

Soyabean Girdle Beetle *Obereopsis brevis* (Swed.): an Emerging Threat and its Integrated Pest Management

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Soybean (*Glycine max* L.) is an important oilseed and protein crop cultivated worldwide for its nutritional and economic value. Its production is affected by several insect pests among which the soybean girdle beetle, *Obereopsis brevis* (Swed.) is an important stem-boring pest causing considerable yield losses. The pest damages the stem by girdling, leading to interruption of vascular flow, drying, lodging and reduced seed yield. Yield losses of 14–42% have been reported, with an Economic Threshold Level (ETL) of 12.36% infested plants. This article reviews the biology, nature of damage, incidence, economic importance and ETL of *O. brevis*, with emphasis on integrated pest management (IPM) approaches. Adoption of timely monitoring and eco-friendly IPM strategies can help minimize pest damage, reduce unnecessary insecticide use and promote sustainable soybean production.

Introduction

Soybean (*Glycine max* L.) originated in Asia and is now one of the most extensively cultivated leguminous crops worldwide owing to its diverse applications and considerable economic value (Liu *et al.*, 2020). It is regarded as a highly versatile and nutritionally important legume because of the distinctive composition of its seeds (Shea *et al.*, 2020). Soybean seeds generally contain approximately 18–22% oil and 38–56% protein, along with a favourable amino acid profile (USDA, 2018). The crop serves as an important source of high-quality protein and edible oil and has wide applications in human food, animal feed, and the oilseed industry. Due to its exceptional nutritional and economic significance, soybean is popularly referred to as the “Miracle Golden Bean of the 20th Century.”

Globally, soybean accounts for nearly 61% of total international oilseed production and is cultivated on approximately 6% of the world's arable land. According to USDA (2021), global soybean production was approximately 391.40 million tonnes, obtained from an area of 121.69 million hectares, with an average productivity of 2.76 tonnes ha⁻¹. The United States, Brazil, and Argentina are the major soybean-producing nations and collectively contribute approximately 81% of global soybean production.

Soybean productivity is influenced by several abiotic and biotic factors, including drought, weed competition, insect pests, and diseases (Mammadov *et al.*, 2018). Among these constraints, insect pests are particularly important as they can increase production costs and adversely affect both crop growth and the quality of harvested produce. Approximately 380 insect species have been documented as pests of soybean in different regions of the world (Patel and Rahul, 2020). Of these, nearly two dozen species are considered economically important and may cause substantial yield losses. Based on their feeding behaviour, soybean insect pests can be broadly classified into six major groups, namely seed and seedling feeders, stem borers, foliage feeders, sap-sucking insects, flower and pod borers,

and storage pests (Biswas, 2013). Among the important insect pests responsible for considerable reductions in soybean seed yield is the girdle beetle, *Obereopsis brevis* (Swed.). This concealed stem-feeding pest damages the soybean stem and can result in yield losses ranging from 14% to 42%. The Economic Threshold Level (ETL) for the soybean girdle beetle, also known as the longhorn beetle, has been reported as 12.36% infested plants. A thorough understanding of the pest's life cycle, damage symptoms, damage pattern, and ETL is essential for developing effective and environmentally sustainable management strategies.

(I) Incidence/occurrence of pests: Chouhan *et al.*, 2019 reported that the infestation of girdle beetle started in 2nd week of August when crop was 28 days old with initial plant infestation 1.40 percent. Maximum and Peak infestation is observed in 2nd week of September it ranged from 11.6 to 15.00 percent. Plant infestation was also observed during the 1st fortnight of October but it was a negligible level. Thus the pest remained active for about two and a half month that is up to before harvest of the crop.

(II) Host plant and Distribution: soybean stem girdle beetle, *Oberiopsis brevis* are major pest of soyabean crop. This pest also attacks occasionally other leguminous crops like pea, pigeon pea, green gram and cowpea and sometimes dicotyledonous plants.

