



NCIPM

Resource Book

# Furtherance in Integrated Pest Management approaches



2021

Mukesh Sehgal, Rekha Balodi, Raghavendra K.V. & Subhash Chander

ICAR-National Research Centre for Integrated Pest Management

LBS Building, Pusa Campus, New Delhi-110012

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# Furtherance in Integrated Pest Management Approaches

**02-04 March 2021**

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**Training program on  
Furtherance in Integrated Pest Management (IPM) approaches for  
ATARI – Zone X**

**March 02-04, 2021**

**Venue: ICAR-NCIPM (on line)**

**Programme**

Time	Lecture	Official
<b>March 02, 2021</b>		
09:30-10:00 hrs	Registration	Mr. S.P. Singh & Mrs. Neelam Mehta ICAR-NCIPM, New-Delhi
10:00-10:30 hrs	Inauguration	ICAR-NCIPM, New-Delhi
10:45-11:00 hrs	Pre-course evaluation	Dr. Rekha Balodi and Dr. Raghavendra K.V. Scientist, ICAR-NCIPM, New-Delhi
11:00-11:15 hrs	Interaction with Subject Matter Specialists (KVKs) and Adopted, progressive farmers	Dr. Subhash Chander , Director ICAR-NCIPM, New Delhi, Dr. J.V. Prasad, Director ICAR-ATARI, Hyderabad, Telengana Ph: +91-9701708171 Email: <a href="mailto:prasadjil64@gmail.com">prasadjil64@gmail.com</a>
11:15-12:00 hrs	IPM Technology for Chilli pest management	Dr. M.K. Naik Vice chancellor, Shimoga, Karnataka Ph: +91- 9448183346 Email: <a href="mailto:vcuahss2014@gmail.com">vcuahss2014@gmail.com</a>
12:00-12:45 hrs	Role and importance of Bio- control in IPM	Dr. Chandish R. Ballal Ex- Director, ICAR-NBAIR, Bengaluru, Karnataka Ph: +91- 9880006624 Email: <a href="mailto:ballalchandish@gmail.com">ballalchandish@gmail.com</a>
12:45- 13:30 hrs	Impact of climate change on pest population dynamics	Dr. M. S. Rao ICAR-CRIDA, Hyderabad, Telangana Ph: +91-9849547302 Email: <a href="mailto:msrao909@gmail.com">msrao909@gmail.com</a> <a href="mailto:ms.rao@icar.gov.in">ms.rao@icar.gov.in</a>
13:30-14:00 hrs	<b>Lunch Break</b>	
14:00-15.15 hrs	Weed Management in Agricultural and Horticultural Crops: Novel approaches and future strategies	Dr. R.P. Dubey Principal Scientist (Agronomy), ICAR-NRCWS, Jabalpur, Madhya Pradesh. Ph: +91-9399763944 Email: <a href="mailto:dubeyrp@gmail.com">dubeyrp@gmail.com</a>

<b>15.15-16.30hrs</b>	Sustainable crop protection through IPM Strategies	Dr. Subhash Chander, Director ICAR-NCIPM ,New Delhi Ph: +91-9868846540 Email: <i>schanderthakur@gmail.com</i>
<b>March 03, 2021</b>		
<b>09.30-10.30 hrs</b>	Role and uses of mechanical tools in pest management: Novel approaches and future strategies	Dr. S.K. Singh Principal Scientist ICAR-NCIPM, New Delhi Ph: +91- 9315831244 Email: <i>surender.singh@icar.gov.in</i>
<b>10.30-11.30 hrs</b>	IPM in Sugarcane: Novel approaches and future strategies	Dr. S.N. Sushil Principal Scientist ICAR-IISR, Lucknow, U.P. Ph: +91- 9910558766 Email: <i>satya.sushil@icar.gov.in</i> <i>snsushil@yahoo.co.uk</i>
<b>11.30-12.30 hrs</b>	Integrated Pest Management in Vegetables crops	Dr. H. R. Sardana Principal Scientist, ICAR-NCIPM, New Delhi Ph: +91- 9968384033 Email: <i>hr.sardana@icar.gov.in</i>
<b>12.30-13.30 hrs</b>	Role of pollinators in sustainable crop production and IPM approaches for conservation of pollinators	Dr. Jagadeesh, K.S. Head, Dept. of Apicultur UAS, Bengaluru, Karnataka Ph: +91- 9341960569 Email: <i>jagsan1968@gmail.com</i>
<b>13.30-14.00 hrs</b>	<b>Lunch Break</b>	
<b>14.00-14.45 hrs</b>	Importance of plant extracts in integrated pest management of insect pests and diseases	Dr. V. S. Rana Principal Scientist ICAR-IARI, New Delhi Ph: +91- 9899109141 Email: <i>ranavs2000@yahoo.com</i>
<b>14:45 -15.30 hrs</b>	IPM in Cotton: Novel approaches and future strategies	Dr. Y. G. Prasad ICAR-CICR, Nagpur, Maharashtra Ph: +917103-275310 Email: <i>ygprasad@gmail.com</i>
<b>15:30-16:30 hrs</b>	Role of chemical pesticides in plant protection: Past, present and future	Dr. Sumitra Arora Principal Scientist, ICAR-NCIPM, New Delhi Ph: +91- 9999927849 Email: <i>sumitra.arora@icar.gov.in</i>



