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Major Insect Pests of Soyabean Crop and Their Management Strategies

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Soyabean, *Glycine max* L is a crucial crop globally, distinguished for its high nutritional value and multiple applications. In spite of its cultivation is significantly challenged by insect pests, leading to substantial yield losses. This paper discusses the major insect pests afficting soyabean crops, identification, damage symptoms and effective management strategies. These insect pests include stem flies, girdle beetle, tobacco caterpillar, pod borer, bihar hairy caterpillar, green semilooper and sucking pests such as aphids, Jassids and whiteflies. Effective management practices are necessary to mitigate these losses and ensuring sustainable soyabean production.

Key words : Soyabean, Insect Pests, Management

Introduction

Soyabean, *Glycine max.* L is the unique grain. legume globally known for its dual purpose uses as pulse and oil seed which containing 38.44 percent protein and 18.22 percent oil. Soyabean cultivated a cross 12.7 million hectors in India and producing 12 million tons annually (Laute *et.al*, 2015). This cropes is called "Miracle bean" due to its versatile application in food, cosmetics and industrial products. Despite its economic importance, insect pests cause significant yield reductions, with global losses estimated at 26.40 percent. It has been observed that about a dozen insect pests frequently infest soyabean crop that are of economic importance and individully causing 20-100 percent yield losses (patel *et.al*, 2019 b.)

Major Insect pests

Soyabean is infested by a dozen of major insect pest (Table-1) damage potential of major insect pests varies 20-50 percent. However, if the population of insect pests is managed properly, an additional of 27 percent may be realized. The insect pests complex differ with regions. Stem fly and semiloopers damage soyabean crop in all the soyaben growing areas. Complex of semiloopers and girdle beetle are prominent in control parts of the country that accounts for more than 80 percent of soyabean and production. Incidence of gram pod borer and damage to flower and young pods by tobacco caterpillar in this regions has become a matter of great concern during the recent season. Whitefly, Jassids and aphids damage the crop extensively.

Table 1: Major Insect pests of soyabeen in India.

Insect Pests	Active Periods
Foliage feedies	
Semiloopers	Pre-bloom to podding
Tobacco caterpillar	Pre-bloom to podding
Gram pod boer	Pre-bloom to podding

Bihar hairy caterpillar	Pre-bloom to podding
Leaf folder	Pre-bloom to podding
Leaf minor	Pre-bloom to podding
Blue beetle	Pre-bloom to podding
Stem Bour	
Stem fly	Seedling to seed development
Girdle beetle	Pre-bloom to seed development
Gram pod bour	Pod initation to seed development
Pink pod bouer	Pod initation to seed development
Sap feeder	
Whitefly	Seedling to pre-bleom
Jassid	Seedling to pre-bleom
Aphid	Seedling to pre-bleom

Stem fly (*Melanagromyza sojae* zehntner): Prevalent in most of the Soyabean growing areas. This insect causes a signifient seedling mortality. The maggots make zig-zag tunnels in the stem, which hinder the availability of water and nutrients in different parts of the plants. It remains active throughout the season and complete 3-4 life cycle.

Semiloopers (C*hrysodeixis acuta* walker): Soyabean crop is infested by a complex of semiloopers. Differing in colour, shape and size. The young larvae initially skeletonize the foliage and later on conpletvly divour the plants. of the event of heavy incidence, they also damage buds, flowers and young pods.

Tobacco Caterpillar (*Spodoptera obliqua* Fab.) : The early instars larvae remains gregarious for 4-5 days and feed on the chlorophyll content of the leaves. Infested plants can easily be spotted in the field. Later on, larvae disperse on high boring plants and damage the leaves by creating hols.

Gram Pod Borer (*Helicoverpa armigera* Hub.): This polyphagous insect pests is one of the major pests in Madhya Pradesh. Initially it feeds on young pods, subsequently it damage developed pods and seeds. Considerable variability has been observed in this insect with respect to colour, pattern of body, stripes and size. This insect exhibits resistance against most of the chemical insecticides after second instar.

