

IPM IN SOYBEAN



Major Insect Pests of National Significance

1. Stem fly (*Melanagromyza sojae* Zehntner)
2. Tobacco caterpillar (*Spodoptera litura* Fabricius)
3. Green semiloopers (*Chrysodeixis acuta* Walker, *Gesonia gemma* and *Diachrysia orichalcea* Fabricius sensu Hübner)
4. Girdle beetle (*Obereopsis brevis* Gahan)
5. Pod borer (*Helicoverpa armigera* Hubner)
6. White fly (*Bemisia tabaci* Gennadius)

Major Insect Pests of Regional Significance

1. Blue beetle (*Cneorane spp.* Jacoby) - Western MP
2. Leaf miner (*Aproaerema modicella* Deventer) - Maharashtra, Karnataka
3. Cotton grey weevil (*Mylloceris spp.*Weevil) - Delhi, Punjab
4. Bihar hairy caterpillar (*Spilosoma oblique* Walker) - Uttarakhand, Western MP
5. Leaf folder (*Hedylepta indicate* Fabricius) - Karnataka, Maharashtra, MP
6. Pink pod borer (*Cydiaptychora sp.* Meyr) - Northern Karnataka
7. Leaf defoliator (*Spodoptera exigua* Hübner) - Central and Western MP

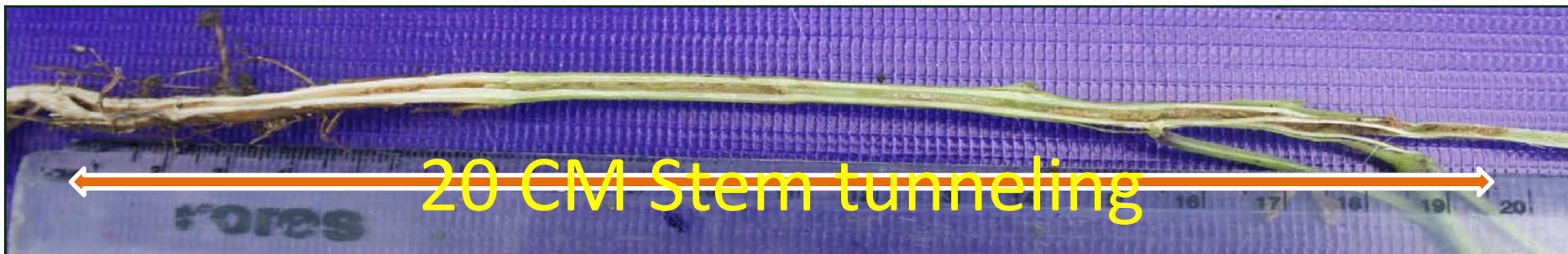
Soybean Stem fly *Melanagromyza sojae* **(Diptera: Agromyzidae)**



A serious seedling pest of soybean and has been identified as a major pest of soybean in India.

Nature of Damage:

1. The adult stem fly deposits eggs in the leaf tissue of **10 day old soybean seedlings**.
2. The first pair of leaves of seedlings favourite sites for oviposition.
3. Maggots mine the leaves or bore into the leaf petiole or tender stem cause extensive **tunneling resulting in withering, drooping and death** of plant.
4. The Seedling mortality was recorded



