



INSECT PESTS OF COTTON

Dr. Nihal R

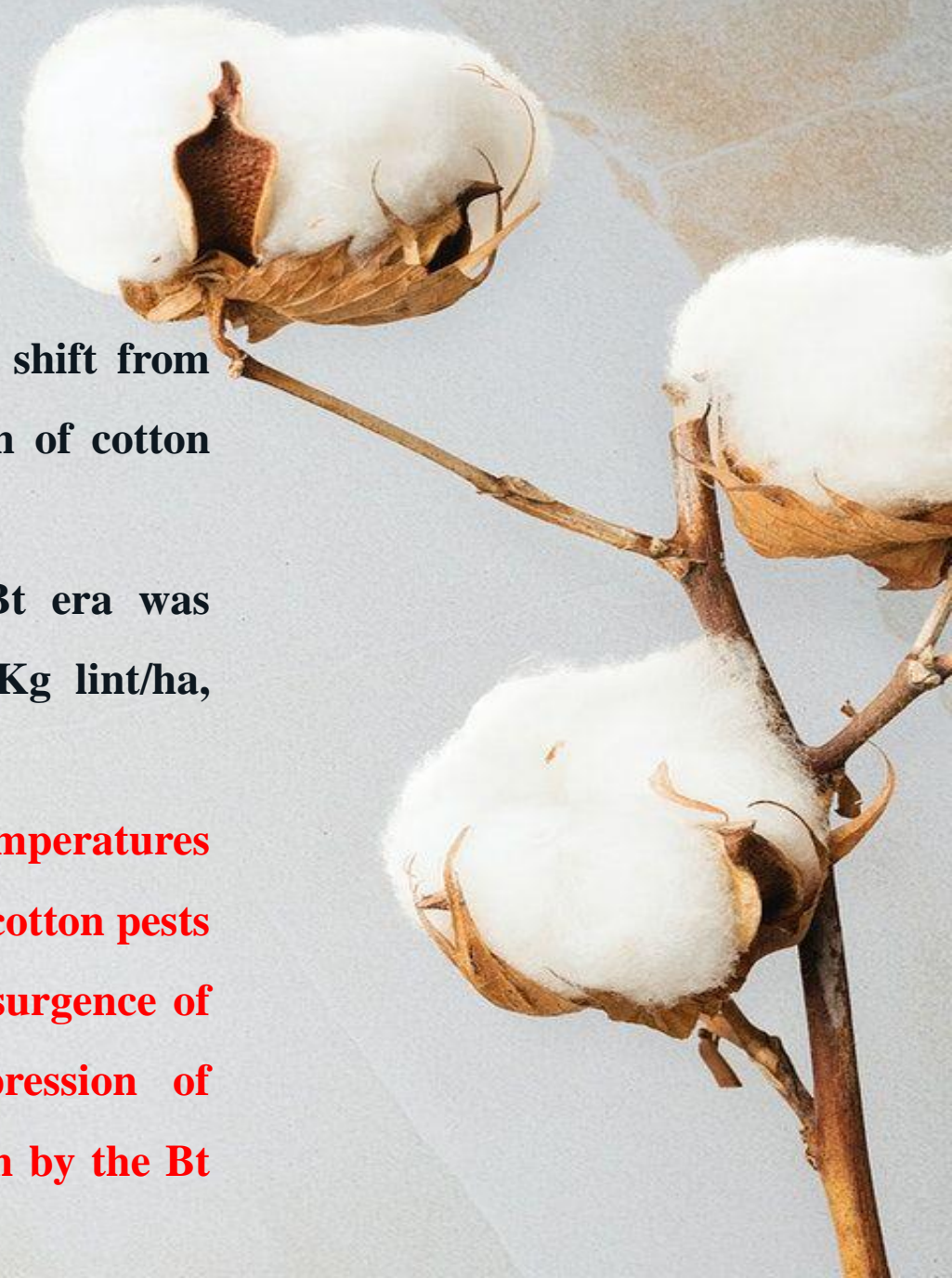
INSECT PESTS OF COTTON

- Commercial cultivation of cotton in India is taken up in three designated cotton growing zones viz., North, Central and South zones falling under varied agro climatic conditions, seasons and cropping systems.
- North zone, traditionally designated as *hirsutum* and *arboreum* zone comprises States of Punjab, Haryana and Rajasthan.
- While Central (*hirsutum*, *arboreum*, *herbaceum* and hybrid) zone has states of Gujarat, Madhya Pradesh and Maharashtra.
- The South (*hirsutum*, *arboreum*, *herbaceum*, *barbadense* and hybrid) zone spreads across states of Karnataka, Andhra Pradesh and Tamil Nadu.



INSECT PESTS OF COTTON

- **Currently, all zones are growing Bt cotton hybrids at large.**
- **The commercial cultivation of Bt transgenic hybrids from 2002, a shift from erstwhile conventional varieties and hybrids changed the paradigm of cotton cultivation in India.**
- **The increase of area, production and productivity in the post Bt era was appreciable indicating 116.14 lakh ha., 334 lakh bales and 489 Kg lint/ha, respectively during 2012-13.**
- **However, multifarious problems of changing rainfall pattern and temperatures during cotton crop growth and development, emergence of alternate cotton pests such as mealybugs, mirids, cotton leaf curl virus, resistance and resurgence of sucking pests to insecticidal measures and sub optimal suppression of Lepidopterous larvae especially *Spodoptera litura* and pink bollworm by the Bt transgenics are the plant protection associated issues on Bt cotton.**



INSECT PESTS OF COTTON

- Under the changed scenario of cotton cultivation not only the production practices changed but also the protection practices.
- **The Bt cotton brought out as a protection technology changed the paradigm of pest scenario and hence the approach to development of IPM in conjunction with the challenges.**
- **Crop, Insect pests, diseases, natural enemies, cropping practices and patterns and prevalent weather are essentially to be considered simultaneously to improve decision making for profitable and sustainable IPM.**
- With more than 90% cotton area under Bt cotton hybrids across three different cotton growing zones of the country, there is necessity to bring out a package of IPM to suit to the Bt cotton cultivation.



INSECT PESTS OF COTTON

- **In India Genetic Engineering Approval Committee (GEAC) of Ministry of Environment, Forest and Climate Change allowed commercial cultivation of Bt cotton in six states viz- Gujarat, Madhya Pradesh, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu in 2002.**
- **The varieties approved for commercialization in central and southern parts of India are: RCH 2 Bt (Rasi Seed), Bt Mech 12, Bt Mech 162 and Bt Mech 184 varieties (Monsanto in collaboration with Mahyco).**
- **The four Bt cotton hybrids allowed for commercial cultivation in south India are: MRC-6322 Bt and MRC-6918 Bt (Mahyco) and RCH-20 Bt and RCH-368 Bt (Rasi Seed).**



INSECT PESTS OF COTTON

- For central India five Bt cotton hybrids approved for commercial cultivation are RCH-144 Bt and RCH- 118 Bt (Rasi Seed), MRC-630 I Bt (Mahyco) Ankur- 681 and Ankur-09 (Ankur Seeds).
- **Bollgard II® cotton contains the cry 1Ac and cry2Ab genes which produce delta endotoxin proteins (Bt toxins) that are toxic to *Helicoverpa* and pink bollworm of cotton.**
- **The presence of more than one insecticidal gene in a single plant may give better insect control and reduce the potential for the insect pests to become resistant to the toxins**



MAJOR PESTS OF NATIONAL SIGNIFICANCE

| Sl. No. | Common Name | Scientific Name | Family | Order |
|---------|-------------|--|----------------|--------------|
| 1 | Aphid | <i>Aphis gossypii</i> | Aphididae | Hemiptera |
| 2 | Mirid bug | <i>Creontiades biseratense</i> (Brown mirid), <i>C. dilutes</i> (Green Mirid) and <i>Sidnia kingbergii</i> (Crop mirid) | Miridae | Hemiptera |
| 3 | Leaf hopper | <i>Amrasca bigutulla bigutulla</i> | Cicadellidae | Hemiptera |
| 4 | Thrips | <i>Scirtothrips dorsalis</i> , <i>Thrips tabaci</i> | Thripidae | Thysanoptera |
| 5 | Whitefly | <i>Bemisia tabaci</i> | Aleyrodidae | Hemiptera |
| 6 | Mealy bug | <i>Phenacoccus solenopsis</i> | Pseudococcidae | Hemiptera |
| 7 | Stem weevil | <i>Pempherulus affinis</i> | Curculionidae | Coleoptera |

MAJOR PESTS OF NATIONAL SIGNIFICANCE

| Sl. No. | Common Name | Scientific Name | Family | Order |
|---------|---------------------|--|---------------|-------------|
| 8 | Spotted bollworm | <i>Earias vitella, E insulana</i> | Noctuidae | Lepidoptera |
| 9 | Pink bollworm | <i>Pectinophora gossypiella</i> | Gelechiidae | Lepidoptera |
| 10 | American bollworm | <i>Helicoverpa armigera</i> | Noctuidae | Lepidoptera |
| 11 | Tobacco caterpillar | <i>Spodoptera litura</i> | Noctuidae | Lepidoptera |
| 12 | Red bollworm | <i>Rabila frontalis</i> | Noctuidae | Lepidoptera |
| 13 | Red cotton bug | <i>Dysdercus cingulatus, D. koenigii</i> | Pyrrhocoridae | Hemiptera |
| 14 | Dusky cotton | <i>Oxycarenus hyalinipennis</i> | Lygaeidae | Hemiptera |

MAJOR PESTS OF NATIONAL SIGNIFICANCE

| Sl. No. | Common Name | Scientific Name | Family | Order |
|---------|------------------|------------------------------------|---------------|-------------|
| 15 | Shoot weevil | <i>Alcidodus affaber</i> | Curculionidae | Coleoptera |
| 16 | Ash weevil | <i>Mylocerus undecimpustulatus</i> | Curculionidae | Coleoptera |
| 17 | Leaf roller | <i>Syllepta derogata</i> | Pyralidae | Lepidoptera |
| 18 | Blister beetle | <i>Mylabris pustulatus</i> | Melioidae | Coleoptera |
| 19 | Bud moth | <i>Phycita infusella</i> | Pyralidae | Lepidoptera |
| 20 | Semilooper | <i>Taracha notabilis</i> | Noctuidae | Lepidoptera |
| 21 | Green semilooper | <i>Anomis flava</i> | Noctuidae | Lepidoptera |

MAJOR PESTS OF NATIONAL SIGNIFICANCE

| Sl. No. | Common Name | Scientific Name | Family | Order |
|---------|---------------|--------------------------------|---------------|------------|
| 22 | Black Scale | <i>Parasaissetia nigra</i> | Coccidae | Hemiptera |
| 23 | White scale | <i>Megapulvinaria maxima</i> | Coccidae | Hemiptera |
| 24 | Yellow scale | <i>Cerococcus hibisci</i> | Coccidae | Hemiptera |
| 25 | Flower weevil | <i>Amorphaidea arcuate</i> | Curculionidae | Coleoptera |
| 26 | Stem borer | <i>Sphenoptera gossypii</i> | Bupestriidae | Coleoptera |
| 27 | Spider mite | <i>Tetranychus macfarlanei</i> | Tetranychidae | Acarina |

1. Cotton Jassid

S.N: *Amrasca biguttula biguttula*
(Cicadellidae: Hemiptera)

- **Distribution:** Widely distributed in India and is the most destructive pest of American cotton in the north-western regions.
- **Hot spot is Madhya Pradesh.**
- **Host range:** cotton, okra, potato, brinjal, sunflower, hollyhock, kangi buti (*Abutilon indicus*), etc [JRF 2002]

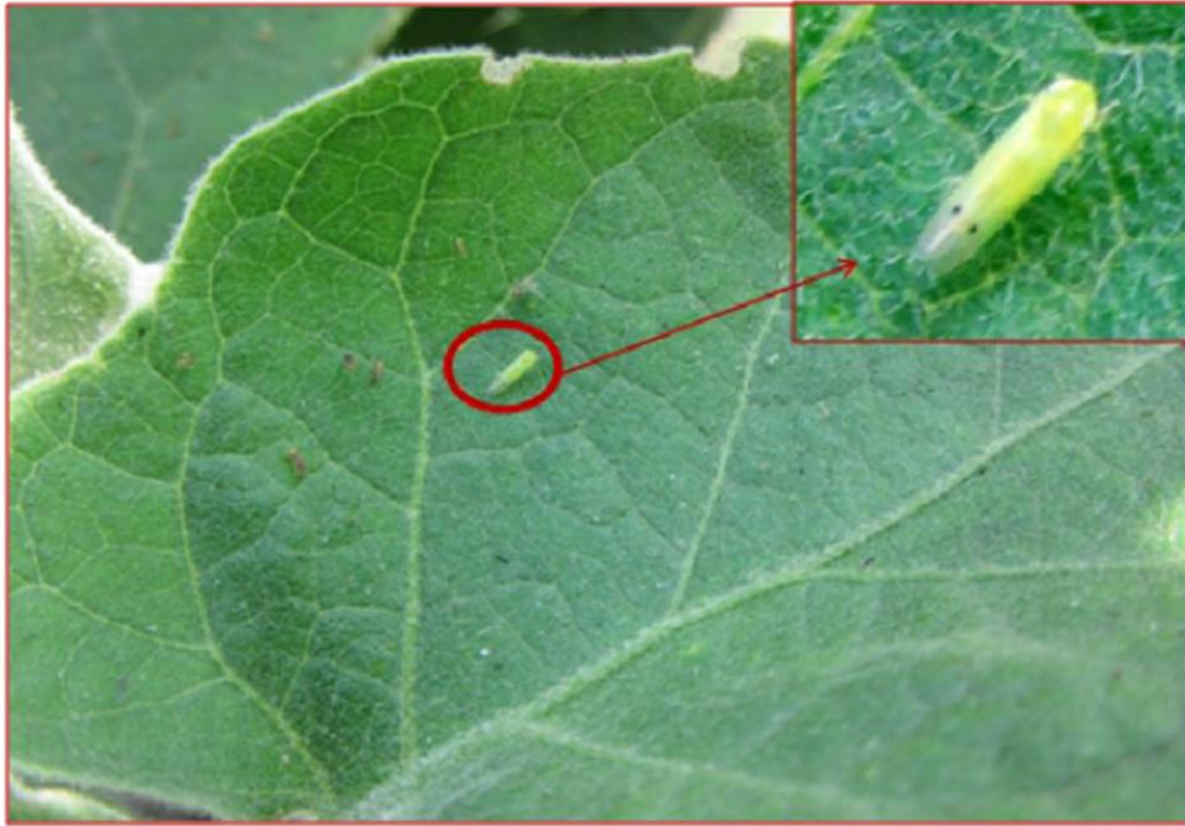


Morphology

- Both adult and nymphs are very agile and move briskly, forward and sideways.
- Adults are greenish yellow during the summer, acquiring a reddish tinge in the winter.
- The winged adults jump or fly away at the slightest disturbances and exhibit phototaxis behavior at night.
- Eggs are yellowish.