Girdle Beetle (*Obereopsis brevis* Swed): A stem girdling insect pest owes its significance due to its interacted life-cycle. The adult beetle lay eggs during july-first fortnight of August and complete the life-cycle during the same copping season, but the adults that emerged during the second fortnight of August and September. Over winter as prepupa and complete life-cycle only after the onset of monsoon in the following year. The infested plants and the plant parts show typicaal drying due to girdles made by the female for egg laying.

Leaf Miner (*Aproaerema modicella Devee*): It is prevalent in Madhya Pradesh, Maharashtra and Karnataka states of the country. Larvae form typical mines (blotches) on the leaves. Early incidence of this insect can cause substantial yield losses.

Whitefly (*Bemesia tabaci* Genn): It is a serious insect pests of soyabean in northern region of India. The nymphs and adults suck the plant sap and also transmit yellow mosaic virus diseases.

Leaf Hopper / Jassid (*Emoasca fabae* Fab.): Nymphs and adults cause damage by sucking the sap from the central portion of leaves and petioles prolonged exposure to leaf hoppers results in a "V" shaped yellowing on the tips of Leaflets which may spread and the intire leaflet become yellow. Severely infested crop give a scored appearance which results in a condition called as "hopper burn".

Aphids (*Aphis fabae* Scop. *and Aphis glycines* Mats): Damage is caused by nymphs and adults that suck sap from leaves, tender shoots and flowers. Plants becomes stunted with distorted foliage and stem. The characteristic sign of aphid attack is presence of sooty mould that is developed on honey dew excreated by aphids. Aphids also act as vectors of viral diseases.

Intergrated Pest Management Strategies

Summer deep planting : Deep ploughing is essential during summer after harvesting the rabi crop. This facilitates exposing the hibernating insects to extreme of sun heat and predatory birds.

Proper sowing time : Crop sown during the second fortnight of June, escapes damage due to stem fly. However, where girdle beetle is a recurring problem. Hence, sowing should be done during the first fortnight of July.

Selection of suitable varieties : Verities recommended for a particular agro climatic zone, should only be used. More yield should not be only criterion. Cultivation of marginally less yielding but insect resistant or tolerant variety is always remunerative. Varieties, *viz*, PS-564, PK-262, PK-472, Pusa-16, Pusa 20, Pusa-24 etc have been reported to be resistant / tolerant to various insect pests in different climatic zones. Yellow mosaic- resistant varieties such as PK-416, PK-472, PS-564, Pusa-16, Pusa-20, Pusa-24 etc should be sown in whitefly and yellow mosaic disease prone areas.

Balanced nutrition : Use of excessive nitrogenous fertilizers leads to more incidence of defoliator insects and girdle beetle. Therefore, use of optimised quantity of recommended nutrients only is preferred. Use of potassium fertiliser impure crop health and previous resistant to insect pests.

Destruction of infested plants and plant parts : Bihar hairy caterpillar and tobacco caterpillar are gregarious feeders at the initial stage of the crop. At this stage infested plants are easily spotted in the field. Removal and destruction of such plants prevent larvae to migrate and damage other plants. Likewise, girdle beetle infested plants are also easily recognised by dried portion alone the girdles. Up to 45 days after showing remove the infested plant parts from below the girdle to destroy eggs and grubs of girdle beetle for spotting and removing the infested plant and plant parts, constant scouting of entire field is very essential.

Use of botanicals: Spray the soyabean crop with the botanicals, viaz neem, tobacco, jpomoea and pongamia leaves mixed with cow urine. This preparation is to be sprayed frequently to deter the insets from feeding on foliage.

Use of light treps: Adults of most of the defoliator insects are nocturnal and are attracted to light traps. The trapped insects may be collected using appropriate recommended light trap (1 trap/ hectare) and destroyed. By doing so, adult can be prevented from mating and laying eggs, thus the crop can be saved.

Use of pheromone traps: Infestation by *Helicovarpa armigera* and *Spodoptera litura* is minimized through specific pheromone traps. These traps help in monitoring the incidence and mass- trapping of the adults. The sex pheromone tracks can be used 5 traps / hectare for attracting male adult insects. Care should be taken that the pheromone septa (Leure) are not touched with bare hands while fixing on the trap.

