

Management of Major Insect Pests in Soyabean Crop

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ARTICLE ID: 30

Introduction:

In India, soybean (*Glycine max* (L.) Merrill) has been the number one oilseed crop in terms of both area and production since 2005. The crop has shown unparallel growth over the last four decades; from an area of only 30,000 ha and production of 14,000 ton in 1970, the area reached 9.95 million ha with total production of 12.57 million ton in 2011, with an average national yield of 1264 kg/ha. The area has increased to about 10.69 million ha, and estimated production has reached to 12.68 million ton, respectively. Soybeans occupied 42% of India's total oilseeds and 25% of edible oil production. The crop currently earns about Rs. 6976 crores of foreign exchange through exports of defatted oil cake. The feasibility of growing soybean crop with minimum input/management lead to the rapid expansion in area and production with the result that India now ranks 4th in terms of global soybean area sown and 5th in terms of soybean production after USA, Brazil, Argentina and China. In India, soybean is mainly grown in the states of Madhya Pradesh, Maharashtra, Rajasthan, Karnataka, Andhra Pradesh, Chhattisgarh, Nagaland and Gujarat as a rainfed crop during the rainy (*Kharif*) season. Over the years, cultivation of the crop has been instrumental in improving the socioeconomic conditions of large numbers of small and marginal farmers in the rainfed agro-ecosystems of central and peninsular India. The crop has potential of mitigating rampant protein energy malnutrition as well as becoming ideal food of the country on account of a number of nutraceutical and functional compounds. Initially, the soybean was free of diseases and insects in India. However, its continuous cultivation with simultaneous increase in area has led to increase in disease, insect and weed incidence. Currently, soybean is severely attacked about half a dozen major diseases, a dozen of insect pest and several major weeds. Yield losses due to individual disease/insect/weed species ranges from 20 to 100 per cent. However, with integrated pest management schedule, 30-35 per cent additional yield can be obtained.

Aphid: (*Aphis glycines*)

Adult soybean aphids can occur in either winged or wingless forms. Wingless aphids are adapted to maximize reproduction, and winged aphids are built to disperse and colonize other locations. Immature soybean aphids resemble adults but are smaller and always wingless. Wingless soybean aphids are pearshaped, 1/16" long, and range from pale yellow to lime green in colour. On late-season soybeans, some aphids may be pale and smaller and often occur on lower leaves of the plant. Adults have dark-tipped cornicles ("tailpipes") at the end of the abdomen. Winged soybean aphids have a dark thorax (central body segment) and cornicles, and transparent wings that extend well past the abdomen.



White fly: (*Bemisia tabaci*)

Due to attack of the insect the leaves turn yellow and become curled. This insect spread the mosaic disease in soybean.

- Nymphs and pupae: Black and round or oval. Pupae have marginal bristles.
- Adults: Small, yellow bodied insects with white wings which are densely covered with a waxy powder.



Girdle beetle: *Oberea (Obereopsis) brevis*

Visible symptoms can be observed at the seedling stage characterized by two circular cuts on the plant's branch or stem. Seedlings and young plants are wilted or dead while older plants' leaves are just wilted or brown, and all dried up. Circular rings will be seen on affected branches. The infested part above the cut will dry up eventually. At a later infestation stage, the plant is severed at about 15-25 cm above the ground.

- **Larva:** White, soft-bodied worm with a dark head.
- **Adult:** The freshly emerged adult is yellow, red, brown on the head, thorax and bases of elytra.



Tobacco caterpillar (*Spodoptera litura*):

Symptoms

Larvae of this insect feed on leaf and scrapping the leaf tissue. Older larvae disperse and feed continuously on leaf at night. They are usually hide in the soil during the day. Female adult laying their eggs in the herd on the lower surface of leaves. The fully developed caterpillars of this insect are dark brown in colour. This insect has a yellow stripe on both sides of the body and also black spots on their body part. The larvae and adult of this insect grow rapidly at temperatures between 15-35°C.

Damage

After eating the leaves, these caterpillars start feeding on young pods also and consequently damaging 40-50 % of the pods. Soybean crop has more prone to the attack of caterpillar when higher dose of nitrogen given to the crop.



Bihar hairy caterpillar: *Spilosomaobliqua*

Symptoms:

Young larvae feed gregariously on chlorophyll mostly on the under surface of the leaves, due to which the leaves look like brownish-yellow in colour. The final instar larvae feed on the leaves from the margin. The damaged leaves of the plant appear in skeletonised/ net/ web form.

- **Eggs:** Lay in clusters of 600-700 under the surface of the leaves.
- **Larva:** Orange coloured with broad transverse band with tufts of yellow hairs that are dark at both ends.
- **Pupa:** Forms a thin silken cocoon by interwoven shed hairs of the larvae.
- **Adult:** Crimson coloured moth with black dots and a red abdomen. Pinkish wings with numerous black spots.



Stem Fly: *Melanagromyzasojae*

The eggs are laid on leaves. After hatching from the egg yellowish maggots bore the nearest vein of the leaf. The maggot then reaches the stem through petiole and bore down the

stem. If the infected stem is opened by splitting, distinct zig zag reddish tunnel can be seen with maggot or pupae inside it. The maggots feed on cortical layers of the stem, may extend to tap root, killing of the plant.