Egg



1st



2nd



3rd



Adlut



5th



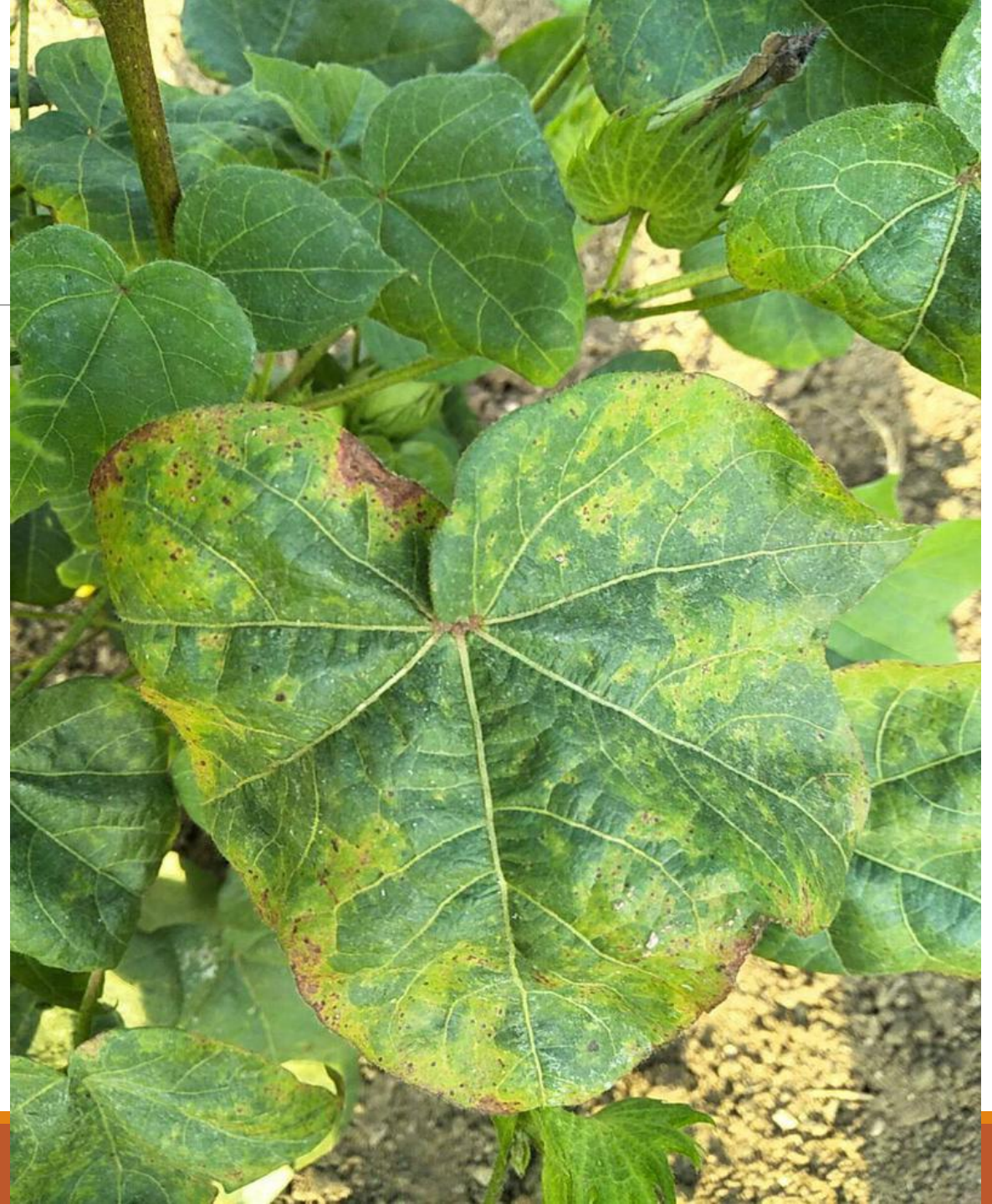
4th

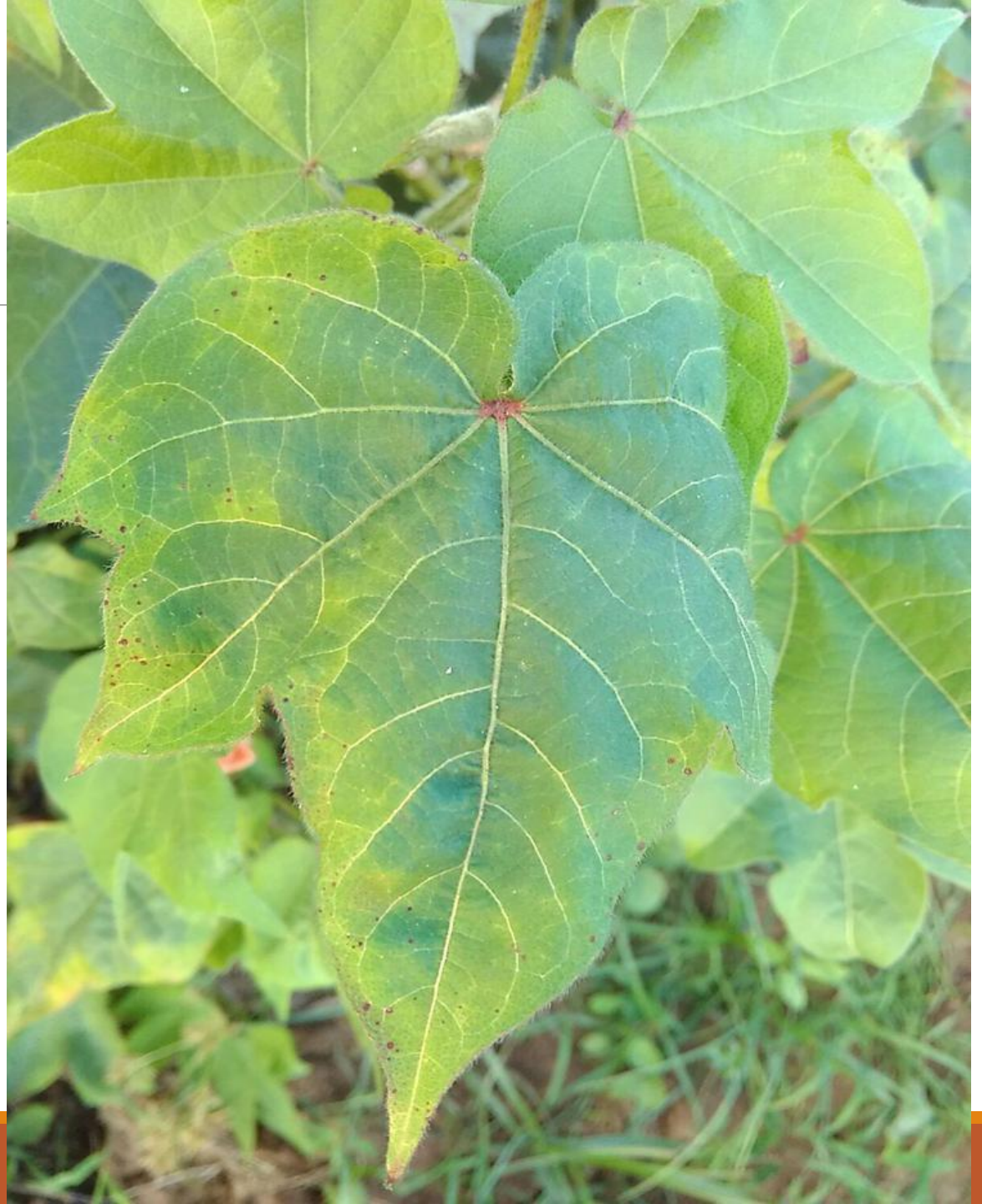
Biology

- The pest breeds practically throughout the year, but during the winter months, only adults are found on plants such as potato, brinjal, tomato etc.
- In spring, they migrate to okra and start breeding.
- **S.O.O. on the underside of the leaves embedding them into the leaf veins.**
- **Egg, nymphal and adult periods are 4-11, 7-21 and 35-42 days respectively.**
- **The pest completes seven generations in a year.**
- **Favorable conditions: positive correlation with temperature, RH & rainfall and negative with sunshine.**

Nature of Damage

- **Both the nymphs and adults suck up the plant sap from the under surface of leaves.**
- **The vigor of the plants is impaired to a great extent.**
- **Injury to plants is due to the loss of sap and probably also due to the injection of toxins.**
- **The attacked leaves turn pale and then rust-red.**
- **With change in appearance, the leaves also turn downwards, dry up and fall to the ground.**
- **The leaves show symptoms of 'hopper burn' such as yellowing, curling, bronzing and sometimes drying up, and these symptoms are expressed differently depending on how the different varieties reacts to the toxic saliva of the insect.**
- **Early infestation stunts the plants.**
- **Owing to the loss of plant vitality, the cotton bolls also drop off, causing up to 35 per cent reduction in yield.**





Management

- *Chrysoperla sp.* and spiders like *Distina albida L.* feed on nymphs and adults.
- No other parasitoids are known for this insect.
- ETL is 1-2 nymphs/leaf up to 50 days age of crops.
- Spray at economic threshold level of 1-2 nymphs per leaf or
- when second grade injury symptoms (yellowing and curling at margins of leaves) appear in 50 per cent of the plants with any one of the following insecticides in 250 liters of water per ha.
- 100 ml of imidacloprid 200 SL, 100 ml of imidacloprid 555, 100 ml of imidacloprid I7.8 SL, 50 g of acetamiprid 20SP, 100 g thiomethoxam 25WG.
- Seed treatment with imidacloprid 70WS @ 5g/kg seed or thiomethoxam 70WS @3 g/kg seed.

2. Cotton Aphid

S.N: *Aphis gossypii*

(Aphididae: Homoptera)

- **Distribution:** throughout India and is considered as a potential pest of cotton.
- **Host range:** Polyphagous- cotton, okra, brinjal, guava, gingelly, etc.
- **Morphology:** The adults are small soft and greenish-brown insects found in colonies on the tender parts of the plants.
- The adults exist both in winged and wingless forms.

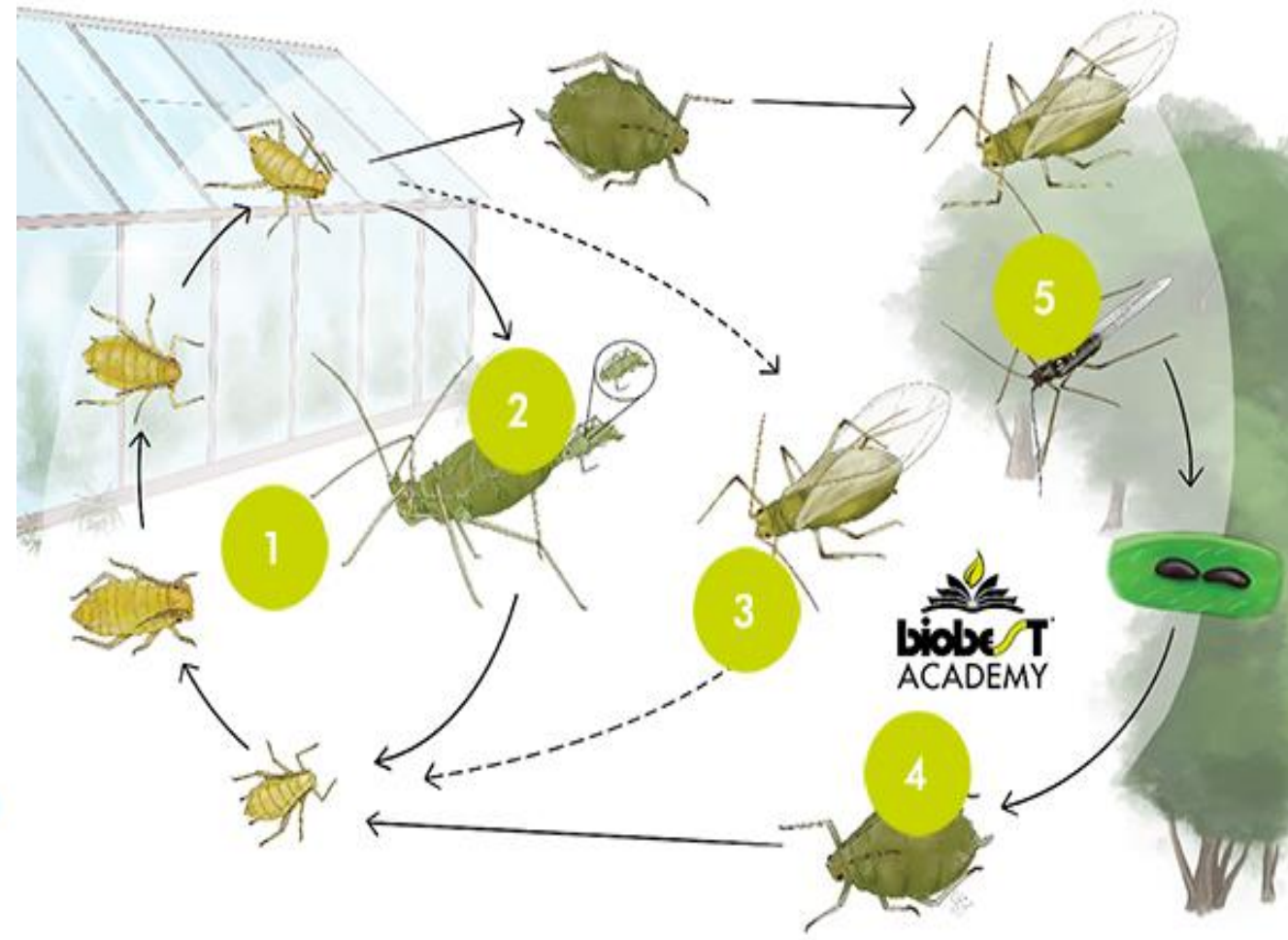
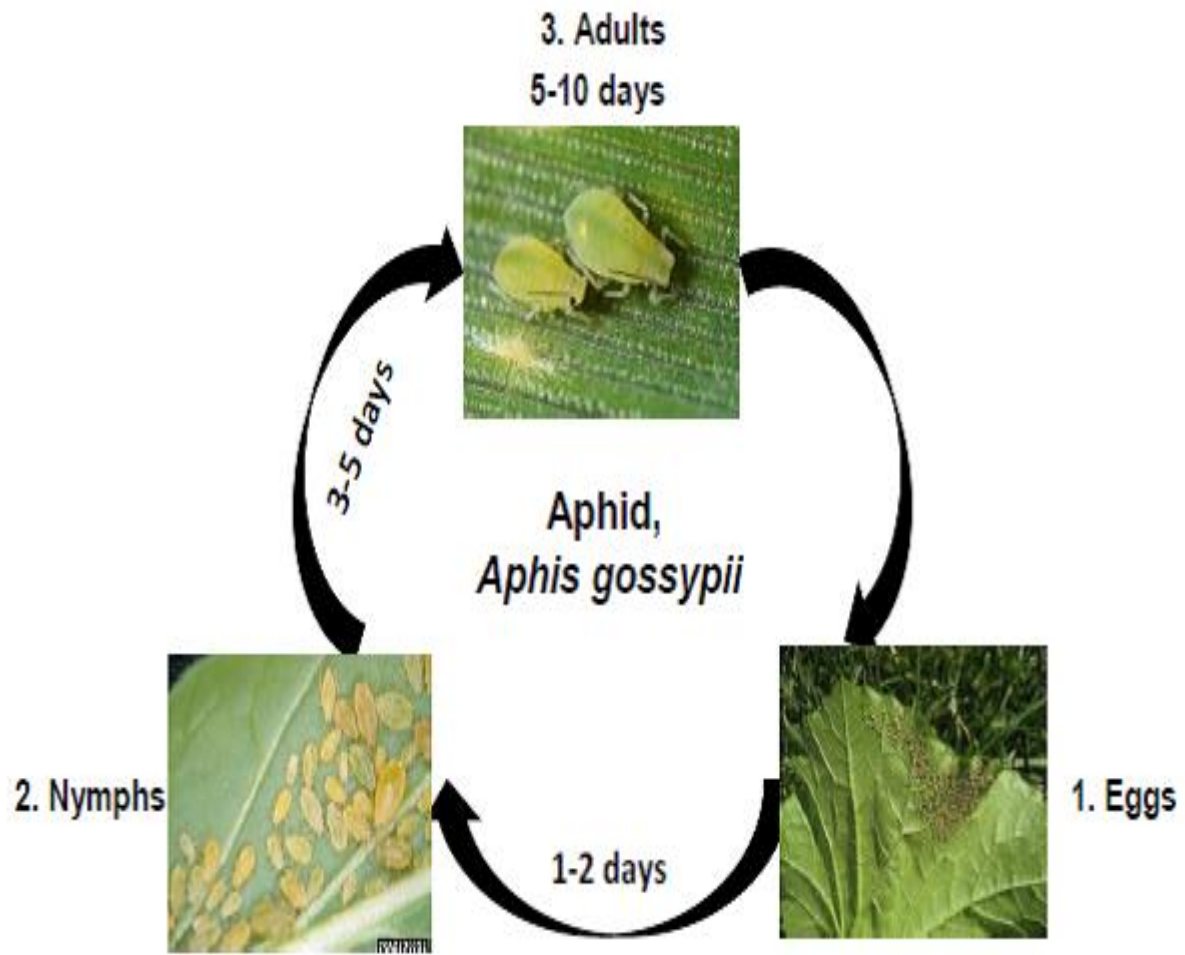