Installation of bird perches: To exploit the potential of insects-predatory birds, birds perches (2 perches / hectare) should be install in the crop fields.

Bio- control options against insect pests: Despite the great potentiality of the bio-control againts of soyabean insect pests, they have not gained the desired momentum. Several natural enemies, including parasites, predators and insect pathogen have been found to operate in soyabeen based copping system (Table-2). Most of them are highly active during the month of August. Under congenial weather conditions, the entomo-pathogen, *Beauveria bassiana* alone can wipe of the population of lepidopterons defoliators.

Table -2 : Bio-control agents of insect pests of soyabean and their potentiality.

Bio-control agents	Host Insect pests	potentiality
a. Parasitoids *Apanteles, Trichogramma, Bracon, Brachymeria, Sturmia spp.*	Semilooper, Tobacco Caterpillar, Gram pod borer	6-30 % Larval mortality
b. Predators *Cantheconidia, Furcellata* and *Chrysoperta Cornea*	Semilooper, Tobacco Caterpillar	10-12 % Larval predation

c. Insect Pathogen *Beauveria Bassiana*, *Nomuraea rieleye*, Bt and NPV	Semilooper, Tobacco Caterpillar, Gram pod borer	15-100 % Larval mortality

Entomo-pathogens for Insect pest management viruses : some virous like nuclear polyhydrosis virus (NPV) cause disease in insect pests and reduce their populations for the management of ***Helicoverpa ormigera and spodoptera litura of*** HaNPV SNPV @ 250 le/ha has been found to be effictive.

Bacteria : Encouraging results have been advised for management of insect pests through ***Bacillus sp.***in different crops. Bacteria kill the insect pests by causring different diseases. The insect body becomes flacid and the larvae dies within 1-3 days. Commercial formulations of ***Bacilles.***

thuringiensis are available with various trade name viz, Dipel, Halt, Delfin, Biobit. They have been found effictive against defoliating larve @ 1.0 Kg or 1.0 L/ha.

Fungi : In contract to virus and Bactria (which infest the insects from inside), fungi infest the insect from outside through the integument. On reaching inside the insect body, they develop cottony mycelium. This mycelium again penetrates through the integument. Finally the insect body gets covered with white powdery substence, which disperses through wind, to infest other insects as well. Naturally occuring fungi like ***Beauveria bassiana, Metarrhizium anisopilai, verticelium likenai*** couse different diseases in insects. There are commercially avilable in the different trade have and use @ 2.5 Kg/ha.

Chemical management : Soyabeen has capacity to yield normally even with 20-25 percent foliage loss. Therefore, it is advisable to use recoverended insecicides.

Use of recommended insecticides : Following insecticides have been recommended for the control of soyabean insect pests by the Central Insecticide Board.

For stem fly and blue beetle : Thiomethoxam 30 FS@ 10 ml/Kg seed, Thiodicarb 75 WP@ 400-500 gm/ha, Emamectin benzoate 5 SG@ 100-125 gm/ha.

for girdle beetle : Thiacloprid 21.7 SC@ 650 ml/ha, Spinosad 45 SC@ 125-150 ml/ha.

For defoliater insect : Rynaxypyre 20 SC @ 100 ml / Indoxacarb 14-5 SC @ 300-400 ml/ha.

For pod borers : Fipronil 5 SC @ 600-700 ml/ha, Thiodicarb 75 WP @ 400-500 ml./ha, Lufenuron 5-4 EC @ 400-500 ml/ha.

For sap sucking insects : Thioamethoxam 300 FS @ 100 ml/kg seed, Imdacloprid 48 FS @ 1.25 ml/kg seed, Imidacloprid 17.8 SL @ 100-125 ml/ha, Acetamiprid 20 SP @ 200 gm/ha, Difenthuron 500 WP @ 200 gm/ha.

Conclusion

The soyabean crop faces significant threats from different insect pests, leading to considerable yield losses. Effective management strategies, including Integrated pest management technology are essential for sustainable production. By integrating cultural, botanical, biological and chemical control measures. Thus, farmers can reduce pest damage and enhance crop productivity, ensuring food security and economic stability.

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