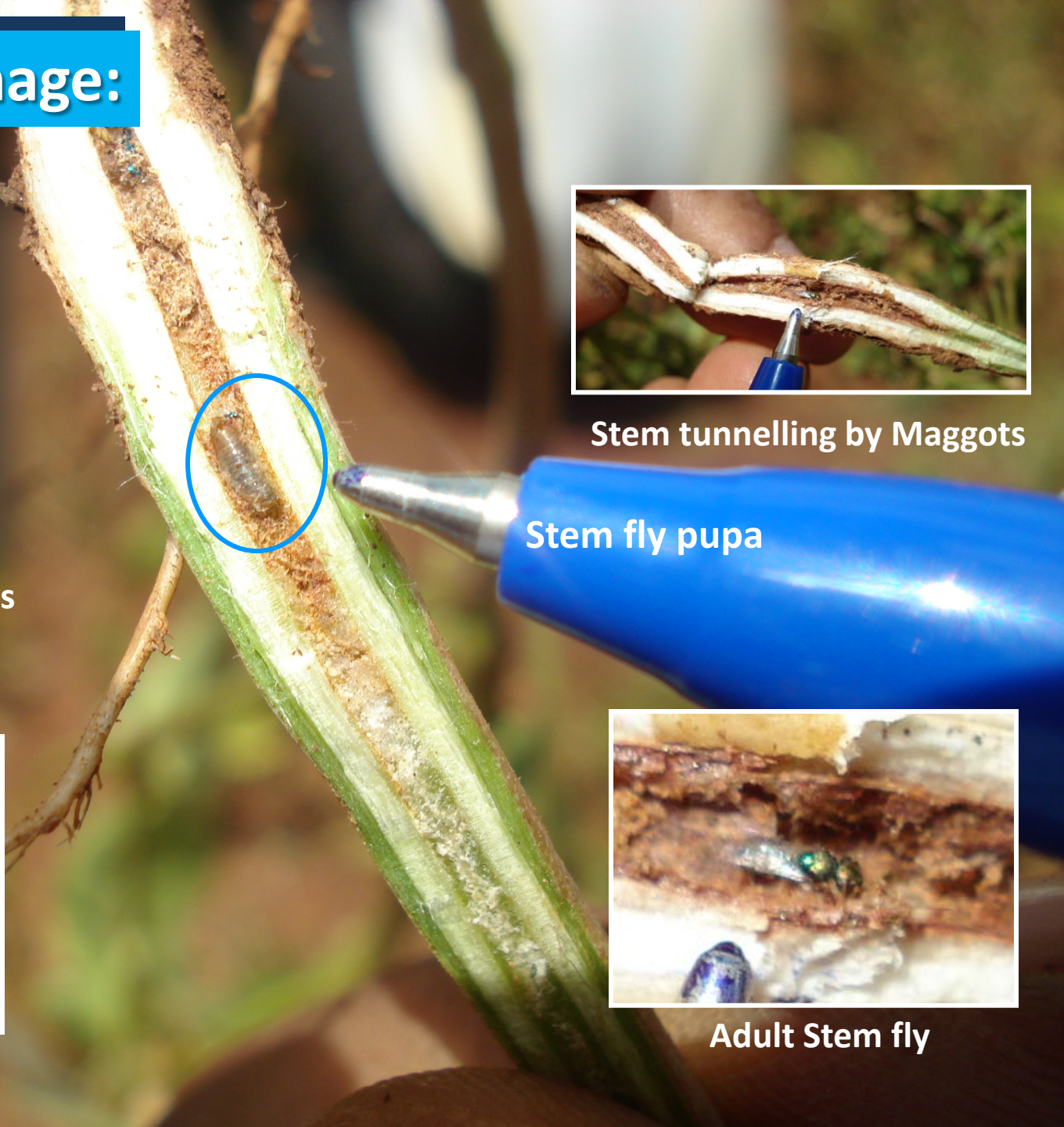
Nature of Damage:



Maggots mine the leaves



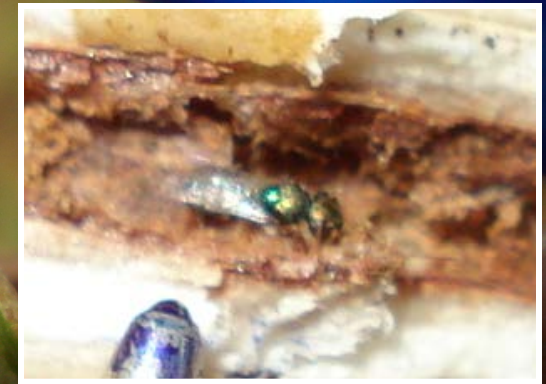
Stem tunnelling by Maggots



Stem fly pupa



Exit hole



Adult Stem fly

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Healthy Soybean plant



**withering, drooping and
death of plant**

**Tobacco caterpillar *Spodoptera litura* (Fab.)
(Lepidoptera: Noctuidae)**



Nature of Damage

A female moth lays masses of eggs on the underside of young leaves. After egg hatch, caterpillars feed on leaves. They are first gregarious and later solitary. They also may feed on stems, buds, flowers and pods.