Biology

- **The alate as well as apterous females multiply parthenogenetically and viviparously.**
- **The female may give birth to 8-22 nymphs in a day,**
- **The nymphs moult four times to become adults complete life-cycle in 7-10 days.**
- **Aphids also lay eggs which over winter.**
- **Optimum temperature is 25-30°C.**
- **Low light is favorable whereas strong light reduces longevity.**
- **Heavy rainfall reduces population directly by washing away aphids.**
- **High RH enhances appearance of entomopathogenic fungi (*Neozygites fresenii*, and *Cladospori sp.*)**



Nature of Damage

- The aphids live in colonies on the tender portions of the plants and suck the sap.
- **In case of severe infestation, the plants become weak, leaves curl up. stunted growth, gradual drying and death of the plants.**
- The younger plants are more susceptible than the older ones.
- The honey-dew encourages sooty mould growth on the leaves.
- The dry conditions favour rapid increase in pest population.





Management

- **Release eggs or first instar grubs of *Chrysoperla* at 10,000/ha.**
- ***Coccinella septempunctata* and *Menochilus sexmaculatus*, *Cheilomenes sexmaculata* are the common predators**
- **The aphids are parasitized by *Aphelius mali* and *A. abdominalis*.**
- **The Economic Threshold Level (ETL) is 10% affected plants counted randomly or 15-20% infested plants up to 50 days age of crops**
- **Spray 750 ml of oxydemeton methyl 25EC or 625 ml of dimethoate 30EC in 250 litres of water/ ha.**
- **When honeydew appears on 50% of the plants.**
- **Acetamiprid 20% SP, azadirachtin 0.03% WSP, buprofezin 25% SC, chlorpyrifos 20% EC, deltamethrin 1.8% EC. fenvalerate 20% EC, fipronil 5% SC, imidacloprid 70% WG, 48% FS, 70% WS, 30.5% SC are recommended.**



**The aphids being parasitized by
*Aphelius mali***

3. Cotton Whitefly

S.N: *Bemisia tabaci*
(Aleyrodidae: Hemiptera)

- **Distribution:** throughout the northern and western regions of the Indian Subcontinent.
- A very serious pest of American cotton, particularly in the dry areas.
- Severe in North zones
- Resurgence capability.
- **Host range:** It is highly polyphagous- cotton, brinjal, hollyhock, lady's finger, cabbage, cauliflower, arson toria (*Brassica campestris*), melon, potato, tobacco, safflower, *Achyranthes aspera*, Lab-lab



Morphology

- **The eggs are stalked, sub-elliptical and light yellow at first, turning brown later on.**
- **The louse-like nymphs, are sluggish creatures, clustered together on the under surface of the leaves and their pale-yellow bodies make them stand out against the green background.**
- **In the winged stage, their yellowish bodies are slightly dusted with a white waxy powder.**
- **They have two pairs of pure white wings and have prominent long hind wings**





Biology

- **The insect breeds throughout the year and all the developmental stages are noticed, although adults predominate in cold season.**
- **S.O.O. singly on the underside of the leaves, averaging 119 eggs per female.**
- **They hatch in 3-5 days in April-September, 5-17 days in October-November and 33 days in December – January.**
- **The nymphs, on emergence, look elliptical and soon fix their mouthparts into the plant tissues.**
- **The egg and nymphal periods occupy respectively 3 to 5 and 9 to 14 days during summer and 5 to 33 and 17 to 73 days as winter approaches.**
- **The total life cycle may range from 14 to 107 days depending upon the weather conditions.**





Bemisia eggs

The darker the color the closer they are to hatching.



Bemisia eggs

The darker the color the closer they are to hatching.



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- ***Bemisia* eggs and the crawler stage of the whitefly.**
 - **The immature stages of whiteflies are called many names.**
 - **One term is an instar another term is scale.**
 - **Whiteflies have an egg, 4 instars and adult.**



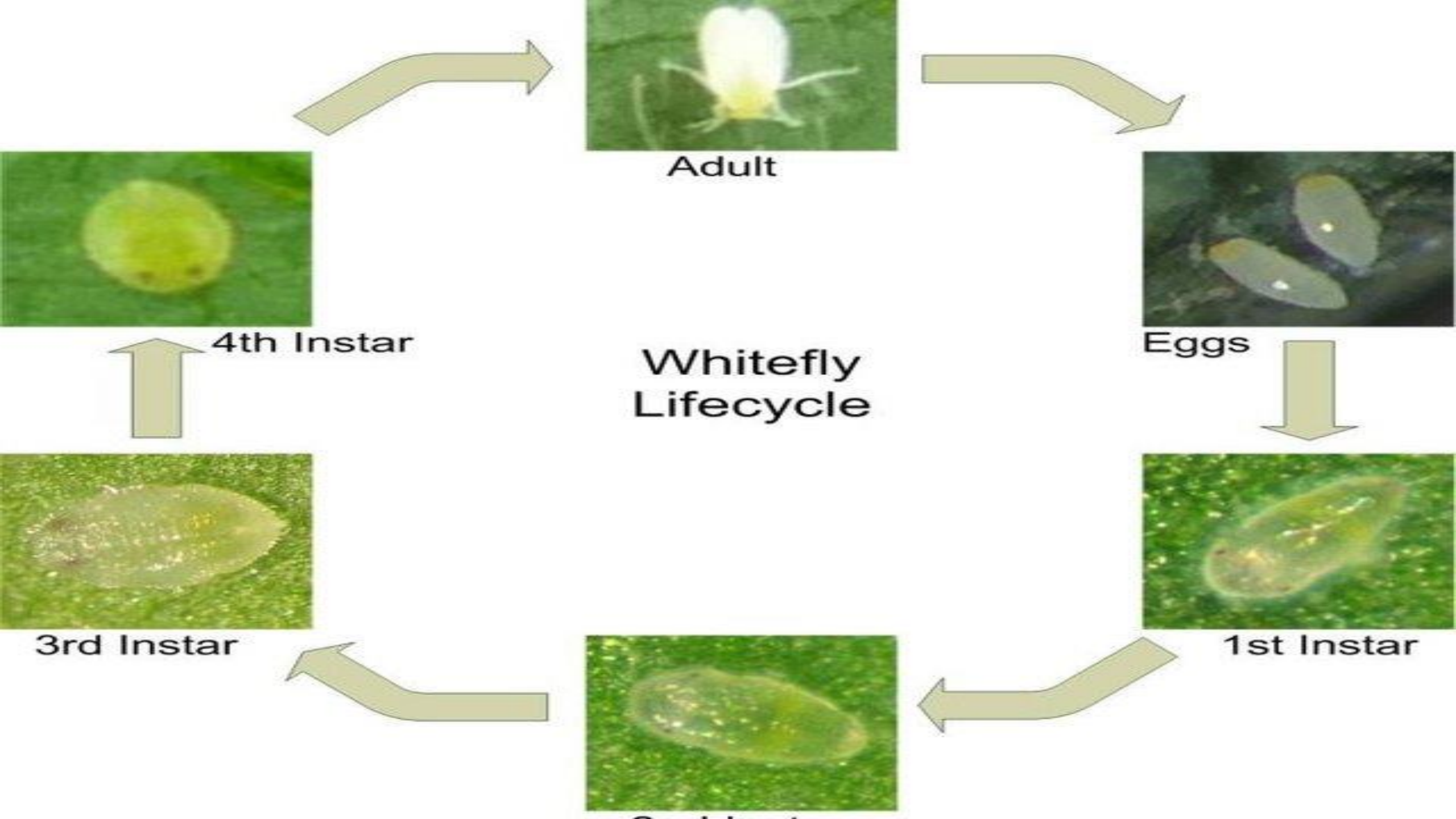
- **A group of 4th instar nymphs**



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- **Pupal stages.**
 - **The very small scales are the first instars or crawler stages.**



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- **A puparium with the adult almost ready to emerge.**
 - **The wings are clearly visible.**



Nature of Damage

- **In cotton the nymphs are found in large numbers on the under surface of leaves and drain the sap.**
- **Due to sucking in cases of severe infestation results in premature defoliation, development of sooty mold on honey dew excreted affecting photosynthesis, and shedding of buds and bolls and bad boll opening.**
- **From a distance, the attacked crop gives a sickly, black appearance.**
- **Consequently, the growth of the plants is adversely affected and when the attack appears late in the season, the yield is lowered considerably.**
- **Transmit a number of viral diseases including the leaf curl disease of tobacco, the vein clearing disease of okra and the leaf-curl of sesame.**
- **Most destructive pest. [IARI PhD 2014, JRF 2002]**



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- **Leaves with sooty mould can be seen from distance**

Management

- *Eretmocerus massii* (Aphelinidae) is associated with nymphs and pupae, and incidence of parasitisation reaches up to 33 per cent while *Encarsia sp.* is responsible for 5- 10 % parasitisation of nymphs and pupae.
- *Chrysoperla sp.* (Chrysopidae) and *Brumus sp.* (Coccinellidae) prey upon nymphs and adults.
- The economic threshold level is 20 nymphs or 8-10 adults/leaf or leaf stickiness due to deposition of honeydew by insects in 50 per cent of plants
- Spray application of acephate 0.075%, profenofos 0.05%, triazophos 0.1 % brings about control of the pest.
- Spray of acetamiprid at 30-40 g a.i./ha or imidacloprid at 25 g a.i./ha or azadirachtin 1500 ppm at 2.5 l/ha or triazophos @ 500g a.i./ha is also suggested.

4. Dusky Cotton Bug

S.N: *Oxycarenus hyalinipennis*
(Lygaeidae: Hemiptera)

- **Distribution:** This is a minor pest of cotton in India and its chief importance lies in the fact that the **adults and nymphs get crushed at the time of ginning, thus staining the lint and lowering the market value of cotton**
- **Host range:** cotton, lady's finger, gogu, *Abutilon indicum*, hollyhock etc.
- **Morphology:** The adults are, dark brown and have dirty white transparent wings.
- The young nymphs have a round abdomen and, as they grow older, they resemble the adults, except for being **smaller and having prominent wing pads instead of wings.**





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Biology

- The insect is active practically throughout the year, but during winter, only adults are found in the unginned cotton.
- The cigar-shaped eggs are laid in the spring on *Hibiscus* and then on okra and finally on cotton during the monsoon (TARI PhD 2002, ARS NET/ PRE 2012)
- Initially, they are whitish turning pale and finally becoming light pink before hatching.
- S.O.O. in the lint of half opened bolls, either singly or in small clusters of 3-18 each.
- The egg stage lasts 5-10 days and the nymphs, on emerging, pass through 7 stages, completing the development in 31-40 days.
- The life cycle lasts 36-50 days and a number of generations are completed in a year.