<b>16:30-17:15 hrs</b>	IPM in Paddy/Rice: Novel approaches and future strategies	Dr. Mukesh Sehgal Principal Scientist ICAR-NCIPM, New Delhi Ph: +91- 9810636677 Email: <i>m.sehgal@icar.gov.in</i>
<b>March 04, 2021</b>		
<b>09:30-10:15 hrs</b>	IPM strategies for management of insect vectors transmitting plant diseases	Dr. N. Krishna Kumar Ex-DDG (Horti) ICAR, New Delhi Ph: +91- 8447284636 Email: <i>kumarihr@yahoo.com</i>
<b>10:15-11:00 hrs</b>	e-Pest surveillance and advisory for pest management	Dr. A. Prabhuraj Principal Investigator (eSAP) UAS, Raichur, Karnataka Ph: +91- 9480396607 Email: <i>prabhusha2014@gmail.com</i> , <i>headesap@uasraichur.edu.in</i>
<b>11:00-11:45 hrs</b>	IPM in pulses: Novel approaches and future strategies	Dr. Rachappa Senior Scientist, AICRP – Pigeonpea, ZARS, Gulbarga, UAS (Raichur) Ph: +91- 9880323707 Email: <i>rachis1@rediffmail.com</i>
<b>11:15-12:30 hrs</b>	IPM in oilseed crops: Novel approaches and future strategies	Dr. P. S. Srinivas Principal Scientist ICAR-IIOR, Hyderabad, Telangana Ph: +91- 9810636677 Email: <i>psatya.srinivas@icar.gov.in</i>
<b>12:30-13:30 hrs</b>	Practical Session on Use of Mobile Apps developed by ICAR-NCIPM, New Delhi	Dr. S. Vennila Principal Scientist ICAR-NCIPM, New Delhi Ph: +91- 9013007359 Email: <i>svennila96@gmail.com</i>
<b>13:15-14:00 hrs</b>	<b>Lunch Break</b>	
<b>14:00-15:00 hrs</b>	Biosecurity in plant protection: Need and strategies	Dr. S. B. Sharma Ex-Professor & Chair, Biosecurity, and Food Security, Murdoch Univ., Australia Ph: Email: <i>foodforallforever@gmail.com</i>
<b>15:00-15:30</b>	Post course evaluation	Dr. Rekha Balodi and Dr Raghavendra K.V. Scientist, ICAR-NCIPM, New-Delhi
<b>15:30 -16:30hrs</b>	Valedictory Function	ICAR-NCIPM, New-Delhi





## CHAPTER 13

### IPM IN OILSEED CROPS FOR ATARI ZONE X

**P.S.Srinivas**

*ICAR- Indian Institute of Oilseeds Research, Hyderabad*

The major oilseeds grown in Zone X are groundnut, soybean, sesame, sunflower, safflower, niger and linseed.

#### **GROUNDNUT**

Groundnut is damaged by defoliators (leaf miner, red hairy caterpillars, tobacco caterpillar, gram pod borer, Bihar hairy caterpillar, and castor semi-looper), root and pod feeders (white grubs and termites), sucking pests (aphids, leafhoppers, thrips).

#### **Defoliators**

**Groundnut Leaf Miner** *Protaetia modicella* (Deventer) After hatching young larvae mine into the leaf. The mines are about 1mm long and enlarge as the larvae grow. Small brown blotches on the leaf can be seen. Older larvae emerge out and web the adjacent leaflets together and continue to feed on webbed leaves. In severe infestation, field gives a burnt appearance. ETL for leaf miner is 5 mines per plant at 30 days of crop age.

**Tobacco Caterpillar** *Spodoptera litura* (F.) Female lays eggs in masses. The early instars are gregarious and feed by scrapping the surface of the leaves leaving the vein. Larvae migrate to other plants and feed voraciously on the leaves, petiole, tender twigs and terminal shoots and defoliate the plant. Sometimes they may feed on flowers and even bore the tender groundnut pods. ETL is 20-25% defoliation at 40days.

**Gram Pod Borer** *Helicoverpa armigera* (Hubner)

The larvae are voracious feeders on flower and foliage. 20-25% defoliation at 40days is considered as ETL for this pest.