Pod damage



Foliage damage

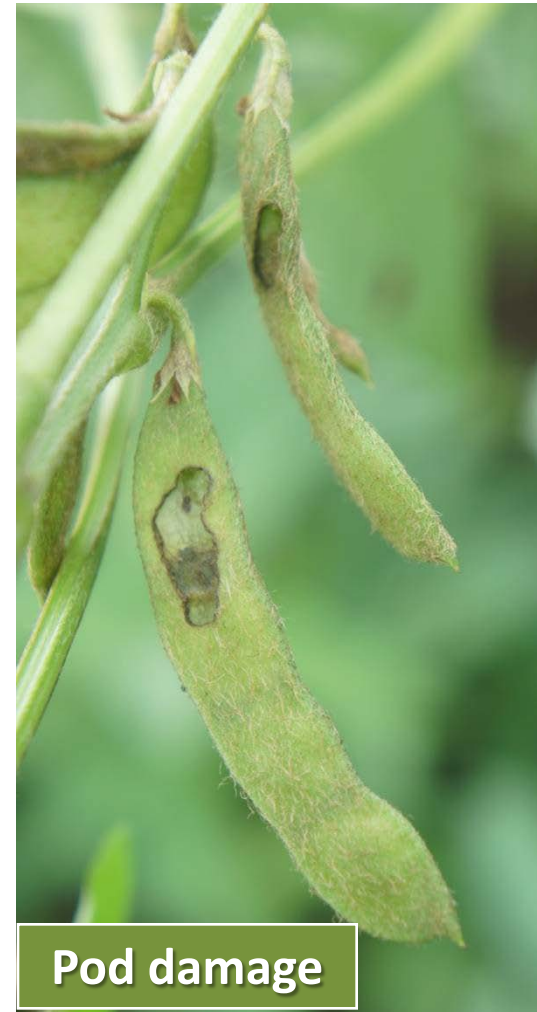
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Foliage damage



Pod damage

Soybean Pod borer, Helicoverpa armigera
(Lepidoptera: Noctuidae)



Nature of Damage

1. On hatching, the larvae feed for a short time on the tender leaflets by scrapping green tissue and then shift to flower buds and tender shoots
2. Slowly it enters and feeds on the seeds inside the pods.
3. The half portion of larvae remains inside pod while feeding on the developing seeds.
4. They can cut hole on one to another locule and feed 20-25 pods in its lifetime.



**Bihar hairy caterpillar *Spilosoma(Diacrisia) obliqua(Walk.)*
(Lepidoptera: Arctidae)**



Nature of Damage

- a. Young larvae feed gregariously on the under surface of the leaves and cause loss by way of defoliation and the leaves of the plant give an appearance of net or web.
- b. Sometimes, after defoliated the crop larvae feed on the pods.
- c. Pupation takes place in the soil under ,dry foliage and debris where the pupae overwintering



