

Integrated Pest Management of Fall Army Worm, Spodoptera frugiperda (J.E. Smith)

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ABSTRACT

Fall armyworm (*Spodoptera frugiperda*) is a serious invasive pest of maize causing heavy yield losses. The larvae damage crops by feeding on leaf whorls, creating holes, frass accumulation, and a torn appearance, sometimes destroying the growing point and cobs. The pest completes its life cycle in 36–42 days, with larvae being the most destructive stage. Management involves an integrated approach including preventive measures (deep ploughing, timely sowing, intercropping), regular monitoring with economic threshold levels, and control through mechanical removal, neem-based products, biological agents like *Trichogramma pretiosum* and *Metarhizium* spp., and need-based insecticides such as spinetoram and chlorantraniliprole. Integrated pest management (IPM) ensures effective and sustainable control.

INTRODUCTION

The invasive insect pest fall army worm, *Spodoptera frugiperda* (J.E. Smith) (Noctuidae: Lepidoptera), native to the tropical and subtropical regions of the Americas, first emerged as an invasive species outside its native range in Africa (Goergen *et al.*, 2016) and was subsequently reported for the first time causing severe damage on maize in Karnataka, India (Sharanabasappa *et al.*, 2018). Thereafter, the pest has spread to most states of India. It causes yield loss up to 35% on maize crop (Day *et al.*, 2017).

Biology or life cycle

The fall army worm life cycle include egg, 6 larval stages, pupae and adult.

The adult female moth lays 100-200 eggs on the leaves. The eggs are covered in cream-colored protective scales. In 3-4 days, larvae emerge from eggs and complete their life cycle in 36-42 days. First to third instars larvae feed on leaves by scrapping and it result in appearance of semitransparent white patches on the leaves. The later instars larvae feed on the older plants, caterpillar bore into the cobs and feeds on the developing kernals.

Identification marks of fall army worm

- A characteristic pale, inverted “Y”-shaped marking is present on the larval head between the eyes.
- On the maize fall armyworm’s second-to-last abdominal segment, four dark spots appear in a square formation.

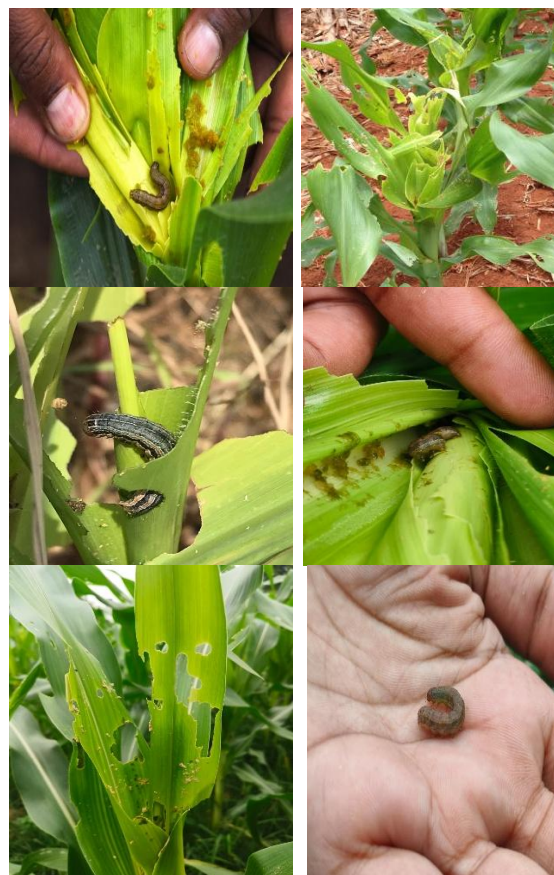
Damage symptoms

Fall army worm caterpillars feed inside whorls on young plants. Young caterpillars feed by scrapping the leaves, resulting formation of white, semitransparent patches on the leaves.

Damage by grown up larvae is characterized by torn appearance on leaves and presence of moist saw dust like frass near the whorls on upper leaves of the plant.

Deep feeding in the whorl may destroy developing tassels

Caterpillars enter the cob and feed on developing kernels.



Fall army worm management practices

1. Preventive Measures

- Deep ploughing to expose pupae to predators and sunlight.
- Early sowing with first rains and **synchronous planting** across the area to reduce pest buildup.

- Intercropping maize with pulses like **pigeon pea, black gram, green gram.**
- Follow recommended **manures and fertilizers** for proper crop growth.

2. Monitoring

- Start **field scouting** immediately after seedling emergence.
- Look for:
 - Egg masses
 - White patches on leaves (early damage)
 - Elongated holes, torn leaves, and frass (later stages)
- **Action Threshold Levels:**
 - Early stage (15–30 DAS): **5–10% damaged plants**
 - Mid stage (30–50 DAS): **10–20% damaged plants**
 - Late stage (50–70 DAS): **>20% damaged plants**

3. Control Measures

Mechanical Control

- Collect and destroy egg masses and young larvae manually.

Botanical Control

- Spray **5% NSKE** or neem-based formulation
- Azadirachtin 10000 ppm @ **2 ml/litre water**

Biological Control

Conservation and augmentation of natural enemies form a key pillar of fall armyworm IPM programmes recommended for

smallholder maize systems (Prasanna *et al.*, 2018).

- Release egg parasitoid ***Trichogramma pretiosum***

✓ @ **3 cards (50,000 eggs)/acre**, twice at 15-day interval

- Spray entomopathogenic fungi:

✓ *Metarhizium rileyi* @ **2–3 g/litre**

✓ *Metarhizium anisopliae* @ **3 g/litre**

- Spray should be **directed into leaf whorls** for effective control.

4. Chemical Control (Need-based)

Field evaluations in Indian maize have shown spinetoram and chlorantraniliprole, among other diamide and spinosyn molecules, to be among the most effective insecticides against fall armyworm larvae (Deshmukh *et al.*, 2020).

- **Bt insecticide @ 2 ml/l**
- **Spinetoram 11.7 SC @ 0.5 ml/l**
- **Chlorantraniliprole 18.5 SC @ 0.4 ml/l**
- **Thiamethoxam + Lambda-cyhalothrin**

5. Restricted Entry Interval (REI)

- Bt: **1 day**
- Spinetoram: **4 hours**
- Chlorantraniliprole: **12 hours**
- Thiamethoxam + Lambda-cyhalothrin: **24 hours**

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