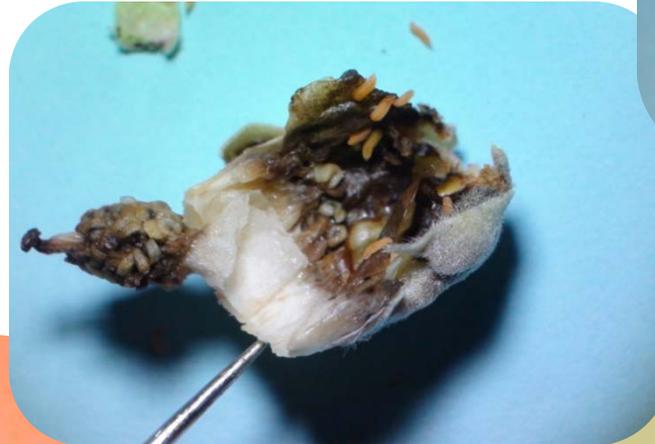


**Maggots feed upon the floral parts  
→ Anthers and Stalk of Stamen**



# 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)

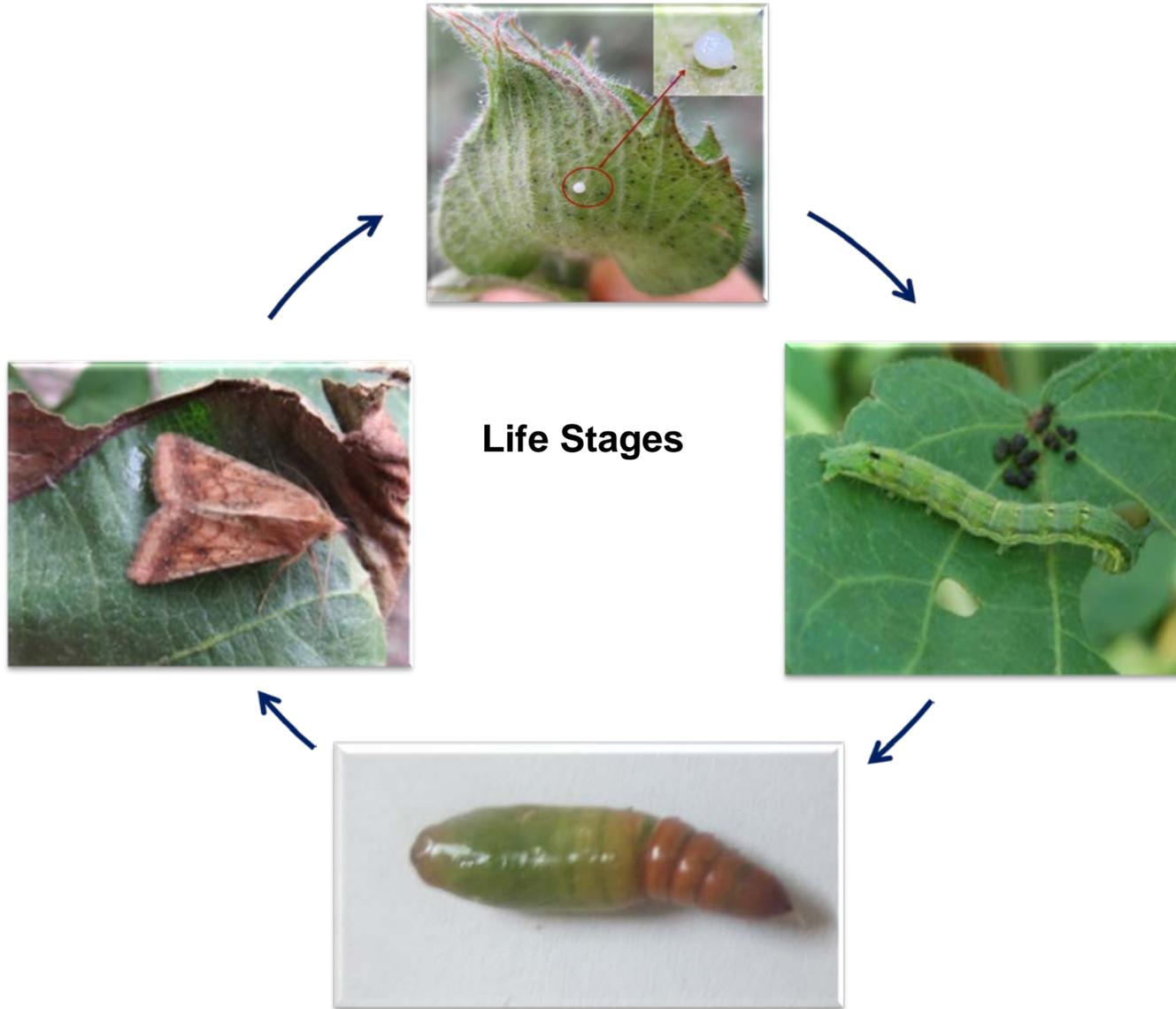


**Suck the sap from leaves  
and green bolls**



- **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 variation from greenish to brown**

**Colour morphs of *H. armigera***

# Nature of damage



**Feeding Injury**



**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)**



***Earias vittella***



***E. insulana***



# 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.**

## Life Cycle



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



# Damaging Symptoms



**Larva enter buds and feed on the Internal content**



**Rosetted 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



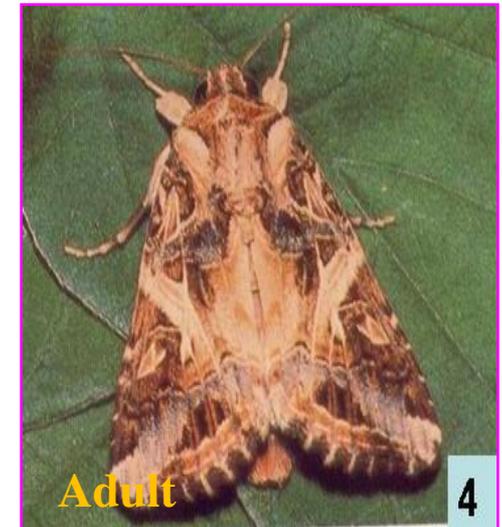
Egg mass



Young larvae



Grown up larva



Adult

# Damaging symptoms



**Skeletonization by early instar larvae**  
**Small holes on leaves by later instar larvae**



# Cotton Leaf roller, *Syllepta 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



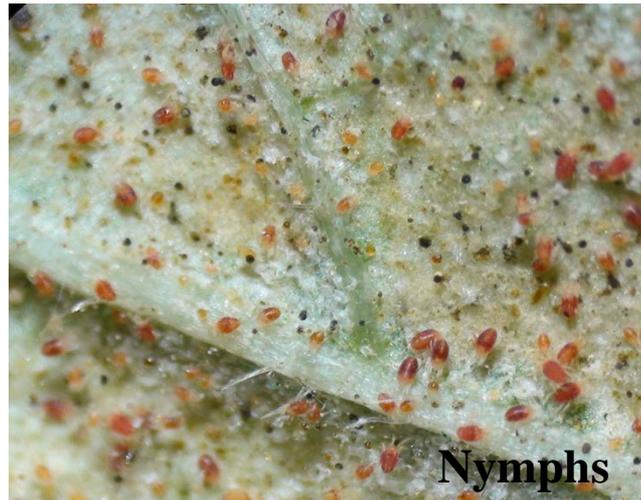
# Red spider mite, *Tetranychus cinnabarinus* (Tetranychidae: Acarina)



Adults



Eggs



Nymphs

## **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)



# 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%**