**Semilooper *Thysanoplusia orichalcea*
(Lepidoptera: Arctiidae)**



Nature of Damage

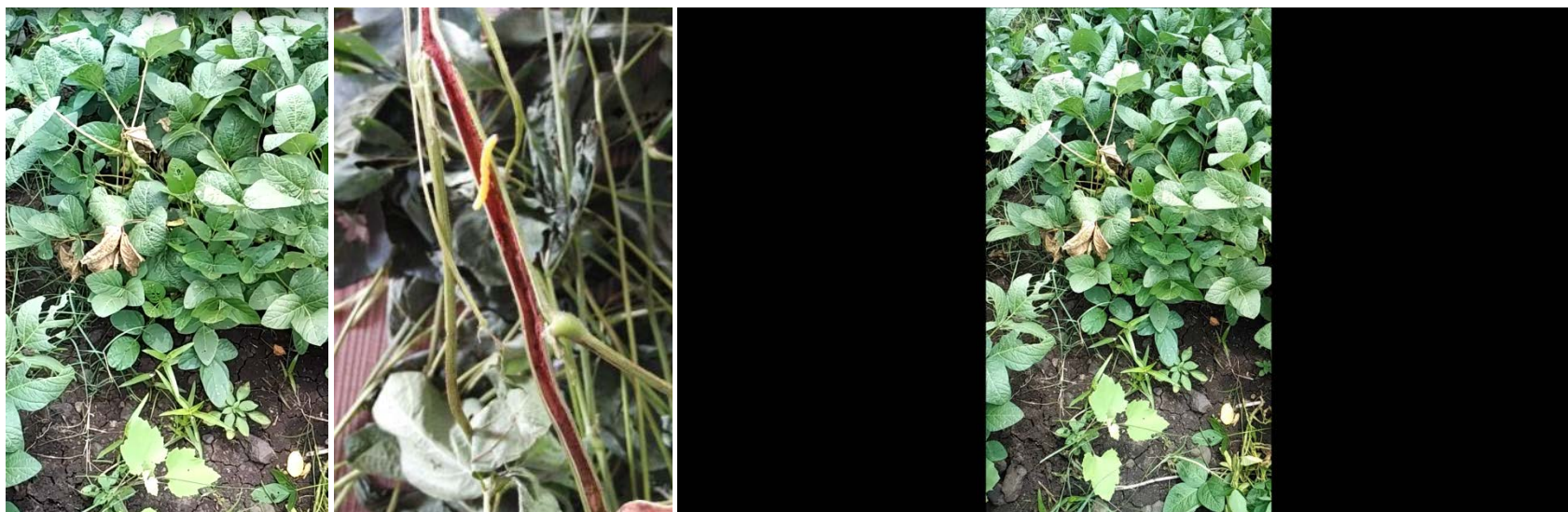


Leaves are with holes and severe damage results in skeletonization and defoliation

Soybean stem borer *Dectes texanus texanus* (Coleoptera: Cerambycidae)



Nature of Damage



1. 10 to 15% yield reduction associated with the tunneling activity
2. Larvae tunnel down the leaf petiole and enter the stem.
3. The leaf leaf tissue above this point wilt and die.

**Ash weevil *Mylocherus undecimpustulatus*
(Coleoptera : Curculionidae)**



Nature of Damage



- **When adult weevils feed on leaves, they feed inward from the leaf margins (or edges), causing the typical leaf notching.**
- **There are some instances where the leaf material is almost completely defoliated, where the weevil has fed along the leaf veins. The adults prefer new plant growth.**

Integrated insect pest management in Soybean

Mechanical Practices

1. Collection and destruction of girdle beetle infested plant parts, egg masses and gregariously feeding larvae of hairy caterpillar and tobacco caterpillar should be done.
2. Erection of bird perches @ 10-12/ha.
3. Installation of pheromone traps for monitoring incidence of *S. litura* and *H. armigera*.
4. Use of Castor as trap crop for *tobacco caterpillar* and *Dhaincha* for *girdle beetle*.

Biological Control

- Conserve spiders, coccinellid beetles, tachinid fly, praying mantids, dragon fly, damsel fly, Chrysoperla and meadow grass hoppers through minimum use of broad spectrum pesticides, so as to exploit maximum potential of bio-control fauna.
- Release *Telenomus remus* @ 50000/ha against *S. litura*.
- Spray *Bacillus thuringiensis* var. *kurstaki*, Serotype H-39, 3b, Strain Z-52 @ 0.75 to 1.0 kg/ha for the management of semilooper complex (*Chrysodeixis acuta*, *Gessionia gemma*, *Diachrysia orichalcea* and defoliators).
- Spray SINPV @ 250 LE/ha
- Spray of NSKE @ 5% for management of early stage larvae and sucking pest.