Life Cycle



Can have 3 to 7 generations in Florida



Adults feed on newly opened bolls and lay eggs



Eggs:
4 to 10 days



5 nymphal stages :
14 days

Image Credits top and clockwise: Linda Russell, Cotton Gin Museum, Texas, Julieta Brambila, USDA-APHIS, Natasha Wright, FDACS-DPI , and Julieta Brambila, USDA-APHIS

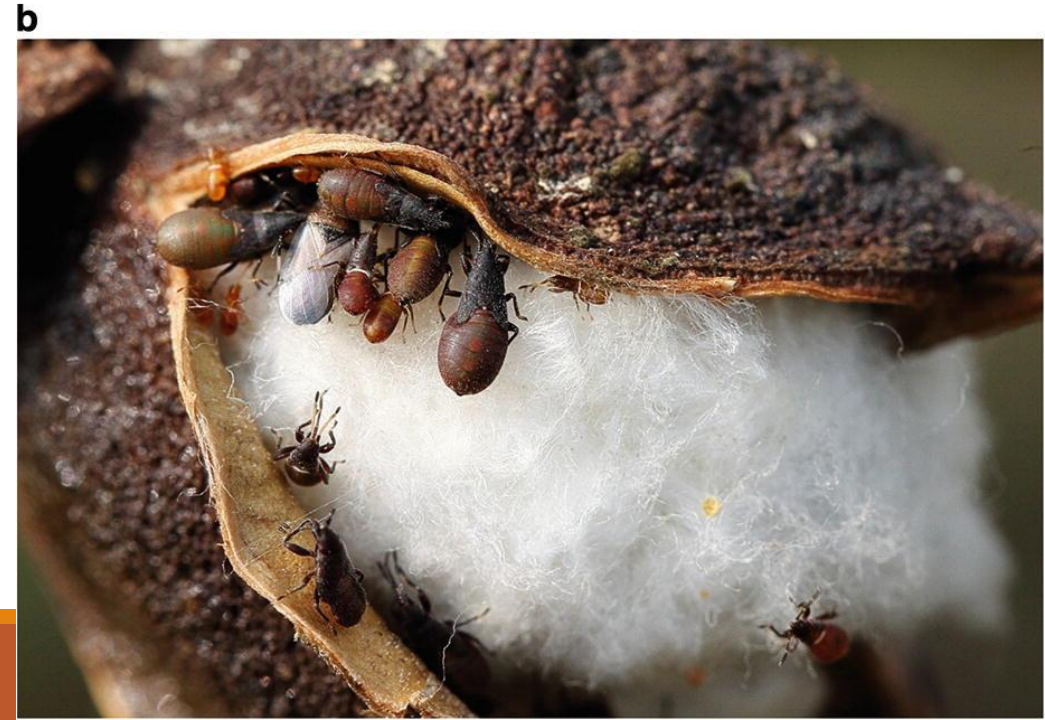


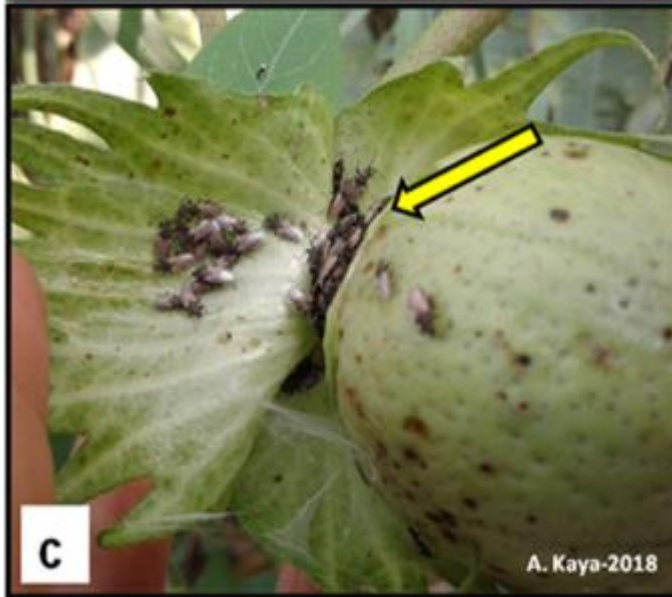
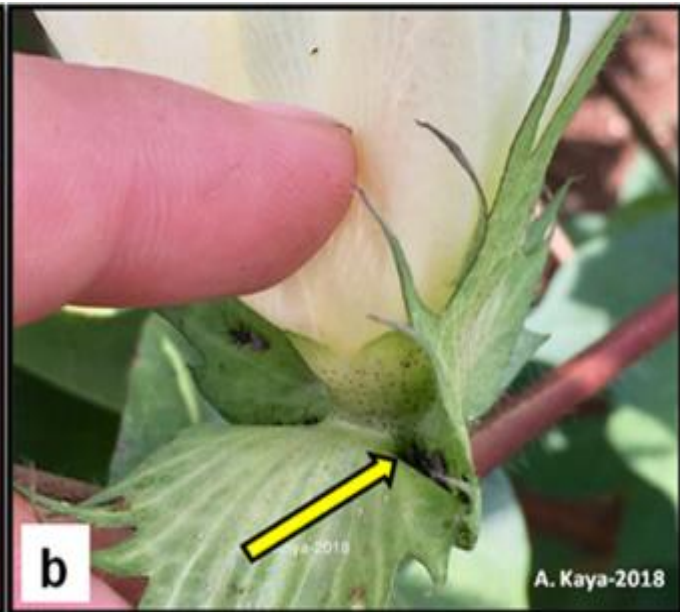
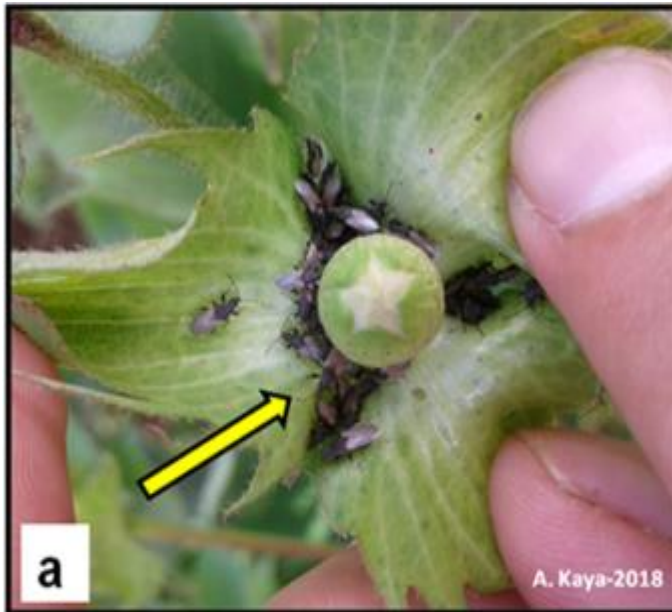
FLORIDA FIRST DETECTOR



Nature of Damage

- **The adults and nymphs suck the sap from developing seeds in open bolls and also stain the lint.**
- **The nymphs and adults suck the sap from immature seeds, whereupon these seeds may not ripen, may lose colour and may remain light in weight.**
- **The adults found in the cotton are crushed in the ginning factories, thus staining the lint and lowering its market value.**
- **Plants are weakened, leaves become pale & fruits gets distorted- lady's finger.**





Management

- ***Triphleps tantilus* (Anthocoridae) feeds on the nymphs of this bug and no other parasitoids are known.**
- **Same as in case of cotton aphid.**

5. Red cotton bug,
S.N: *Dysdercus koenigii*, *Dysdercus cingulatus*
(Pyrrhocoridae: Hemiptera)

- **Distribution:** Widely distributed in India.
- **Host range:** cotton, okra, hollyhock, wheat, maize, pearl-millet, clovers, etc.
- **Morphology:** The eggs are spherical, bright yellow and are laid in clusters or in loose irregular masses.
- The bugs are elongated slender insects. crimson red with white bands across the abdomen.
- The membranous portion of their fore wings, antennae and scutellum is black.



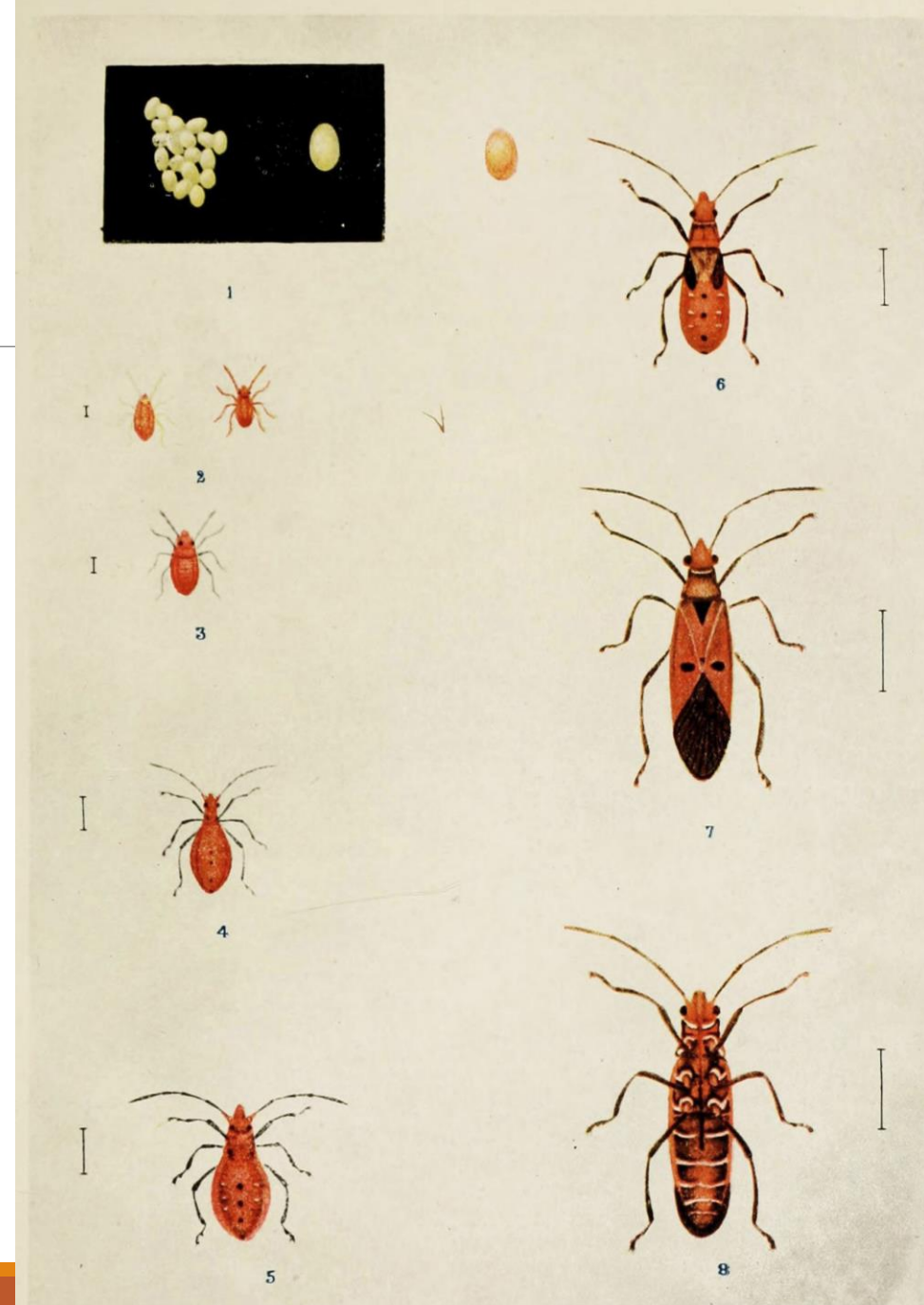






Biology

- This insect is active throughout the year and passes winter in the adult stage.
- In spring, the bug becomes active.
- **S.O.O. in moist soil or in crevices in the ground.**
- Young nymphs have flabby abdomens, but as they grow older, they become slenderer and develop black markings on the body.
- Egg and nymphal periods are 7- and 49-89 days respectively.
- **There are 5 nymphal stages.**
- **In summer, the life of an adult is very variable, but in winter, it may live up to three months.**



RED COTTON BUG.

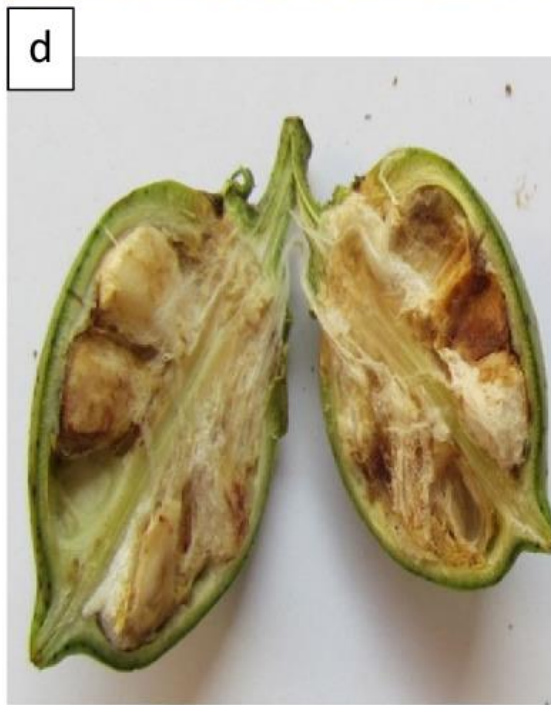
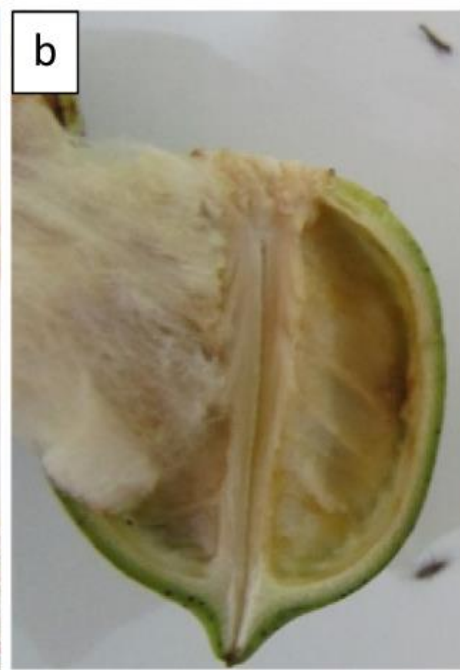
Nature of Damage

- The insects suck cell-sap from leaves and green bolls of cotton.
- Heavily attacked bolls open badly and the lint is of poorer quality
- The seed produced may also have low germination and less oil.
- Moreover, the bugs stain the lint with their excreta or body juices as they are crushed in the ginning factories.
- *Nematospora gossypi* (fungus) enters at the site of injury and stains the cotton fiber [ARS PRE/NET 2014].





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- **The nymphs sucking cell-sap from leaves and green bolls of cotton.**



Management

- The predacious bugs like *Antilochus cocqueberti* (Pyrrhocorid) and *Harpactor costalis* (Reduviidae) feed on nymphs and adults.
- Same as in case of cotton aphid.



6. Cotton Mealybug

S.N: *Phenacoccus solenopsis*

(Pseudococcidae: Hemiptera)

- **Distribution:** Recently emerged as a serious pest of cotton in 2006.
- **Host range:** Cotton, tomatoes, mustard, sorghum and bakain (*Melia azedarach*) trees, congress grass, *Abutilon theophrasti*, *Abutilon indicum*, *Achyranthes aspera*, *Xanthium strumarium* etc..