**Hairy Caterpillars** (*Amsacta albistriga*, *A. moorei* and *Spilosoma oblique*)

Young larvae of *A. albistriga* feed gregariously on the under surface of the leaves by scrapping them. The grown up larvae are voracious feeders and defoliate the crop leaving the appearance of a cattle grazed field resulting into total loss of yield. Similar pattern of feeding was observed by *A. moorei*. Due to scrapping by young larvae of *S. obliqua*, some



leaves become papery thin and dry, while full-grown larvae devour the foliage completely. ETL is 10% defoliation at 40 days.

### Management of defoliators

Deep ploughing during summer exposes the pupae to sunlight and predatory birds. • Set bonfires on community basis on the field bunds at night after rain. • Setup the light traps to attract and kill the moths during June-August. • Form a deep trench around the field and dust with 5% carbaryl to avoid the migration of larva from one field to the other. • Collect and destroy egg mass and early instar larva. Place the vegetative traps like *Jatropha* or *Calotropis* in and around groundnut fields to attract and kill larva.

Install Ha specific pest specific pheromone traps. Spray of bio-pesticides viz., NPV-*Spodoptera*, NPV-*Helicoverpa*. • Spray neem oil @ 5 ml/ l water along with suitable surfactant like detergent powder 1g /l of water or NSKE 5%.

### Sucking Pests

**Aphids** (*Aphis craccivora* Koch) Aphids congregate on young leaves and young leaf buds sometimes even on flowers and aerial pegs. Adults and nymphs suck the sap from leaves and tender shoots. Under severe infestation, leaves curl and turn yellow. ETL is 5-10 aphids per terminal at seedling stage.

**Leaf hoppers** (*Empoasca kerri* Pruthi) Both nymphs and adults suck sap from under surface of the leaves. The initial symptoms appear on young leaves and veins turn white. The terminal leaves may wilt when plants are young. Prolonged feeding by jassids results into a 'V' shaped yellow patch on leaf tips, which may further spread and the entire leaflet may become yellow. 5 to 10 adults per plant up to 30 days age.

**Thrips** *Scirtothrips dorsalis* Hood, *Frankliniella schultzei* Trybom, *Thrips palmi* Karny and *Caliothrips indicus* Bagnell. Thrips occur starting from vegetative stage till harvest. Thrips feed by rasping the upper surface of the leaves. During bud stage, thrips feeding causes distortion of unfolded leaves called "pouts". Leaf discoloration tinged with red or even black colour is common. ETL is 5 thrips/terminal at seedling stage.

### Management of Sucking Pests

- Seed treatment with imidacloprid 17.8 SL @ 2 ml/kg seed.
- Spray imidacloprid or acetamiprid or thiamethoxam @ 4 ml/15L of spray solution.

### Root and Pod Feeders

**White Grubs**, *Holotrichia consanguinea* and *H. Serrata*



In endemic areas, the damage ranges from 20-80%. Major damage is caused by young grubs that feed on fine rootlets while mature grubs feed on both roots and pods. The affected plants show varying degrees of wilting, which ultimately die. Died plants can easily be pulled out. Damage is generally noticed in patches leading to 'patchy appearance' of field. The roots show a sharp cut which can be distinguished from the damage by termite where the main root becomes hollow and is filled with soil. Beetles feed on the foliage of variety of host trees such as ber, drumstick, tamarind, banyan, acacia, neem, mahagoni, jamun, guava, sapota, banana, mango, fig etc found in and around the farm.

### **Management**

Both adult and grub management is needed.

#### **Adult control**

- Place light traps @ 1 trap/ha between 7PM to 10PM after receipt of first monsoon rains. Trim off trees and shrubs in and around the fields.
- Spray imidacloprid 17.8SL@ 1.5ml/l during the evening hours on trees and shrubs.
- Place 3 pheromone (synthetic pheromone-Anisole) dispensers per tree at 15 meter radius for three consecutive evenings after the first monsoon rains.
- Collect and destroy the adults fallen near the base of trees.

#### **Grub control**

- Take up deep summer ploughing to expose the pupae to scorching sun and predatory birds.
- Use well decomposed organic manures.
- Incorporate carbofuran 3G @ 33.0 kg/ha or phorate 10G @ 25.0 kg/ha in soil before sowing.
- Seed furrow application of insecticides such as thiamethoxam 25 WS @ 1.9 l/ha or fipronil 5FS @ 2.0 lt/ha.
- Seed treatment with chlorpyrifos 20EC @ 6.5-12.0 ml/kg or imidacloprid 17.8SL @ 2.0 ml/kg seed.
- Take up early sowing if irrigation facility is available.
- Drench the root zone of crop with chlorpyrifos 20 EC @ 4.0 lt/ha or quinalphos 25EC @ 3.2 l/ha three weeks after the adult emergence.