Chemical methods

Insect	Insecticides and dose
Defoliators (<i>Spodoptera litura</i>) (<i>Helicoverpa armigera</i>)	Chlorantraniliprole 18.5% SC @ 150 ml/ha. Indoxacarb 15.8% EC @ 333 ml/ha <i>Bacillus thuringiensis</i> var. <i>kurstaki</i> , Serotype H-39, 3b, Strain Z-52 (Bt) @ 0.75 to 1.0 Kg/ha Quinalphos 25 EC @ 1000 ml/ha
White fly (<i>Bemisia tabaci</i>)	Thiamethoxam 30% FS @ 10 Kg/hg
Stem fly (<i>Melanogromyza sojae</i>)	Thiamethoxam 30% FS @ 10 Kg/hg Chlorantraniliprole 18.5% SC @ 150 ml/ha.
Pod borer (<i>Helicoverpa armigera</i> and <i>Cydia ptychora</i>)	Indoxacarb 15.8% EC @ 333 ml/ha <i>Bacillus thuringiensis</i> var. <i>kurstaki</i> , Serotype H-39, 3b, Strain Z-52 (Bt) @ 0.75 to 1.0 Kg/ha
Girdle beetle (<i>Obereopsis brevis</i>)	Triazophos 40 EC @ 625 ml/ha Chlorantraniliprole 18.5% SC @ 150 ml/ha.
Blue beetle (<i>Cneorane</i> spp.)	Indoxacarb 15.8% EC @ 333 ml/ha

Insect pest resistant/ tolerant varieties

Insect pest	Resistant/tolerant varieties
Stem fly	JS 335, PK 262, NRC 12, NRC 37, MACS 124 and MAUS 2, MAUS 47
Tobacco caterpillar	JS 81-21, PS 564 and PK 472
Green semilooper	NRC 7, NRC 37, PUSA 16, PUSA 20, PUSA 24, JS 93-05, JS 97-52, MAUS 47 and JS 80-21
Girdle beetle	JS 71-05, NRC 7, JS 97-52, MAUS 32 and Indira Soya 9

IPM IN MUSTARD



Painted Bug: *Bagrada hilaris* (Pentatomidae: Hemiptera)

- Both nymphs and adults suck cell sap from the leaves and developing pods, which gradually wilt and dry up.
- The nymphs and adult bugs also excrete a sort of resinous material which spoils the pods.



Mustard aphid: *Lipaphis erysimi*

- Both the nymphs and adults suck cell-sap from leaves, stems, inflorescence or the developing pods.
- Vitality of plants is greatly reduced. The leaves acquire a curly appearance, the flowers fail to form pods and the developing pods do not produce healthy seeds.
- The yield of an infested crop is reduced to one-fourth or one-fifth.