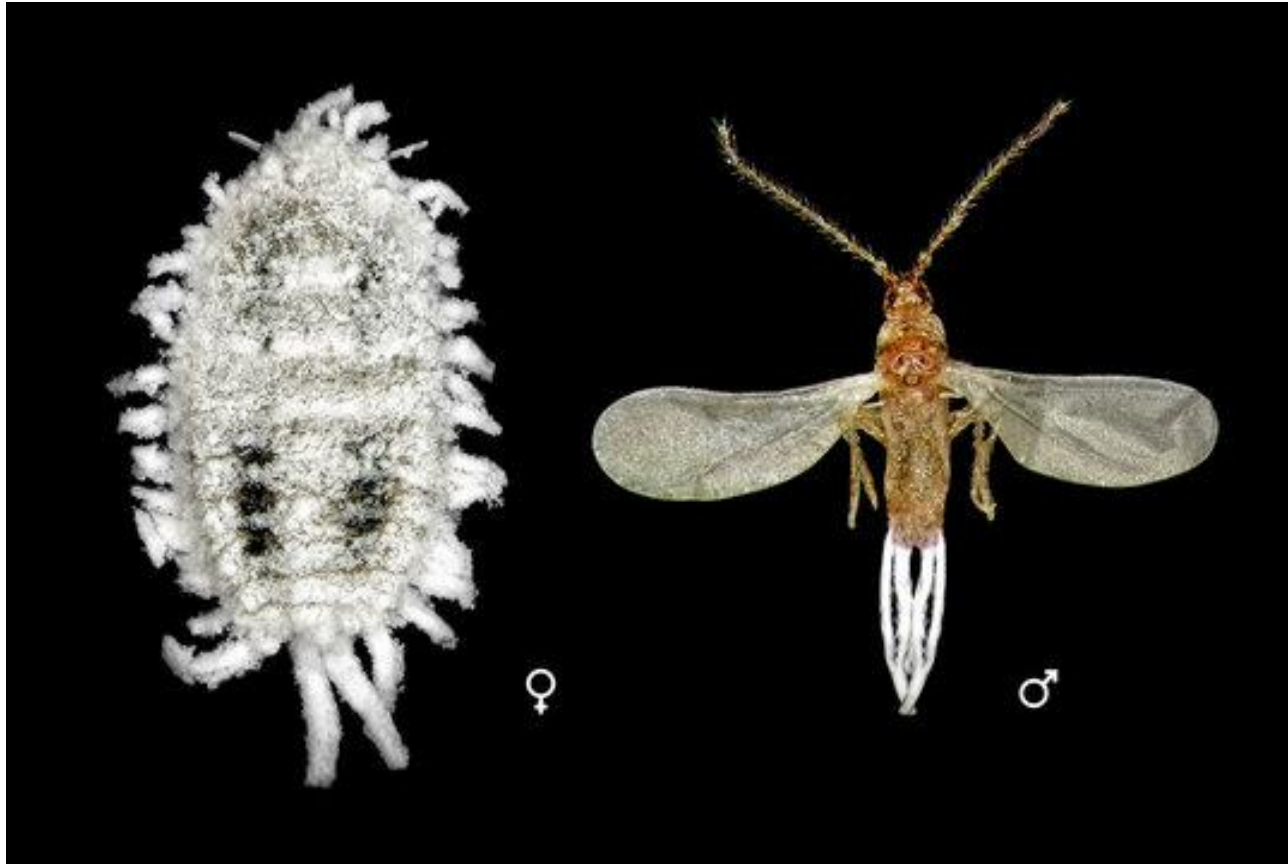


Morphology

- The mealy bug is cottony in appearance, small, oval, soft-bodied covered with white mealy wax.
- The female adults are apterous, however, male adults are having one pair of wings
- Nymphs are pale yellow with reddish eyes, which are later on covered with white powdery mass







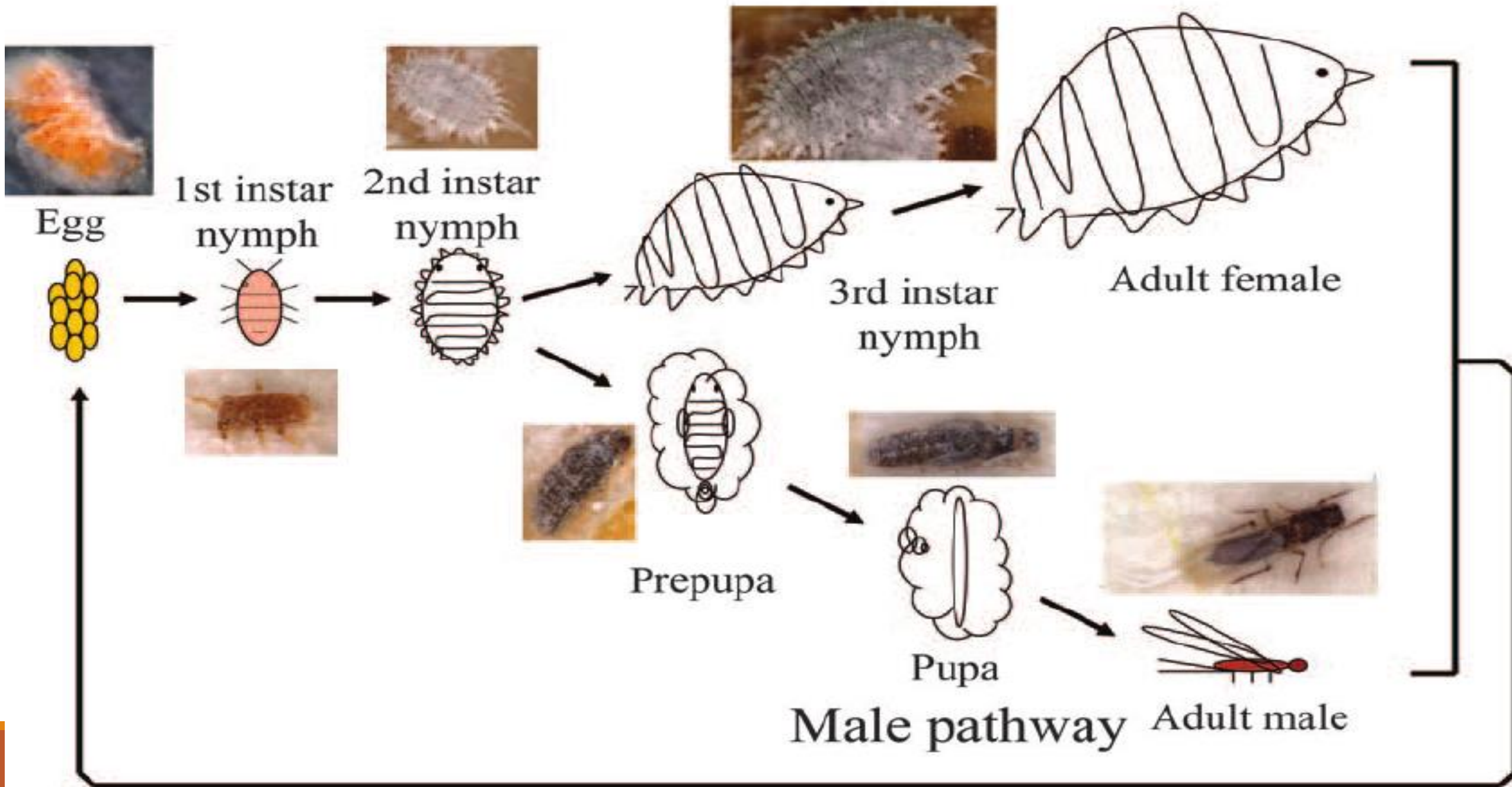
Biology

- **A female oviposits in cotton like ovisac beneath her body.**
- **Reproduction is by ovoviviparity or oviparity.**
- **The newly emerged nymphs (crawlers) crawl out and start feeding on young plants.**
- **They prefer the growing shoot of the plant which is soft and juicy.**
- **Later on, they attack the older lower cotton plant.**
- **Its population increases tremendously and soon a colony is formed.**
- **Mature females are relatively sessile with a large, out pocketing cottony pouch from the posterior end, stuffed with its offspring.**
- **In case of severe infestation, the mealy-bug occurs in the form of clusters with white cottony crawler sacs protruding from the anal region of their body.**

Biology

- Thus, unspecified protective layers are formed due to the overlapping and clinging of one mealybug over another.
- The female mealybugs pass through 4 instars.
- The longevity of adult is 7-14 days.
- **The total life cycle is completed in 25-30 days and here may be 14-15 generations in a year.**
- Males have an additional pupal stage of 5-7 days.
- **The total developmental period is respectively 13-15 days for female and 18-19 days for male.**
- A female may produce 120-800 crawlers and duration of reproduction varies from 10 to 47 days.

Female pathway

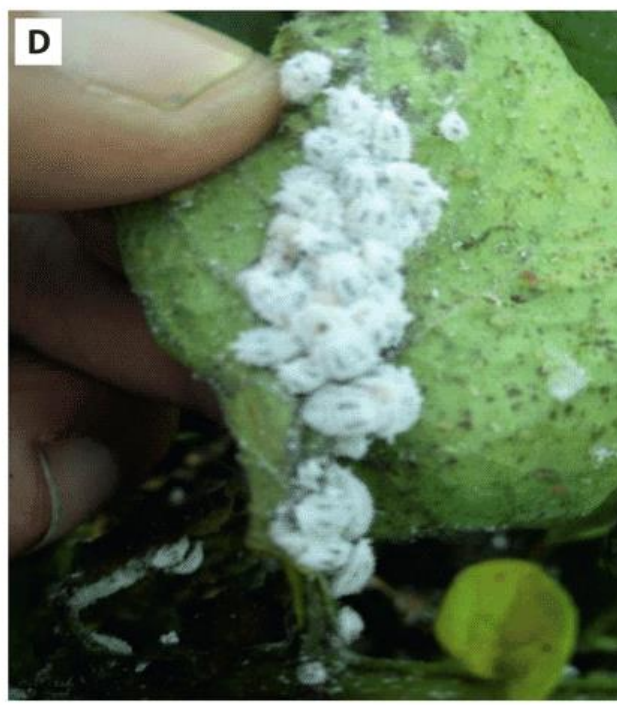


Nature of Damage

- **The mealy-bug first attacks the alternate hosts growing in outer region of the cotton fields and then shifts to the cotton crop.**
- **Both nymphs and adults suck the sap from leaves, lower buds, petioles, twigs, internodes and even from the stem of the cotton plants renders it weak, feeble and dehydrated.**
- **The sooty mould reduces the photosynthetic ability of the plants.**
- **In addition, mealybug also injects toxins into the host tissues.**
- **The flower buds, flowers, immature bolls and even the leaves fall down, and the growth of the plant is retarded.**
- **Plant exhibits die back of growing shoots and twigs, ultimately reducing the yield.**

Nature of Damage

- **In late infestation, plants bear fewer bolls of smaller size and there is incomplete opening of bolls.**
- **In case of severe infestation, the infested plants give the appearance of a field sprayed with a defoliant or herbicide.**
- **White cottony heads appear on the infested plants where intensive infestation of all the stages can be observed.**
- **The yield losses due to the pest were estimated to be up to 50%.**
- **Bt cotton fields heavily infested**





Management

- **Remove regularly the weeds growing adjacent to road sides, pathways, water channels and waste lands to check the spread.**
- **Prepare the land thoroughly so that eggs may be destroyed.**
- **Sufficient quantity of water should be used for spray so as to drench the whole plant.**
- **Soil around the stem must be sprayed.**
- **Use of soap oil or fish oil resin soap twice at an interval of 15-20 days.**
- **Most affected plants should be uprooted and burnt.**
- **This pest mostly spreads in other areas of field during the picking time, therefore, cotton pickers should be guided accordingly.**

Management

- *Aenasius bambawalei*, *Anagyrus kamali*, *Cryptolaemus montrouzieri*, *Chrysoperla zastrowi*, *Lecanicillium (= Verticillium) lecanii* and *Beauveria bassiana* are effective biocontrol agents.
- Destroy the infested host plants along with the pest very carefully, preferably by burning/deep ploughing, but never throw in open water channels.
- Avoid growing cotton near the fields of alternate hosts of mealy-bug.
- Locating of ant colonies and destroy them with drenching of chlorpyrifos 20 EC @ 2.5 ml/l of water or by application of 5% malathion dust @ 25 kg/ha.
- This operation can be carried out round the year
- Mealybugs at initial stage appear in small pockets, therefore, recommended insecticide are applied only in the infested spot, not in the entire crop.

Management

- **Recommended doses of insecticides of carbamate (carbaryl 50 WP @ 2.5 kg/ha or thiodicarb 75 WP @ 625 gm/ha)**
- **organophosphate (profenofos 50 EC @ 1,250 ml/ha, quinalphos 25 EC @ 2,000 ml/ha, acephate 75 SP @ 2,000 gm/ha or chlorpyriphos 25 EC @ 5lt/ha) could be sprayed rotation-wise in consecutive sprays.**

7. Pink bollworm

S.N: *Pectinophora gossypiella*
(Gelechiidae: Lepidoptera)

- **Distribution:** One of the most destructive pests of cotton in the world and is found in all cotton growing areas.
- **It is pest of national importance.**
- **Host range:** cotton, lady's finger, hollyhock, *Thespesia populnea* etc.



Morphology

- Larvae are pink.
- In the adult stage, the insect is a deep brown moth.
- There are black spots on the fore wings, and the margins of the hind wings are deeply fringed.
- The caterpillars, on emergence, are white and turn pink as they grow older.





Biology

- **The yearly life-cycle begins with the emergence of moths in the summer.**
- **The emergence takes place at two distinct times: in May-June and then in July-August.**
- **S.O.O.- singly on the underside of the young leaves, new shoots in between bracts, flower buds and the young green bolls.**
- **Soon after emergence, the larvae enter the flower-buds, the flowers or the bolls.**
- **The holes of entry close down, the larvae continue feeding inside the seed kernels.**
- **S.O.P.- on ground, among fallen leaves, debris, double seeds etc.**
- **Full-grown larvae of the last generation do not, however, pupate.**
- **Just a few of them reach the ground, but the great majority keeps feeding inside the bolls.**
- **They cut window holes in the two adjoining seeds and join them together, forming what are known as the 'Double seeds'.**

Biology

- **Such damaged bolls are generally left unpicked in the field.**
- **Later, they fall to ground and form a major source of infestation for the next year.**
- **Some are picked along with healthy cotton and reach the ginning factories, from where just a few return to the fields along with the seed.**
- **The hibernating larvae lie curled in double seeds for many months and after passing the winter, they emerge as moths (IARI PHD 2000).**
- **The last life-cycle is very long covering 5-10 months, although during the active season, the life cycle is short, taking only 3-4 weeks i.e. both short & long life cycles occurs in North India.**
- **In South India the insect is not known to hibernate in any stage of its development.**



Eggs of PBW on leaves



Neonate larva of PBW



Freshly formed pupa



Late age pupa

Nature of Damage

- **The larva enters the developing boll through the tip portion and the entrance hole gets closed up as the boll matures.**
- **It feeds on the seeds and moves to adjacent locule by making a hole through the septum.**
- **Double seed formation [JRF 2006]**
- **Larvae are found inside flower buds, panicles and the bolls of cotton or the fruits of okra and other allied plants.**
- **Damage is caused in various ways.**
- **There is excessive pre-mature shedding of flower buds and fruiting bodies and those which do mature do not contain good lint.**
- **Among bollworms, this pest is the most serious.**

Nature of Damage

- The damaged seed-cotton gives a lower ginning percentage, lower oil extraction and inferior spinning quality & seeds shows lower germination power.
- It is considered that by controlling the pink and spotted bollworms, the cotton yield can be increased up to 50 per cent.
- **A typical rosette-shaped bloom when examined will contain the larva [ARS PRE/NET 2016]**
- **Further, infested bolls open prematurely and expose it to invasion by saprophytic fungi**
- **The infestation ranges from 40 to 85%.**

Larvae feeds on









Normal flower



Infested flower with rosette bloom

Management

- **The destruction of off-season cotton sprouts, alternative host plants or the burning of plant debris from cotton fields, minimizes the incidence of this pest.**
- **Avoid staggered sowing in an area and take up timely sowings.**
- **Use acid delinted seed only.**
- **Keep the crop free from weeds.**
- **Monitor the pest build up with field scouting and pheromone traps.**
- **Destroy pink boll worm larvae in rosette flowers and also through periodical removal of dropped squares, dried flowers and pre-matured bolls to suppress pest population in the initial stage.**
- **Avoid ratooning or summer cocoon.**
- **Promptly remove and destroy cocoon stubbles to prevent carry over pest to prevent carry over pest to next season.**

Management

- **Restrict the movement of cotton seed from other areas to prevent carry over [JRF 2002].**
- **Need based use of insecticides.**
- **After last picking allow goats, cattle to feed on the plant debris & unopened bolls.**
- **Burn the stained kapas regularly.**
- **Use Pb Rope L (sex pheromone based commercial product) dispenser @ 200ha for the management of pink bollworm (*Pectiphora gossypiella*) by mating disruption technique.**
- **Deep ploughing with a furrow-turning plough by the end of February is also helpful in reducing the carry over of this pest to the next season.**
- **Release of *Trichogramma chilonis* @ 1,50,000/ha starting from 70 day after sowing at weekly interval with a total of 8-10 releases is effective against bollworm.**

Management

- **In case the bollworm damage exceeds 5 per cent, the crop should be sprayed immediately and thereafter at 10-day interval with any of the following insecticides in 315-375 liters of water per ha:**
- **2.0 liters of quinalphos 25EC, 1.25 liters of monocrotophos 36SL, 5.0 liters of chlorpyrifos 20EC, 1.5 liters of triazophos 40EC, 2.0 kg of acephate 75SP, 1.25 liters of profenophos 50EC, 2.5 kg of carbaryl 50WP, 200 ml of cypermethrin 25EC, 400 ml of deltamethrin 2.8EC, 250 ml of fenvalerate 20EC, 250 ml of alphasmethrin 10 EC, 1750 ml of cyfluthrin 0.25SC, 750 ml of fenpropathrin 10 EC. 150 ml of spinosad 48SC, 100 ml of flubendiamide 48SC, 500 ml of indoxacarb 15SC**
- **The attacked parts should be collected and destroyed, and Fumigation of seeds with methyl bromide at 1.5 kg/100 cu. m. for 24 hours or with aluminium phosphide at 18 tablets/ 100 cu. m. or heat treatment for a few minutes at 60°C kills hibernating larvae in seeds.**

8. Spotted Bollworms

S.N: *Earias insulana* and *E. vittella*
(Noctuidae: Lepidoptera)



- **Distribution:** widely distributed in India and are serious pests of cotton.
- **Host range:** American cotton, okra, sonchal (*Malva parviflora*), gulkhaira (*Althaea officinalis*), hollyhock (*Althaea rosea*) and some other malvaceous plants, *Hibiscus cannabinus*, sunhemp etc.