### **Termites, *Odontotermes obesus* and *Microtermes obesi* Holmgren**

Termites damage the groundnut plants from seedling stage to maturity. They feed and hollow out taproot causing wilting and premature death of plants especially in sandy and





red soils. They feed on pod shell by removing the corky material between the strands of vascular tissues, which is called 'scarification'. The scarified pods are prone to shatter or crack during harvest resulting into loss of kernels particularly during mechanical harvesting.

### Management

- Destruction of termatorium and queen termite in and around field.
- Pre-sowing soil treatment with phorate 10 G or carbofuran 3 G or Thiamethoxam 75SG @125ml/ha

#### Insecticides registered for Groundnut

Insecticides	Insect Pests
Carbofuran 03.00% CG	White grub, pod borer
Chlorpyrifos 20.00% EC	Aphids, root grub
Deltamethrin 02.80% EC	Leafminer
Flubendiamide 20.00% WG	<i>Spodoptera litura</i>
Imidacloprid 17.80% SL	Aphid, Jassid
Lambda-cyhalothrin 05.00% EC	Thrips, leafhopper, leaf miner
Methomyl 40.00% SP	<i>Spodoptera litura</i>
Quinalphos 20.00% AF	<i>Spodoptera litura</i>
Quinalphos 25.00% EC	Thrips, leafhopper, leaf miner
Fipronil 40.0%+Imidacloprid 40.0% WG	White grub
Thiamethoxam 75SG	Termite
Novaluron 05.25%+ Indoxacarb 04.50% SC	<i>Spodoptera litura</i> , <i>Helicoverpa armigera</i>
Thiamethoxam 12.60%+Lambda-cyhalothrin 09.50% ZC	Leaf hopper, Leaf eating caterpillar

(Source: CIBRC,2021)

### SESAME

Sesame is grown thorough out the year in one or other part of India and in more than one season in a region. It is grown as a *kharif* crop in arid and semi arid tropics and as a rabi or summer crop in the cooler areas. More than 38 species of pests are known to attack the crop. Crop pest diversity analysis indicated that the foliage feeders were dominant group (54%) comprising both sucking pests (*Orosius albicinctus*, *Nesidiocoris tenuis*, *Bemisia tabaci* and *Aphis gossypi*) and defoliators (*Antigastra catalaunalis*, *Spilosoma obliqua*, *Acherontia* sps). The nature, symptoms of damage and management of major Sesame pests is described hereunder.

**Leaf webber, *Antigastra catalaunalis*** (Dupanchel) (Crambidae: Lepidoptera)



This occurs during July to September. It infests the crop from 15 day after sowing. Caterpillars feed on tender leaves and remain inside the leaf web. Later on they move to flowers and developing capsule and feed on them. A web is formed around the capsule. Larvae feed inside and pupate.

Early sown crop is less attacked than the late sown. Use tolerant varieties like, Swetha til, Hima and Rajeswari. Intercropping with black gram, green gram, pigeon pea, pearl millet, cowpea attracts less infestation compared to sole crop. Erect 40-50 bird perches in a hectare. Release larval parasitoids viz., *Bracon hebetor*, *Trethala flavoorbitalis* and predators like *Cantheconidia furcellata*.

Spray neem oil 2% or quinolphos (2ml/l) or profenofos (2ml/l), trizophos (1ml/l) or chlorpyrifos (1.5ml/l) or spinosad (0.2ml/l) at 30 and 45 days after sowing. ETL is 10% of infestation.

**Gall fly, *Asphondylia sesame*** Felt (Diptera: Cecidomyiidae)

This pest attacks the crop at bud initiation stage. It is prevalent during September to November. Maggots feed inside the floral bud leading to formation of gall like structures which do not develop in to flower/capsule. The affected buds wither and drop.

Clip off the galls in the initial stages. Inter cropping with green gram, black gram or pigeon pea results in low infestation. Varieties like Swetha til, Hima, RT-46, RT-103, RT-127, RT-125 and OMT-26 are reported tolerant to this pest. Spray dimethoate (107ml/l) or quinolphos (2ml/l) or dichlorvos(0.7 ml/l) or imidacloprid (0.3ml/l) at bud initiation stage.

**Bud fly, *Dasineura sesame*** Barnes (Cecidomyiidae: Diptera)

It occurs during September-October. Bud fly maggots feeds on flower buds and makes gall like structures that produce no seeds. The affected buds wither and drop.

Varieties like, MT-75 and Shekar tolerate their damage. Spray NSKE 5% or dimethoate (1.7ml/l) or dichlorvos (1ml/l) or imidacloprid (0.25ml/l) at bud initiation stage.