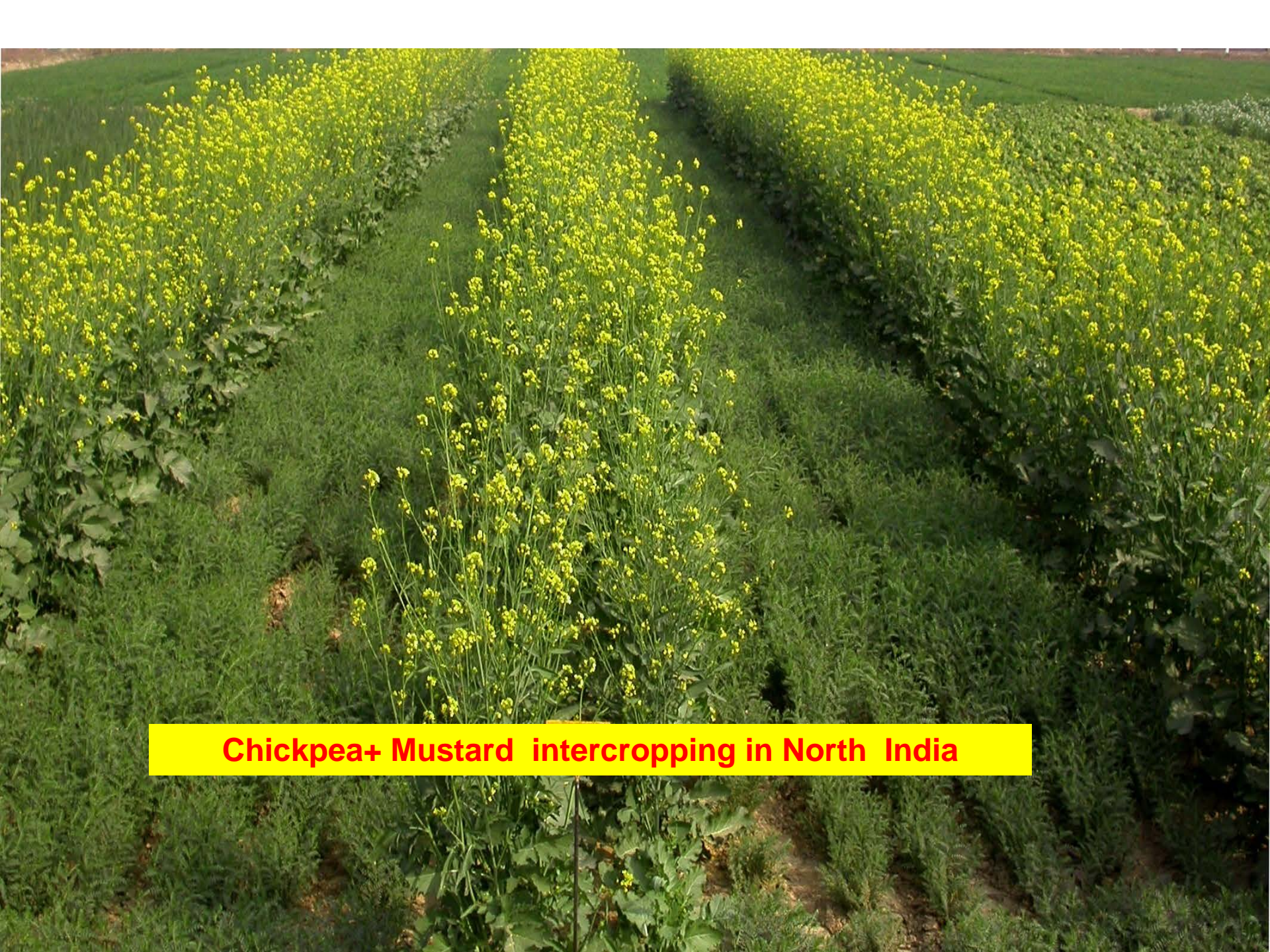
Mustard saw fly: *Athalia lugens proxima*

- 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 of insect pests of Mustard

- Inter Cropping
- Early sown crops (before 20th October) suffered less damage from **aphid** than late sown crop.
- Apply irrigation in seedling stage is very crucial for **sawfly** management because most of the larvae die due to drowning effect. Severe cold reduces pest load.
- Collection and destruction of grubs of **sawfly** in morning and evening
Conserve *Perilissus cingulator* (parasitoids of the grubs), and the bacterium *Serratia marcescens* which infect the larvae of sawfly.
- Seed treatment with imidacloprid 70 WS (5g/kg) provided good control to **painted bug** up to 30-35 days after sowing.
- Wherever the economic threshold level of **mustard aphid** (up to 50 aphids per plant) has been crossed, spray of systemic insecticides viz., monocrotophos (0.05%), oxydemeton methyl (0.025%) etc., is recommended.
- Spray the crop with malathion 50 EC @ 1000 ml/ha quinolphos 25 EC @ 625ml/ha. All this should be applied in about 600 to 700 litres of water per ha is recommended for the management of **sawfly**.



Chickpea+ Mustard intercropping in North India



Lentil+ Mustard intercropping in North India

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