Morphology

- **Adult of *E. vitella* has pale whitish forewings with a broad greenish band in the middle while *E. insulana* has completely green forewings.**
- **The egg is crown shaped, sculptured and deep sky blue in colour.**
- **The larva of *E. vittella* is brownish with a longitudinal white stripe on the dorsal side and without finger- shaped processes on its cream coloured body and orange dots on prothorax [ARS PRE/ NET 2015].**
- **The larvae of *E. insulana* is cream coloured body with orange dots on prothorax and with finger like projection**
- **The boat shaped tough silken cocoon is dirty white brownish.**



E. vittella and *E. insulana*



D. Martiré

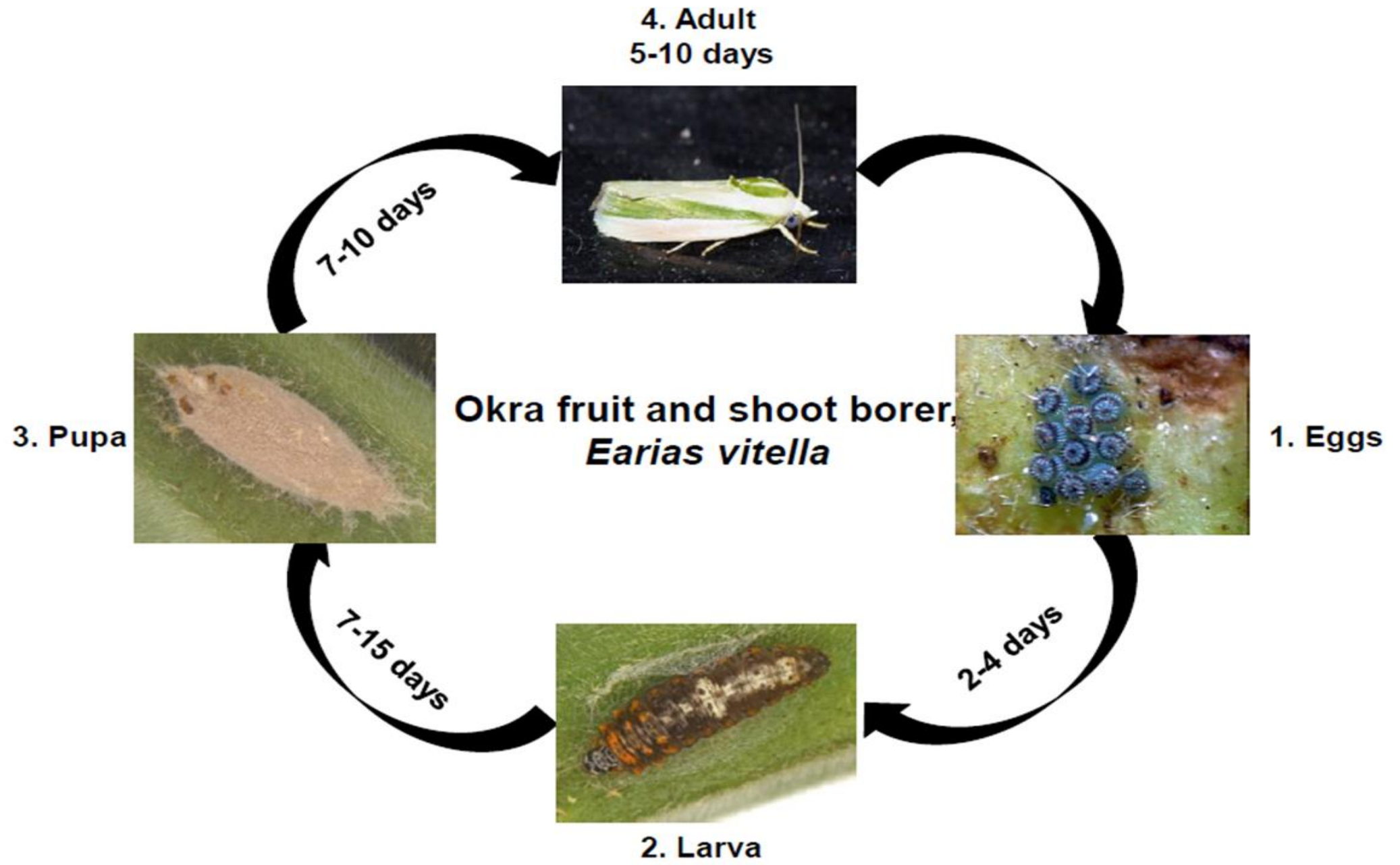


E. vittella and *E. insulana*



Biology

- **The pests breed practically throughout the year but during the winter only the pupae are found hiding in plant debris. The moths that appear in April.**
- **S.O.O. singly on flower buds, brackets and tender leaves of okra or cotton plants during night.**
- **The hairy & tender parts of the plants are preferred for oviposition.**
- **The caterpillars pass through 6 stages.**
- **S.O.P. either on the plants or on the ground among fallen leaves.**
- **The egg, larval, pupal and adult periods are 3-4, 10-16, 4-9 and 8-22 days respectively.**
- **The life cycle is completed in 17-29 days during the summer. Several overlapping generations in a year.**
- **The roots of cotton plants sprouting in early spring and the fruits of neglected okra left in the field, are the two important sources of early infestation and multiplication of this pest.**
- **Drier weather is favorable**



Nature of Damage

- **When cotton plants are young, the larvae bore into the terminal portions of the shoots, which wither away and dry up.**
- **Later on, they cause 30-40 per cent shedding of the fruiting bodies.**
- **The infested bolls open prematurely and produce poor lint, resulting in lower market value.**
- **Larvae feed on the inner contents of bolls.**
- **The initial infestation generally takes place on 6 week old crop in which the larva causes drooping and drying of the shoot due to its feeding by boring into it.**



Nature of Damage

- In the later stages of the crop the buds, flowers and bolls are damaged and a larva may migrate and attack fresh parts.
- Heavy shedding of early formed flower buds due to the pest is a common feature in cotton fields.
- The lint from attacked bolls will not-be clean.
- In south India *E vitella* is found in large numbers on cotton crop than the other species
- Shedding of squares and flaring of bracts [ARS PRE/NET 2014] [JRF 2002, 2011]



Infested boll

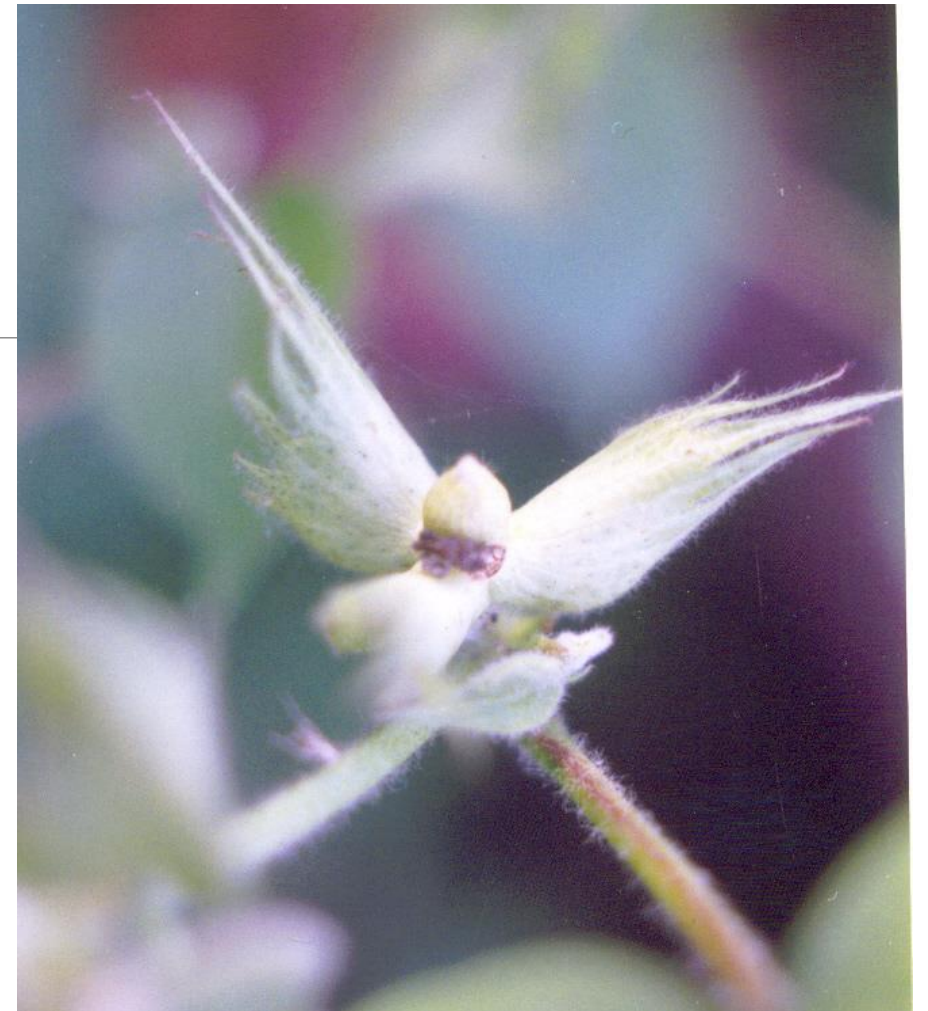
Nature of Damage

- **Infested bolls often infected by fungi which cause rotting & dry up without opening.**
- **Bolls with bore holes plugged with excreta.**





Infested leaves



Flared up square



**Spiny bollworm (*Earias insulana*)
caterpillar and damage to cotton
boll**

Management

- **Monitoring: 1 male moth/m²/trap for 3 consecutive nights may be predicted that egg laying occurs in 3-5 days.**
- **The pest can be suppressed with clean cultivation and the destruction of alternative food plants, particularly when cotton or okra is not growing in that locality.**
- **The infested shoots as well as shed buds and bolls should be collected and destroyed.**
- **Chemical measures are same as in case of pink bollworm.**
- **The economic threshold level is 10 per cent incidence in shoots or reproductive parts.**
- **ETL in central India is- 5% boll damage [JRF 2006]**
- **To reduce the damage in cotton, bhendi is used as trap crop. [ARS 2005]**
- **Conserve natural enemies: egg- *Trichogramma evanescens*, larvae- *Bracon lefroyi* and pupae- *Chelonus rufus*.**

Management

- **Periodical spray applications with insecticides like.**
- **carbaryl 50 wP at 2.5 to 3.0 kg/ha or monocrotophos 36 SL at 1.0 to 1.25 litres/ha or thiodicarb 75 WP at 625 g/ha are effective.**
- **Synthetic pyrethroids like deltamethrin at 12.5 to 15g ai. /ha, cypermethrin at 80 g a.i./ha, and fenvalerate at 100-150 g a.i./ha are also effective.**
- **Organophosphorus compounds like acephate, triazophos are also effective.**
- **Other products found effective are: cyfluthrin 2.5 EC (12.5 to 18.0 g a.i/ha), indoxacarb, 14.5 EC (50-100 g a.i/ha), flufenoxuron 10 OS (75-100 g a.i. ha), novaluron 10 EC (75-100 g a.i/ha) and spinosad 48 EC (75-100 g aiJha) and the combinations cypermethrin 50 g+ chlorpyrifos 500 g/litre, cypermethrin 30 gt quinalphos 200 g/litre, alphamethrin 10 g+ chlorpyrifos 160 g/litre, and deltamethrin 10 g + triazophos 450 glitre have also been found effective.**

9. American Bollworm

S.N: *Helicoverpa armigera*

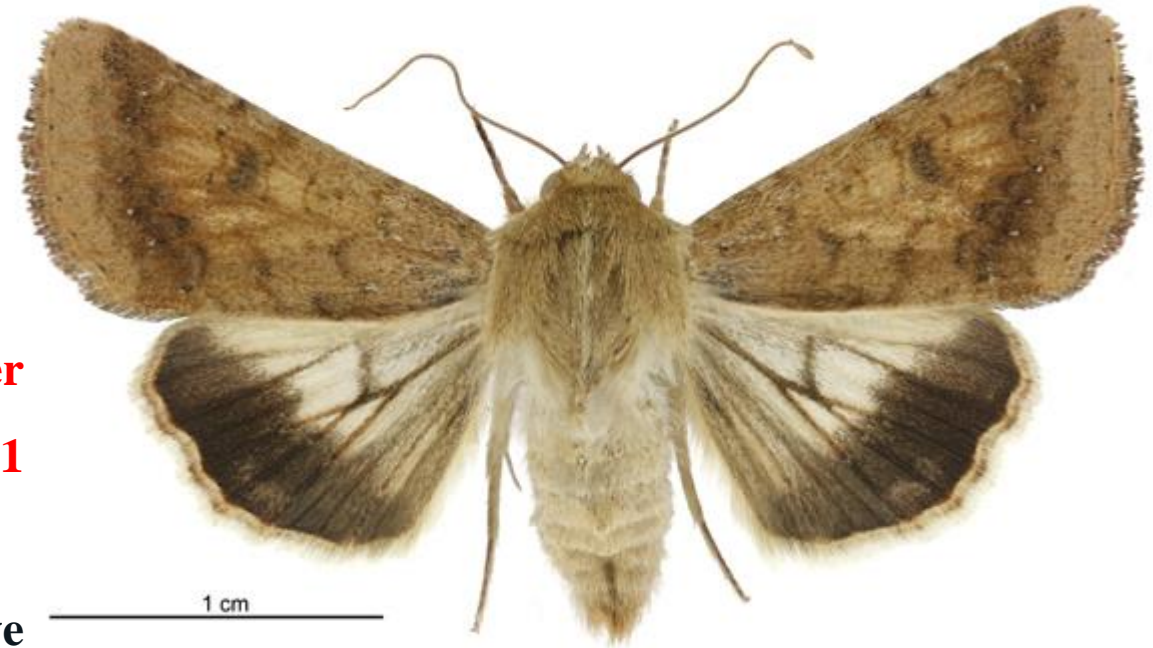
(Noctuidae: Lepidoptera)