**Leafhopper, *Orosius albicinctus*** Evans (Cicadellidae: Hemiptera)

It is white in colour. Both nymphs and adults suck the sap from the tender parts of the plant. It acts as a vector for sesame phyllody disease. Its activity is more between July to September.

Seed treatment with imidacloprid or thiamethoxam (5g/kg). Remove and destroy the infected plants. Spray NSKE 5% or Dimethoate (1.7ml/l) or Oxydemeton- methyl (2ml/l) or dichlorvos (1ml/l) or imidacloprid (0.25ml/l) or acetamiprid (0.3g/l) or thiamethoxam (0.25g/l) or Thiacloprid (aml/l).



**Hawk moth, *Acherontia styx* Westwood (Sphingidae: Lepidoptera)**

Caterpillars are big in size and green in colour. They feed on leaves voraciously and completely defoliate the plants. It occurs during August- October.

Collect and destroy the caterpillars. Spray NSKE 5% or quinolphos (1.5ml/l) or chlorpyrifos (2ml/l) or dusting Phosalone 4% or Malathion 5% (25kg/ha).

**Bihary hairy caterpillar, *Spilarctia abliqua* (Arctiidae: Lepidoptera)**

It occurs during August to October. Young larvae are gregarious. Larvae have thick hairs on the body. Older ones migrate to other plants and feed voraciously leaving only stem.

Destroy egg masses and young larvae. Erect bird perches, 40-50/ha. Spray NSKE 5% or azadirachtin 0.03% (5ml/l) or *Bt* var kurstaki (1g/l) or dichlorvos (1ml/l) or profenofos (1ml/l) or quinolphos (2ml/l) or chlorpyrifos (2.5ml/l).

**Insecticides registered for sesame**

Insecticides	Insect Pests
Quinalphos 25% EC	Leaf webber, Jassid
Oxydemeton–Methyl 25% EC	Leaf hopper (Jassid)
Carbaryl 10% D.P.	Sesamum leaf roller

(Source: CIBRC, 2021)

**SOYBEAN**

Major Insect Pests that attack soybean are Stem fly, defoliators (Tobacco caterpillar, Green semiloopers), Pod borer, Girdle beetle, and White fly

**Stem fly, *Melanagromyza sojae* Zehntner**

Shiny black flies lays eggs on leaves. After hatching yellowish maggots bore the nearest vein of the leaf, reach the stem through petiole, bore down the stem, and root as well. If the infected stem is opened by splitting, distinct zigzag reddish tunnel can be seen with maggot or pupae inside it. Plants turn yellow and die.

**Management**

Avoid pre monsoon sowing. Use optimum seed rate and spacing. Remove and destroy the damaged plants.

Spraying of suitable plant protection chemicals may not be cost effective particularly in event of 25% tunneling already caused by the Stem fly. Soil application of phorate





granules 10 G (15 kg/ha) or seed treatment with thiamethoxam 30 FS @10 ml/kg seed. Spray chlorantraniliprole (0.3 ml/l), Indoxacarb (0.6 ml/l) or lambda cyhalothrin + thiamethoxam (125 ml/ha).

#### **Girdle beetle, *Obserea brevis***

The attack of the insect initially begins in the last week of July to the first fortnight of August. The insect remains active from July to October, damaging the crop most severely during August and September. Heavy incidence may reduce the yield by up to 40%. The presence of circular cuts on the branch or stem is a characteristic symptom. Larvae bore into the stem of soybean. The inside of the stem is eaten by the larvae, forming tunnels within the stem. The infected portion above the circular cut is unable to get any nutrition so it dries up. In the later stages of infestation, the plant is severed at about 15 to 25 cm above the ground.

#### **Management**

Practice deep summer ploughing. Crop should not be overcrowded. Destroy crop residues. Avoid excess nitrogenous fertilizers. Sow tolerant varieties such as NRC-12 or NRC-7. Collect and destroy infested plant parts at least once every 10 days.

Apply pesticides if pest population crosses the Economic Threshold Level (5 per cent damaged plants). Spray NSKE 5% or azadirachtin 10,000 ppm @1 ml per 1 litre of water to avoid the pest laying eggs. As soon as symptoms are noticed, spray Thichlopid 21.7 SC (750 ml/ha) or Profenophos 50 EC (1250 ml/ha) or pre-mixed formulations like Betacyfluthrin + Imidaclopid (350 ml/ha) or Thiomethoxam + Lambda Cyhalothrin (125 ml/ha). Spraying insecticides may not be cost effective particularly in event where the larvae of girdle beetle is fully developed (attained 75% of its size).