(III) Nature of damage:

The Girdle beetle, *Oberiopsis brevis* primarily damage soyabean crop through girdling by adult and tunnelling by larvae. Larva chew two parallel circular rings arounds petioles or stem bore inside and lay eggs creating internal tunnels by eating vascular tissues. Damaged plants were identified based on drooping leaves/ withered leaves due to construction of two parallel rings (Girdles) on the stem, petiole and base of central trifoliate leaf by female girdle beetle. As a result of girdle formation, the leaf withers at the distal ends and dried up ultimately. In the course of time, the girdled parts also dry up.

(IV) Morphological identification: Eggs of girdle beetle are white spindle shaped, Larvae are cylindrical, soft-bodied and legless, creamy colour with distinct dark brown hardened head capsule. Pupae are exarate type and Adult is reddish brown and wing or elytera is dark brown to black in colour. Antennae are long thread like covering full body length and presence of strong chewing mandibles are major characteristics of pest.

(V) Biological life cycle: Girdle beetle belongs to order coleoptera and family cerambycidae, single female can lay between 100 to 125 eggs over her lifetime, oviposits its eggs on multiple plants. Girdle beetle creates two characteristic ring-like cuts around it, spaced about 7–8 cm apart. Within this girdled section, drills three small holes two minor ones and a slightly larger central hole. She deposits her eggs into this central hole and then flies off, leaving the eggs hidden within the stem. After 5-6 days the eggs hatch into larvae that immediately bore deeper into the stem. They feed on the vascular tissues, disrupting water and nutrient transport. This causes wilting and eventually death of the affected plant part. The mature larvae pupate inside the stem, safely enclosed within the plant's tissues. After completing pupation, the adult beetle emerges through an exit hole in the stem, ready to repeat the cycle.

(VI) Integrated Pest Management Strategies: The subsequent Good Agricultural Practices need to be implemented to effectively handle pest infestations stem girdle beetle in soyabean crop. First most Start scouting 15–20 days after sowing.

A. Cultural Practices

- Field Sanitation including -Deep summer ploughing and expose and destroy pupae and weed bunds to cleaning
- Timely sowing to avoid peak infestation periods
- Crop rotation with non-host crops like wheat or gram
- Use of soyabean resistant variety towards Girdle beetles are are VL Bhat 201, MAC 1281, NRC 12, NRC 7 Indira Soya 9 and DSb-1.

B. Mechanical Control

- Regularly inspect the crop and manually remove and destroy infested plants or plant parts to reduce pest populations.

- Install light traps during night to attract and capture adult beetles.
- Use pheromone traps for monitoring and reducing adult pest populations.
- Install bird perches in the field to attract insectivorous birds and encourage natural pest control.

C. Biological Control

- Application of *Beauveria bassiana* a fungal bio-agent
- Promoting natural enemies like parasitic wasps and predatory beetles

D. Chemical Control

- It is most widely and effective method of controlling the pest and can save the crop Listed chemical which is used in soyabean is –
- Thiacloprid 21.7 SC @ 750 ml /ha or Profenophos 50 % EC @1250 ml/ ha or Indoxacarb 15.8 EC (333 ml/ha)
- Emamectin Benzoate 5% SG & 1.9 % EC @ 425 ml/ ha only effective till 3rd instar of the larvae
- Chlorantraniliprole 18.5 SC @150ml/ha for hand spray mixed with 500L water (before flowering- can protect crop upto 25-30).

Conclusion

Stem girdle beetle, *Obereopsis brevis* (Swed.) are major and destructive pest of soyabean crops. Studying its seasonal patterns of insect pests in a specific crop is important because it offers insights into the prevalence of various pests and the existence of their natural enemies. Furthermore, it helps to identify the susceptible growth phases of the crop. This essential data is instrumental in the development of efficient strategies for managing insect pests at different stages of crop development.



Fig: 1. Damage symptom of Girdle beetle, *Obereopsis brevis*



Fig: 2. Adult of Girdle beetle

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