- **Distribution:** It was first reported on cotton in 1977 in Punjab.
- In 1983, it appeared in serious form in northern cotton growing belt and reduced yield by 40-50 per cent.
- Again in 1900, it caused severe losses to cotton in Haryana, Punjab and Rajasthan thus becoming pest of National importance.
- The incidence of this pest has decreased after the introduction of Bt cotton.
- **The economic threshold is 10 per cent incidence in reproductive parts.**
- Favorable conditions are more frequent rains from April-June, lowering of mean temperature, more cloudy days & increase in RH: high nutrient status, close spacing & over use of synthetic pyrethroids



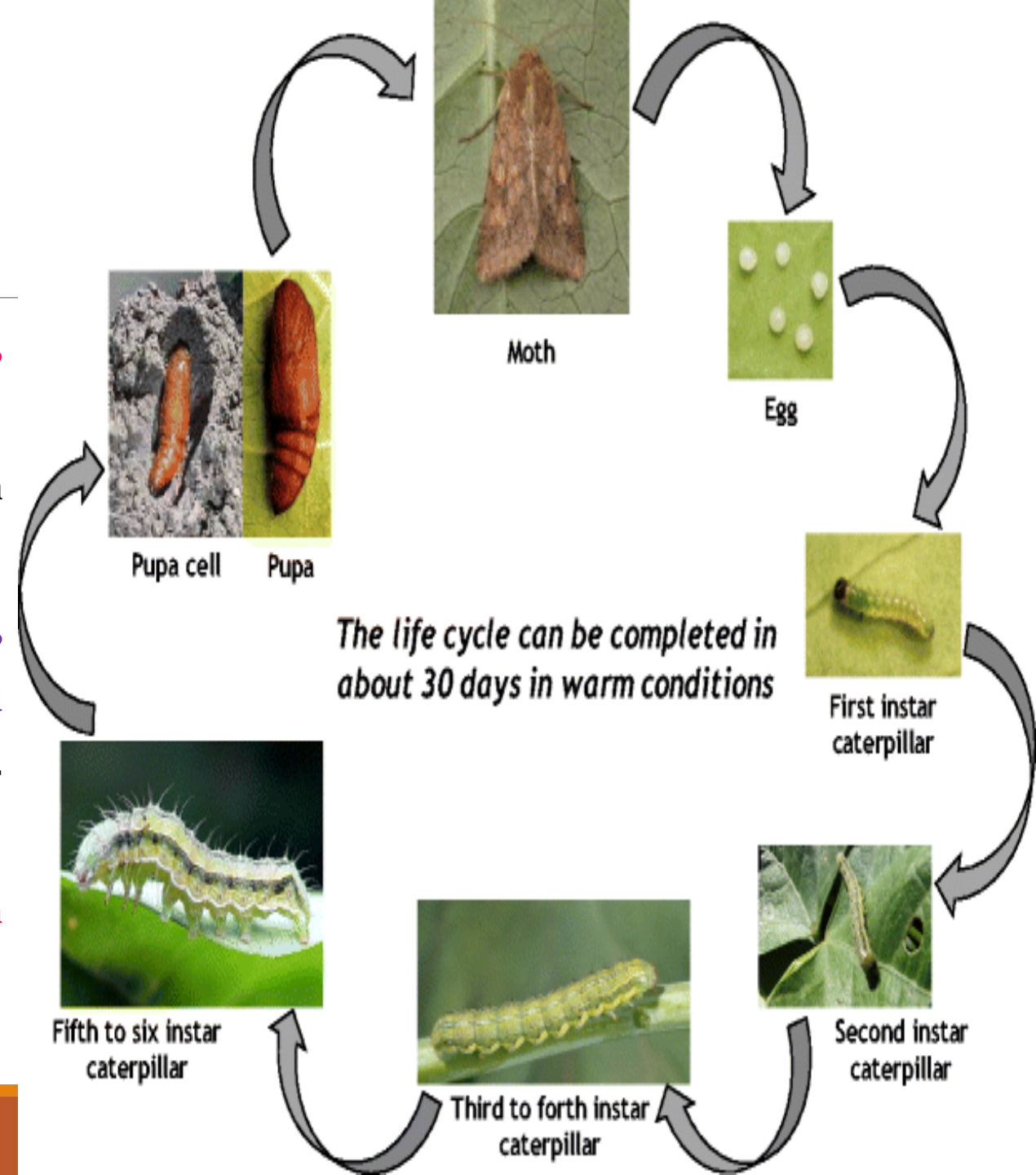
Morphology

- **It is a polyphagous pest and it has got large number of alternate hosts i.e. 96 species of crops and 61 species of weeds.**
- **It will keep multiplying and will be always above ETL**
- **Damage- 40-65% of damage to cotton plant**
- **Adults are medium sized, light brown coloured moths**
- **Fore wings-** are light brown with a prominent black spots on the wing
- **Hind wings-** are grey coloured with broad black patch along apical margin



Biology

- **Eggs-** are laid singly on tender leaves, shoots, squares, flower buds, bracts, bolls. I.P – 3-4 days.
- Larva passes 5-6 instars, measures 3.5 to 4.0 cm in length, variously coloured.
- Different colour morphs, pale green, dark green, pale brown, dark brown and can be recognized by a yellowish line on either side of the body. L.P- 30-40 days.
- **Pupa-** Pupation takes place in soil in an earthen cocoon P.P- 9-12 days.
- Overlapping generations are common.



Nature of damage

- **Squares. buds, flowers & young bolls are pierced & shed to the ground.**
- **The older bolls are perforated and contents partially eaten resulting in rotting,**
- **The growing points are damaged by young larvae. In severe attack leaves are eaten up.**
- **Larva habit of putting of head and thorax inside the boll and remaining body outside with this habit it has potentiality of destroying more bolls than what it feeds.**
- **Entry hole wont be plugged with excreta (large entry holes) a single larva can damage more of bolls.**





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Management

- **Monitoring: 2 male moths/ night trap for 3 consecutive nights may be predicted that egg laying in the next 5-8 days**
- **Avoid the cultivation of okra, moong, arhar, dhaincha and castor in and around cotton crop or any other alternate host.**
- **Avoid growing American cotton in orchards.**
- **Entomopathogenic fungi such as *Metarhizium anisopliae*, *Beauveria bassiana* and *Nomurea rileyi* can be used.**
- **Observe the incidence of bollworms by using respective pheromone at 5 traps/ha (Helilure).**
- **Release the egg parasitoid *Trichogramma chilonis* immediately after the appearance of bollworm eggs or when moth activity is observed, at 1,50,000 per hectare/week**
- **ETL- 1 egg/plant or 1 larva/plant or 5-10% damaged fruiting structures or 3 flared up squares/ plant at 65-110 days age of the crop.**

Management

- **Acephate 75%SP**
- **alphacyprmethrin 10 SC,**
- **acetamiprid 20 SP,**
- **alpha cypermethrin 10 EC,**
- **azadirachtin 0.1 5% EC, 0.3% EC, 0.03% EC,**
- **B.t.k. 5% WP,**
- **Beta cyfluthrin 2.45%SC,**
- **Beauveria bassiana 1.15% WP,**
- **bifenthrin 10%EC,**
- **chlorantraniliprole 18.5%SC,**
- **Chlorpyrifos 20%EC & 50%EC,**
- **diflubenzuron 25% WP.**
- **emamectin benzoate 5%SG,**
- **fipronil 5%SC.**
- **flubendiamide 39.35%SC,**
- **fluvalinate 25%EC,**
- **indoxacarb 14.5% SC, & 15.8%EC.**
- **novaluron 10 % EC,**
- **NPV of H.a. 0.43%AS,**
- **spinosad 45%SC,**
- **acephate 25% + fenvalerate 30 %EC,**
- **Acephate 0% + imidacloprid 1.8%SP**

10. Cotton Leaf-roller

S.N: *Haritalodes (Sylepta) derogata*
(Pyralidae: Lepidoptera)

- **Distribution:** In all the Cotton growing tracts and is an important **sporadic pest**.
- **Host range:** cotton, okra, gulkhaira (*Althaea officinalis*), kanghi buti (*Abutilon indicum*) and some forest trees.
- **American cotton is preferred over desi cotton.**
- **Morphology:** The egg is smooth, flat and pale white.
- Full grown larvae are greenish grey or pink and are usually found feeding inside the rolled leaves.
- **Moths are yellowish-white, with black spots on the head and the thorax.**
- **Adults have a series of brown wavy lines on the wings.**





Biology

- **The leaf-roller is active from March to October and passes the winter as a full grown caterpillar among plant debris or in the soil.**
- **The hibernating larvae pupate by the end of February and the moths emerge during March.**
- **The moths are active at night, then they mate.**
- **S.O.O. singly on the underside of the leaves.**
- **The young caterpillars feed first on the lower surface of the leaves.**
- **The older larvae roll leaves from the edges inwards up to the midrib and feed on leaf tissues from the inside.**
- **The larvae grow through seven stages.**
- **S.O.P. either on the plant, inside the rolled leaves or among plant debris in the soil.**
- **The egg, larval and pupal periods are 2-6, 15-35 and 6-12 days respectively.**

Biology

- The life-cycle is completed in 23-53 days and the pest passes through 5 or 6 generations.
- From March to June, the infestation develops mostly in thick plantations of forest trees but during the monsoon, it spreads to nearby fields of American cotton.

















Nature of Damage

- **The leaves are rolled by the larvae which feed on green matter by scraping.**
- **Only one larva is seen in each leaf roll.**
- **The larvae feed on cotton leaves and in years of serious outbreaks, the cotton plants may be completely defoliated.**



Management

- *** Same as in case of pink bollworm**
- **ETL- 10% or more plants with rolls at 25-60 days age of the crop.**
- **Spray application of phosalone 0.05% or methyl parathion 0.025% manage the pest.**

11. Cotton Semi-looper

S.N: *Tarache notabilis*
(Noctuidae: Lepidoptera)

- **Distribution:** Minor pest of cotton,
- **Host range:** cotton, sonchal (*Malva parviflora*), brinjal, etc.
- The full-grown caterpillars are dark green, having six pairs of black and bright-yellow spots on the back.
- As they bend the body, forming half loops and hence the name semi-looper.
- **Adults are stoutly built, white moths, with prominent grey and brown spots on the wings.**





Biology

- The pest is active from April to October and passes the winter as a hibernating pupa.
- The moths appear in March-April and are active at night.
- **S.O.O. singly. on the underside of leaves.**
- The eggs hatch in 2-4 days and the caterpillars immediately start feeding voraciously.
- **They are full-fed in 9-16 days and then descend to the ground, where they construct earthen cells at a depth of 3cm for pupation.**
- They emerge as moths in 5-14 days and are short-lived.
- The life-cycle is completed in 16-34 days.
- **By October- November, they complete 4-5 generations.**

Damage and Management

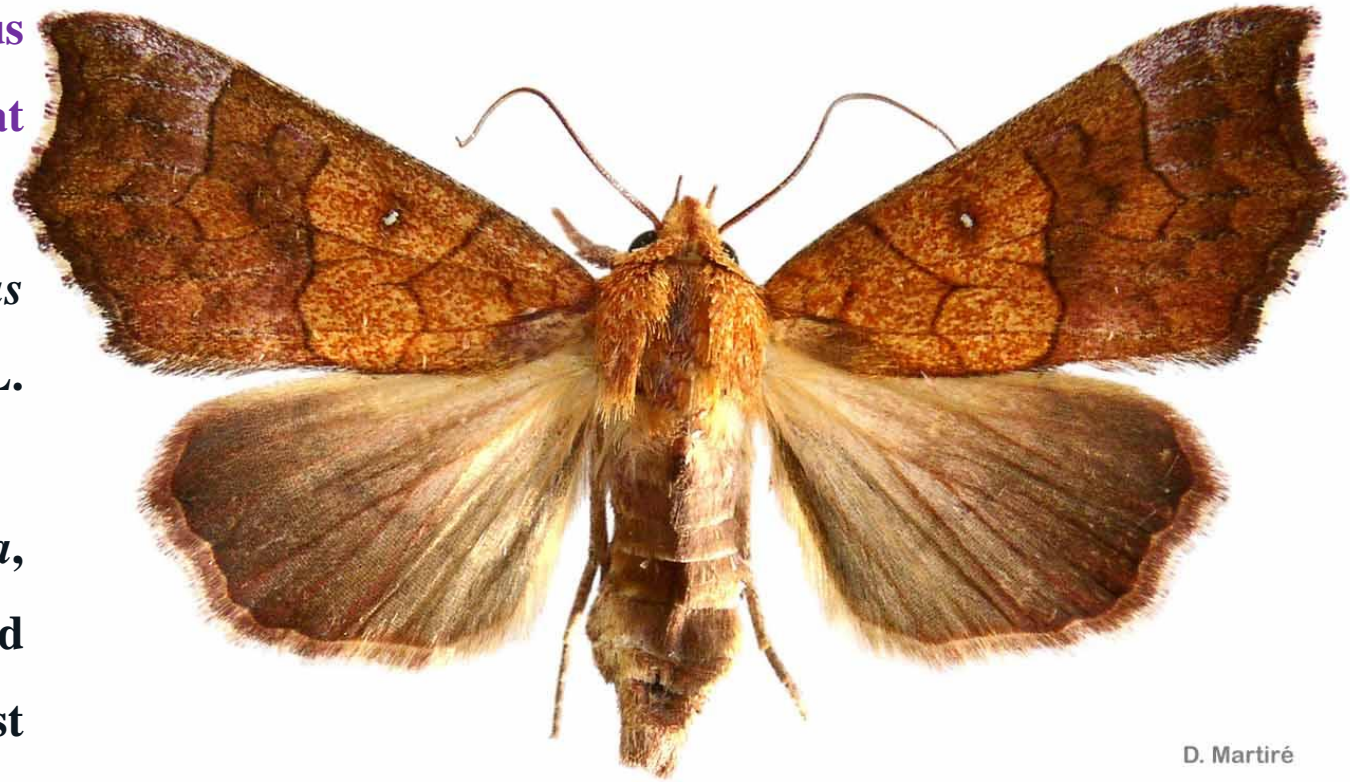
- **The caterpillars feed on leaves and skeletonize them heavily.**
- **Ploughing the fields soon after cotton harvest or by rotating cotton with clovers reduces incidence.**
- **Chemical control measures are same as in case of pink bollworm.**



12. Green semi-looper

S.N: *Anomis flava*
(Noctuidae: Lepidoptera)

- **Distribution:** In India, it is a sporadic pest of cotton and sometimes causes a serious damage to the crop particularly in Gujarat and Rajasthan.
- **Host range:** cotton, okra, *Hibiscus cannabinus*, and *Phaseolus radiatus* L. among the cultivated plants.
- *Hibiscus rosasinensis*, *Sida cardifolia*, *Althaea rosea*, *Bombyx malabaricum* and *Malachra capitata* L. among the forest trees.