#### **Defoliators**

**Semiloopers (*Cryodexia acuta*, *Diachrysis orichalcea*, *Gesonia gemma*, *Mocis undata*):** Soybean is infested by a complex of semiloopers. Colour, shape and size vary considerably. Young larvae skeletonize the foliage and later on completely devour the plants. In the event of heavy infestation buds, flowers and young pods also are damaged. Infestation and yield loss will be more in areas with less rain, high temperature and humidity. ETL is 4 larvae/m row length at flowering or 3 larvae/m row length at podding.

**Tobacco caterpillar, *Spodoptera litura*:** Eggs are laid in masses; the early instars remain gregarious for 4-5 days. Later on, larvae disperse to other plants and damage the leaves. ETL is 10 larvae/m row length before flowering.



**Gram pod borer, *Helicoverpa armigera*:** This is a polyphagous pest. Young larvae feed on developing pods, subsequently it damages developed pods and seeds. Larvae exhibit considerable variability with respect to colour, pattern of body stripes and size. Older larvae (after second instar) exhibit insecticide resistance. ETL 10 larvae/m row length at pod development.

### Management

Use recommended seed rate. Install bird perches to facilitate the predatory birds. Remove plants with egg masses and with gregarious larvae. Collect adult moths with the help of "Light Traps" and destroy.

Spray biological pesticides like HaNPV or SI NPV (250 LE/ha) at the initial stage of infestation in case of organic soybean production. The following insecticides may be applied in rotation. chlorantraniliprole 18.5 SC 150 ml/ha or indoxacarb 15.8 EC 333 ml/ha or profenofos 50 EC 1250 ml/ha or quinalphos 25 EC 1500 ml/ha or spinetoram 11.7 SC 450 ml/ha or beta cyfluthrin 8.49%+ imidacloprid 19.81% OD 350 ml/ha or flubendiamide 39.35 SC 150 ml/ha or flubendiamide 20 WG 250-300 g/ha or lambda cyhalothrin+ thiamethoxam 125 ml/ha.

For pod borer management, apply profenofos 50 EC 1250 ml/ha or chlorantraniliprole 18.5 SC 100 ml/ha or Indoxacarb 15.8 EC 333 ml/ha 333 ml/ha

### Sucking pests

#### White fly:

It a serious insect-pest of soybean in northern region (Delhi, Punjab, Haryana etc.). The nymphs and the adults not only suck the plant sap but also transmit yellow mosaic virus causing YMV disease in soybean. Insecticides recommended against major insects in soybean.

Seed treatment with Thiamethoxam 30 FS (10 ml/kg seed) or Imidachloprid 48 FS (1.25 ml/kg seed). Spray the crop with Thiomethoxam 25 WG (100 gm/ha) soon after the initiation of infestation.

#### Insecticides registered for soybean

Insecticides	Insect Pests
Chlorantraniliprole 18.5SC	Green semilooper, stem fly, girdle beetle
Emamectin benzoate 1.9EC	Green semilooper, tobacco caterpillar, girdle beetle, pod borer
Flubendiamide 39.35SC	tobacco caterpillar, pod borer, semilooper



Flubendiamide 20WG	tobacco caterpillar
L-cyhalothrin 4.9CS	Green semilooper, stem fly
L-cyhalothrin + thiamethoxam	Green semilooper, stem fly, girdle beetle, tobacco caterpillar
Thiamethoxam 30FS (seed dresser)	Stemfly
Novaluran + indoxacarb	Spodoptera, <i>Helicoverpa</i>
Indoxacarb 15.8EC	Green semilooper, stem fly, Spodoptera
Phosolone 50EC	Green semilooper, girdle beetle
Thiacloprid 21.7SC	girdle beetle

(Source: CIBRC,2021)

## SUNFLOWER

Sunflower crop is attacked by both sucking pests and lepidopteran pests. In general, lepidopteran pests (*Spodoptera*, *Helicoverpa*) are more prevalent in *kharif* season whereas sucking pests (leafhoppers, whiteflies) are more in *rabi* season. Symptoms and management of important insect pests are given below.

### 1. Tobacco caterpillar, *Spodoptera litura* :

Damage is done mostly by defoliation. Eggs are laid in masses. Hatched larvae feed gregariously and skeletonise leaves. After few days of feeding, larvae disperse to other leaves and plants, feed and defoliate the plants. Larvae also feed on the head by boring in to the thalamus of the head

Collect and destroy egg masses, early instars along with mesh like leaves. Install sex pheromone traps to monitor *Spodoptera* @ 10 traps/ha. Erect bird perches @ 15/ha to facilitate predatory birds.

Spray NSKE 5% @ 5ml/l synchronizing with oviposition and early larval stages (defoliators)

Spray insecticides - Profenofos 50EC (1000 ml/ha) or quinalphos 25EC (1000 ml/ha) or chlorpyrifos 20EC (1250 ml/ha) or chlorantraniliprole 18.5 SC (150 ml/ha) or flubendiamide 39.35 SC 150 ml/ha.