Gram pod borer: *Helicoverpa armigera*

Symptoms of damage:

The young larvae feeds on the chlorophyll of young leaves and skeletonize it. They feed voraciously on the foliage in early stage, may defoliate the plant and later they feed on flowers and pods. Identification of the pest.

- ✚ **Eggs:** Spherical in shape and creamy white in colour, laid singly.
- ✚ **Larva:** Shows colour variation from greenish to brown. It has dark brown grey lines on the body with lateral white lines and also has dark and pale bands.
- ✚ **Pupa:** Brown in colour, occurs in soil, leaf, pod and crop debris



Soybean looper: *Chrysodeixis includens* (Walker)

Symptoms of Damage:

Damaging infestations occur from early August through September. Soybean loopers usually reach higher populations in areas where cotton and soybeans are grown together.

Management practice:

- Deep summer ploughing.
- Remove and destroy all plant debris after harvest to kill pupae.
- Handpick and destroy larvae.
- Encourage natural enemies
- Install pheromone traps at a distance of 50 m @ 5 traps/ha for each insect pest.
- Erect bird perches @ 50/ha.
- Clip terminal shoots on 100 days of crop growth.
- Setting of light traps (1 light trap/5 acre) to kill moth population
- Dusting with Chlorpyriphos 1.5 % DP or fenvalerate 0.4% @ 25 to 30 kg/ha.
- Spray with Chlorpyriphos 1.5 % DP @1200 ml/ha @ 1.0 lit/ha.

Cultural practices:

Cleaning of infected stubbles followed by deep summer ploughing, optimal fertilizer application, timely sowing, proper seedbed conditions and depth of sowing, optimum seeding rate and plant population, regular scouting, rogueing and destruction of infected crop/plant parts, elimination of collateral/alternate and reservoir hosts, crop rotation and intercropping, cultivation of soybean in rainy season only and avoidance of mono varietal culture. Intercropping soybean either with asafoetida (early maturing variety) or maize or sorghum in the sequence of 4 rows of soybean with 2 rows of intercrop should be practiced. Such biodiversity will help in build-up and conservation of natural bio control fauna viz., coccinellid beetles, Chrysoperla etc. In girdle beetle and semilooper endemic areas, intercropping with maize or sorghum should be avoided. Fertilizer dose NPK and S at the rate of 20:60-80: 30-40:20 kg/ ha should be applied. Seed treatment Seed treatment by *Trichoderma viride* @ 5g seed for the management of seed, seedling and seed borne foliar diseases. This should be followed by seed treatment with Bradyrhizobium and Phosphate Solubilizing Bacteria (PSB) @ 5 + 5 gm / kg seed. Sowing time Sowing should be done

timely when soil moisture is sufficient (8-12 cm depth) to ensure proper germination. Seed rate and sowing Optimum seed rate (65-75 kg/ ha) should be used depending upon seed size. After every 15 rows, a gap of one row should be given to provide moving space for spraying in standing crop.

Mechanical Practices:

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

Biological Control:

Insects, 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 *Telenomusremus* @ 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*, *Gessoniagemma*, *Diachrysiaorichalcea* and defoliators). Spray SINPV @ 250 LE/ha. Spray of NSKE @ 5% for management of early-stage larvae and sucking pest.

Do's:

- Deep ploughing is to be done on bright sunny days during the months of May and June. The field should be kept exposed to sun light at least for 2-3 weeks
- Adopt crop rotation
- Grow only recommended varieties.
- Sow early in the season
- Always treat the seeds with approved chemicals/bio products for the control of seed borne diseases/pests
- Sow in rows at optimum depths under proper moisture conditions for better establishment

- Apply only recommended herbicides at recommended dose, proper time as appropriate spray solution with standard equipment along with flat fan or flat jet nozzles
- Maintain optimum and healthy crop stand which would be capable of competing with weeds at a critical stage of crop weed competition
- Use the NPK fertilizers as per the soil test
- Use micronutrient mixture after sowing based on test recommendations
- Conduct AESA weekly in the morning preferably before 9 a.m. Take decision on management practice based on AESA and P: D ratio only
- Install pheromone traps at appropriate period.

Don'ts:

- Do not plant or irrigate the field after ploughing, at least for 2-3 weeks, to allow desiccation of weed's bulbs and/ or rhizomes of perennial weeds
- Avoid growing monocrop.
- Do not grow varieties not suitable for the season or the region
- Avoid late sowing as this may lead to reduced yields and incidence of white grubs and diseases
- Do not use seeds without seed treatment with biocides/ chemicals.
- Do not sow seeds beyond 5-7 cm depth
- Pre-emergent as well as soil incorporated herbicides should not be applied in dry soils. Do not apply herbicides along with irrigation water or by mixing with soil, sand or urea
- Crops should not be exposed to moisture deficit stress at their critical growth stages
- Avoid imbalanced use of fertilizers.
- Do not apply any micronutrient mixture after sowing without test
- Do not take any management decision without considering AESA and P: D ratio
- Do not store the pheromone lures at normal room temperature (keep them in refrigerator)

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