Morphology

- **The full-grown larva is pale-yellowish green with five white lines arranged longitudinally on the dorsal surface.**
- **The adult is an attractive, small moth with reddish brown fore wings traversed by two darker zig-zag bands.**
- **The hind wings are pale brown.**



MINDEN
PICTURES



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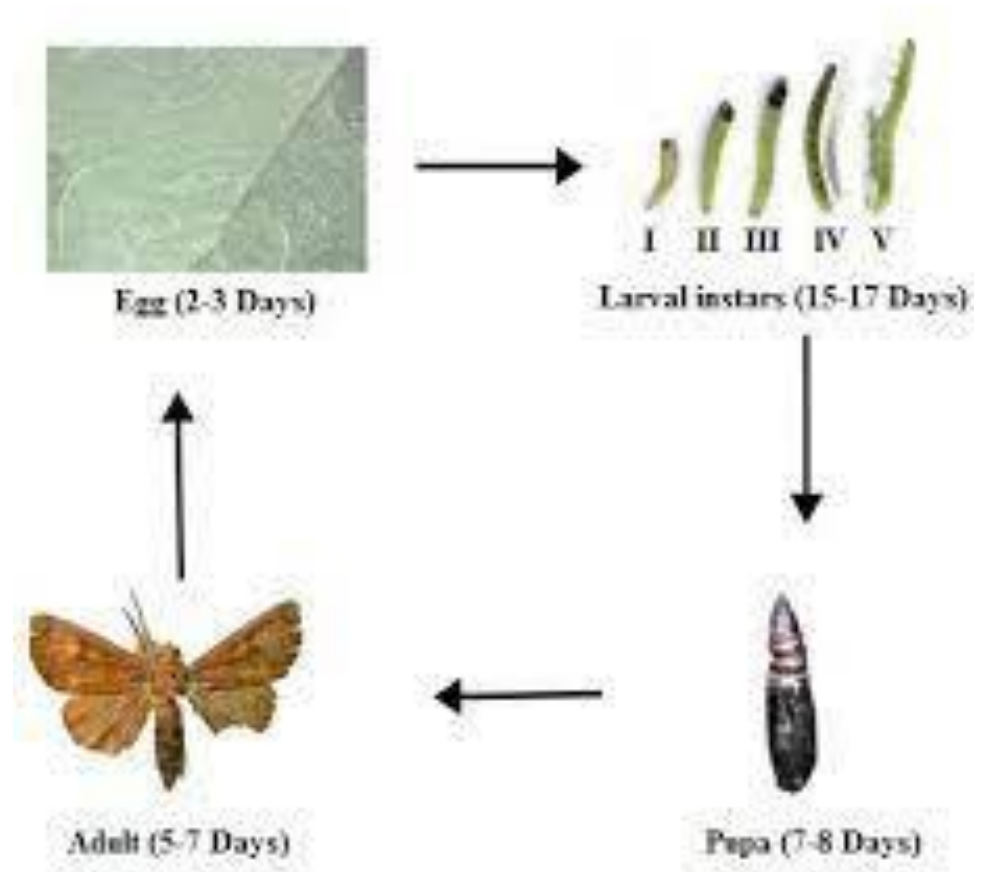
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Biology

- The emergence of moths coincides with the warming up of the season.
- **S.O.O. on leaves.**
- The larvae which move around with a characteristic semi-loop crawl and feed on leaves.
- They complete development by passing through 5 instars.
- **S.O.P. either within the leaf folds or among debris in the soil.**
- The lifecycle is completed in 4-6 weeks.
- More than one generation is completed in a crop season.



Damage and Management

- **The young larvae feed on leaf lamina making small punctures.**
- **The grown-up larvae feed voraciously on the entire leaves, leaving only the main veins.**
- **The caterpillars also eat the tender shoots, buds and bolls**

- **Same as in case of pink bollworm.**



13. Bud Moth

S.N: *Phycita infusella*

(Pyralidae: Lepidoptera)

- **Distribution:** Throughout India as a minor pest of cotton and is more serious on desi cotton.
- **Host range:** Cotton, okra and other allied plants.
- **Morphology:** The full-grown greenish caterpillars having a black front and faint brown stripes on the rest of the body.
- The adult is a greyish-yellow moth, speckled with fuscous.
- The front wings are faint yellow at the base with red wavy lines and the hind wings are white, with brown marginal lines.



Damage and Management

- **Due to the webbing of leaves and buds feeding by the caterpillars, further growth of the plants is inhibited.**
- **The attacked leaves wither away, dry up and drop off.**
- **The flowering and fruiting are very poor and the reduction in yield is considerable.**

14. Tobacco caterpillar

S.N: *Spodoptera litura*
(Noctuidae: Lepidoptera)

- Tobacco caterpillar is a polyphagous pest and the larvae cause serious damage to cotton from August to November.
- The young larvae feed gregariously and skeletonize the foliage.
- The grown-up larvae disperse and feed singly.
- Besides leaves, they also damage the buds, flowers and green bolls.





Eggs covered with hairy scales



Caterpillar



Feeding behavior and damage symptoms



Adult



Pupa



Management

- **Avoid growing castor, moong, dhaincha (*Sesbania aculeata*) and okra in and around cotton as these are the most preferred hosts of tobacco caterpillar and help the pest to multiply before shifting to cotton.**
- **Plough the dhaincha crop immediately when it has attained reasonable height and bury the larvae along with the straw deep into the soil.**
- **Keep the fields free from the weed itsit (*Trianthema portulacastrum*), as it acts as an alternate host of the insect.**
- **Collect and destroy the egg masses and young larvae feeding gregariously on the cotton crop.**
- **ETL- 1 egg mass/skeletonized leaf.**
- **Spray 2.0 kg of acephate 75 SP or 5.0 litres of chlorpyrifos 20 EC**

15. Cotton grey weevil

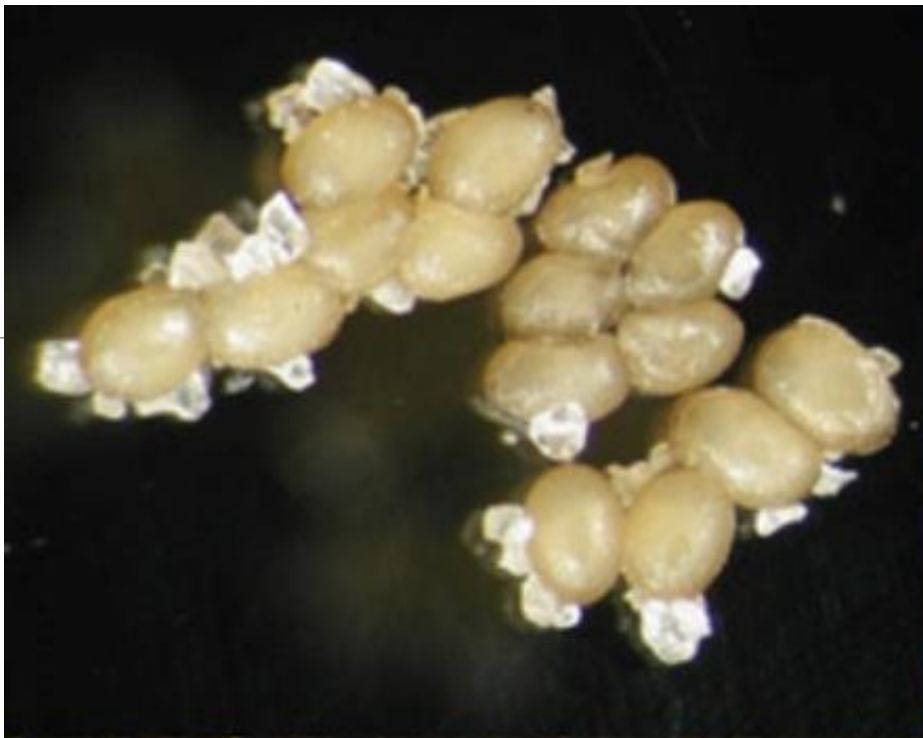
S.N: *Myloccerus undecimpustulatus*
(Curculionidae: Coleoptera)

- **Distribution:** Throughout India and is a minor pest of cotton, particularly of the desi cotton varieties.
- **Host range:** bajra, maize, sorghum, guava, red gram, groundnut, etc.
- **Morphology:** The weevils are grey.
- The grubs are white, legless, cylindrical.



Biology

- **The pest is active from April to November and passes winter in the adult stage hidden in debris.**
- **The weevils appear in April-May and lay ovoid, light yellow eggs in the soil.**
- **A female lays, on an average. 360 eggs for a period of 24 days.**
- **The eggs hatch in 3-5 days in May-September and the young grubs feed on the roots of cotton and other plants.**
- **The grubs complete their development in 1-2 months.**
- **They pupate in the soil inside earthen cells, forming creamy-white pupae, which change into adults in about one week.**
- **The adults live for 8-11 days in the summer and 4-5 months in the winter.**
- **During the active period, the life-cycle is completed in 6-8 weeks and the pest probably breeds 3-4 times in a year.**



Nature of Damage

- Both adults and grubs cause damage.
- The grubs feed underground on the roots of cotton seedlings and destroy them.
- One grub can destroy 9 seedlings in 40 days.
- The adults which feed on leaves, buds, flowers and young bolls cut prominent round holes.



Management

- **The pest can be suppressed by disturbing the soil up to a depth of 7.5 cm and destroying the eggs, grubs and pupae.**
- **Spray 2.5 kg of carbaryl 50 WP in 375 litres of water per ha.**

16. Cotton stem weevil

S.N: *Pempherulus affinis*

(Curculionidae: Coleoptera)

- **Distribution:** The grubs of cotton stem weevil feed on many species of cotton in India, Myanmar, Thailand and the Philippines.
- In India, it occurs in Tamil Nadu, Andhra Pradesh, Karnataka, Kerala, Bihar, Orissa., Rajasthan, Uttar Pradesh, Gujarat and Assam.
- **Host range:** The most favoured host is *Triumfetta rhomboidea*.
- Alternate hosts are *Corchoris olitorius*, *Abutilon spp.*, *Hibiscus rosa sinensis*, *H. cannabinus*, *H. vitifolius*, *Triumfetta rhomboidea*, *Sida spp.*, and *Althaea rosea*



Morphology

- **The grubs feed on the soft tissues of cotton stems.**
- **Greyish-black weevil, emerge from the stem Killing the plants.**
- **The adult is a dirty brown or greyish-black weevil, about 3 cm in length.**
- **The grub is slightly curved, creamy white, with a distinct head.**



Biology

- **The weevils emerge from the cotton sticks wherein they spend the summer.**
- **After mating female makes a cavity in the hypocotyle region of the plant and lays an oval, globular, smooth, white egg.**
- **During an oviposition period of 60-80 days, a female may lay up to 121 eggs visiting from plant to plant.**
- **The eggs hatch in 6-10 days and the grubs feed inside the soft stem tissue.**
- **They continue to feed inside till the development is completed in 35-57 days.**
- **The pupation takes place inside the stem and this stage lasts from 25 to 30 days.**
- **Three generations are completed in a year from October to April and the summer is passed as an adult in the cotton sticks.**

Nature of Damage

- In south India it is an important pest of cotton, particularly on summer crop.
- 12-15 day old cotton seedlings are first infested and such plants generally succumb to the attack whereas 4-5 month old plants mostly withstand the injury.
- About 23- 25% of plants are attacked.
- The pest causes serious damage to Cambodia cotton in South India.
- As the grubs tunnel within the stem, that portion swells, and such symptoms are generally seen at the base of the plant [JRF 2006, ARS NET/PRE 2016]
- Under strong winds, the affected plants may break at the swellings.
- The pest causes plant mortality up to 25 per cent, especially during the early stages of growth.



Management

- **Collection and destruction of affected plants is recommended for the control of this pest.**
- **MCU 3 variety is resistant to cotton stem weevil.**
- **Avoid growing of alternate or collateral host plants during the off season.**
- **Application of chlorpyrifos 0.05% at 15-days interval commencing 3 weeks after sowing is suggested.**

17. Mirid bugs

S.N: *Creontiades* spp.

(Miridae: Hemiptera)



Nature of Damage

| Plant part | Nature of Damage |
|-------------------|---|
| Seedling | Wilting of seedling |
| Plant tip | Produces another dominant growing terminal, causing brief delay in crop maturity. |
| Squares | Shedding of small squares when fed on the stalk of the squares Damage to the developing anthers may lead to deformed bolls called Parrot beaking due to lack of fertilization of some ovules. |
| Bolls | During feeding, bugs release pectinases that cause necrotic lesions. Affected parts gradually turn yellow then shrivel and finally drop down prematurely Feeding result in shiny black spots on the outside of the bolls at feeding site. |
| Terminals | Delay the onset of fruiting due to more vegetative branches |





Management

- **Avoid closer spacing**
- **Grow lucerne as trap crop in the borders.**
- **Grow resistant varieties like KCH-135, RCH 536 Bt cotton.**
- **Collection and destruction of infested plant parts and alternate hosts.**
- **Use of NSKE 5% found to be effective.**
- **Seed treatment with carbosulfan 25 D (10 g/kg of seed).**
- **Recommended insecticides are dimethoate 30 EC (500ml/ha), indoxacarb 14.5 SC (400ml/ha), fipronil 5SC (500ml/ha) etc.**

18. Thrips

S.N: *Thrips tabaci* and *Scirtothrips dorsalis*
(Thripidae: Thysanoptera):

- **The former species infests cotton flowers and the latter one attacks the leaves.**
- **The nymphs and adults lacerate the tissue and suck the sap from the upper and lower surfaces of leaves and in cases of severe attack they curl up and become crumpled.**
- **Leaves wrinkled & distorted with white skinny patches in case of seedlings, older leaves turn brown & give rusty appearance.**
- **Becoming serious on Bt. Cotton.**
- **Severe in central zone of India.**
- **Control as under cotton aphid.**



19. Red bollworm

S.N: *Rabila frontalis*

(Noctuidae: Lepidoptera)

- **The pinkish stout larva scoops out the contents of bolls.**
- **It pupates in the soil in an earthen cocoon.**
- **The adult is pale brown with yellow markings on fore wings and white hind wings.**
- **It attacks Karunganni and Cambodia cotton in south India.**



thank  you