### 2. Head borer, *Helicoverpa armigera*:

Infestation starts at starbud stage. Eggs are laid on unopened flower and on leaves. Larvae feed on developing seeds and cause yield loss.





Install sex pheromone trap to monitor *Helicoverpa armigera* @ 10 traps/ha. Collect and destroy the early instars. Erect bird perches @ 15/ha to facilitate predatory birds.

Spray, profenofos 50EC (1000 ml/ha) or spinosad 45SC (160ml/ha). Apply Btk1g/ml to control early instar larvae. Avoid spraying in the full flowering stage. It may kill honey bees.

### 3. Bihar hairy caterpillar *Spilarctia obliqua*

- Early instars are gregarious in nature. Later, larvae feed voraciously on the foliage. In severe infestations, complete defoliation is noticed.
- Collect and destroy egg masses and gregarious stages of larvae. Spray NSKE 5% or dichlorvos 76EC (625ml/ha) or Cypermethrin 10EC (650-760ml/ha)

### 4. Leafhopper (Jassid), *Amrasca biguttula biguttula*

- Leafhoppers are more prevalent during *rabi* and summer season. Both nymphs and adults are seen on lower side of leaf and suck the sap from plant. Leaf margin turn yellow and later spread all over the leaf. Yellow colour changes to brown and leaf dry and brittle on the margins (hopper burn).
- Seed treatment with imidacloprid 70 WS (5 g/kg) of seed or thiamethoxam 30FS @10g/kg seed. Spray imidacloprid 17.8 SL (100 ml/ha)

### 5. Whitefly, *Bemisia tabaci*

Whiteflies sporadically occurs on sunflower. Acts as vector for leaf curl virus. Under severe infestations, chlorotic spots on leaves are seen which latter coalesce forming irregular yellowing of leaf.

Spray malathion 50EC @100ml/ha or diafenthiuron 50WP @ 500 g/ha

#### Insecticides registered for sunflower

Insecticides	Insect Pests
Dichlorvos 76% EC	Caterpillar, Cabbage looper, Semilooper
Imidacloprid 17.8% SL	Jassid, Thrips, Whitefly
Malathion 50% EC	Whitefly
Imidacloprid 48% FS	Jassid, Whitefly (See Treatment)
Imidacloprid 70% WS	Jassid, Whitefly (Seed Treatment)

(Source: CIBRC, 2021)

## SAFFLOWER

Among the annual oilseed crops, Safflower is considered as one with many health benefits. Maharashtra, Karnataka, Telangana are the major safflower growing states.



Aphids, Safflower caterpillar, capsule borer and gujhia weevil are the important insect pests in safflower in India.

**Aphids, *Uroleucon compositae***

Safflower aphid is a major sucking pest in all safflower growing areas. It can cause a yield loss of 50-100% if no control measure is taken. Nymphs and adults suck sap from the tender shoots and leaves. Sooty mold will develop on leaves effecting photosynthesis. Plants, turn yellow, wilt and dry.

Management: Aphids multiply faster during December- January in Telangana, Maharashtra and Karnataka. Therefore, avoid late sowing of safflower, November onwards. Sow moderately aphid resistant varieties like A-1 or Bhima.

If crop is sown late, seed treatment with thiamethoxam 30 FS @10ml/kg or imidacloprid 600 FS @ 8ml/kg seed is beneficial and protects the crop from aphids up to 30-40 days. Spray Dimethoate 30EC @1000ml/ha or Acephate @ 750g/ha . In water scarce areas dust formulation, Quinolphos 4D @ 25kg/ha may be applied. New insecticides, Imidacloprid 17.8SL @ 200ml/ha or Thiamethoxam 25WG @ 125g/ha or Clothianidin 50WDG @ 100ml/ha or pymetrozine 50WG @ 300 g/ha at 15 day interval from stem elongation stage (45 day old) effectively reduces aphids.

**Safflower caterpillar, *Perigaea capensis***

This pest occurs regularly in Karnataka. It infests from early stage of crop growth, feeds on leaves. In severe infestations, eats away whole leaves. Caterpillars are greenish to brownish black.

Management: For safflower caterpillar spray Indoxacarb 15 EC @ 0.3ml/l or Spinosad 45 SC @ 0.15ml/l as soon as the larvae are noticed, but do not have label claims for safflower. Use spray fluid of 500l/ha.

**Gujhia weevil, *Tanymecus indicus***

It is a soil borne insect that can survive deep inside the soil. It is a regular pest in Akola region of Maharashtra and causes extensive damage to safflower. It was also noticed in some parts of Telangana but occasionally. During seedling stage, it feeds on tender stem and eats away the new leaves. In severe infestations, re-sowing of crop may be necessary. It infests the crop at all stages and cause considerable damage to the foliage.

Management: Apply Phorate 10G granules @ 10kg/ha to soil at the time of sowing and foliar spray with Chlorpyrifos 20EC@ 2ml/l two to three times depending on the level of infestation. Please note the above insecticides does not carry label claims for safflower.



### **Capsule borer, *Helicoverpa armigera***

*Helicoverpa* is an occasional pest on safflower. It infests the crop at capsule formation stage. It bores in to capsules and feeds on developing seeds. If crops like chickpea or redgram and other host crops are nearby, the chances of infestation are more. No insecticides are recommended specifically for this pest on safflower.

#### **Insecticides registered for safflower**

<b>Insecticides</b>	<b>Insect Pests</b>
Dimethoate 30% EC	Aphid
Acephate 75% SP	Aphid
Phenthoate 2% DP	Aphid
Quinalphos 1.5% DP	Aphid

(Source: CIBRC,2021)

### **NIGER**

This minor oilseed crop is invaded by a few pests of which niger caterpillar, hairy caterpillars and safflower aphid are the major ones.

#### **Niger caterpillar, *Condica conducta***

- The caterpillar green with purple markings feeds on leaves and defoliates the plants.
- Proper weeding reduces hiding places. Spray quinalphos (2 ml/l) or dichlorvos (0.7ml/l) or profenofos (1 ml/l) or dust carbaryl 5% (20-25 kg/ha).

#### **Cutworm, *Agrotis ipsilon***

- The moth hides under dried twigs during day time and lays eggs on leaves. Larvae attack the crop and plants at ground level.
- Keep grass bundles or crop refuges in cluster in field for the caterpillars to hide during evening and collect the caterpillar early in the morning and kill them by dusting the crop with Chlorpyrifos 1.5%DP (25 kg/ha) or spray quinalphos (2 ml/l).

#### **Bihar hairy caterpillar, *Spilarctia obliqua***

- The caterpillars remain gregarious underneath leaves in early stages and cause serious loss in yield at third and fourth instar.
- Collect and destroy egg masses and early instars of caterpillars. Spray dichlorvos (0.7 ml/l) or profenofos (1ml/l) or quinalphos (2ml/l) or chlorpyrifos (2.5ml/l) or dust carbaryl 5% (25 kg/ha).





#### **Aphid, *Uroleucon compositae***

- This is one of the important sucking pests of niger during later period of crop growth.
- Spray dimethoate (1.5 ml/l) or oxydemeton- methyl (1.7 ml/l) or dust quinalphos 1.5% (20 kg/ha).

#### **Semilooper, *Plusia orichalcea***

- Larva feeds on the leaves and defoliates the plant.
- Spray NSKE 5% or dichlorvos (0.7 ml/l) or profenofos (1 ml/l).

#### **Niger capsule fly, *Dioxyrna sarorcula***

- Maggot feeds on seed and pulp inside the capitula.
- Install light trap one per ha. Spray quinalphos (2 ml/l) or dichlorvos (0.7 ml/l) or dimethoate (1.7 ml/l) or imidacloprid (0.3 ml/l).
- NO insecticides have been registered for niger

### **LINSEED**

The crop is damaged by bud fly which is the key pest of linseed. The pest causes severe yield losses *i.e.* 20 to 75%. The intensity of pest incidence varies from location to location. Sometimes, the crop is also damaged by leaf miner, thrips and gram pod borer.

#### **Linseed bud fly (*Dasyneura lini*)**

- The internal parts of flower bud are eaten by the maggot resulting in un-opening of the bud.
- Deep summer ploughing of the fields exposes the bud fly maggots. Follow crop rotation. Intercropping with chickpea (3:1) or mustard (5-6:1) reduces bud fly infestation. Erect bird perches @ 40-50/ha for increasing the activity of predatory birds.
- Adult bud flies get attract to light trap or attractant like jaggery (1 kg/75 lit. water) can be used to lure and kill adult flies. Spray NSKE 5% or imidacloprid (0.2 ml/l) or spinosad (0.3 ml/l)
- Gram pod borer (*Helicoverpa armigera*)
- The caterpillars bore the young capsules and feet on the seeds.
- Sow the crop as per recommended sowing time of respective zone.
- Spray profenofos (1ml/l) or spinosad (0.3 ml/l).

#### **Leafminer (*Chromatomyia horticola*)**

- The larvae make tunnels on the leaf.



- Spray dimethoate (1.7 ml/l)

**Thrips (*Caliothrips indicus*)**

- Nymphs and adults suck the sap from the tender shoots and leaves.
- Spray of imidacloprid (0.2 ml/l) or spinosad (0.3 ml/l).
- NO insecticides have been registered for linseed

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