

Fall Armyworm Invasion

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INTRODUCTION

Spodoptera frugiperda, often known as the fall armyworm, is a destructive insect pest that is a member of the Noctuidae family in the Lepidoptera order. It is a polyphagous pest that harms economically significant farmed cereal crops including maize, rice, sorghum, cotton, and other vegetable crops, which has an effect on food security in the long run. One of the most adaptable crops, maize, *Zea mays* L. (Poaceae), is widely accepted and can grow in all but Antarctica's agro-climatic conditions. Due to its high genetic yield potential among cereals and ranking as the third-most significant cereal crop in the world after rice and wheat, maize is regarded across the globe as the "Queen of Cereals." Over 100,000 acres of maize are planted in 70 countries, 53 of which are developing nations. Maize is grown in India for a variety of uses, including human consumption, animal and bird feed, food processing, and the production of starch, dextrose, corn syrup, and corn oil. Maize has an energy density of 365 Kcal/100 g and comprises around 72% carbohydrate, 10% protein, and 4% fat. The fall armyworm feeds on plant species' leaves, stems, and reproductive organs. It is indigenous to the Americas' tropical and subtropical climates. One of the frequent pests of maize in South and North America is fall armyworm, which was initially discovered in America. fall armyworm incidence recorded in India in May 2018.



Fig. 1: Fall armyworm

To reduce the loss, effective pesticide and bio-pesticide are recommended, along with awareness campaigns about the pest's symptoms, early detection, and control measures. In the long run, national policies should encourage lower risk control options through short-term subsidies and quick evaluation and registration of bio-pesticides and biological control products. It is necessary to assess suitable crop varieties that can withstand the fall armyworm.

Life Cycle of the insect

Fall armyworm has a four-stage life cycle: eggs, larvae (caterpillars), pupae and adults (moths).

Egg

Typically, eggs are laid on the underside of leaves. The eggs may also be laid on top of the leaves and stem of early maize plants when the population is abundant. The egg masses have a hairy coating and are cream, grey, or white in colour. Frequently, this mass comprises 100–200 spherical eggs. In her lifespan, a single female moth typically lays 1,500 eggs. In warm weather, the egg stage only lasts a couple of days.



Fig. 2: Egg

Larvae

Within 3-5 days, eggs hatch as little caterpillars that travel to the funnel. Additionally, wind can transport the tiny caterpillars to neighbouring plants.



Fig. 3: Larvae

Small caterpillars could have a greenish appearance, whereas larger caterpillars might be orange, green, black, or brown in colour. Within 14–22 days (2–3 weeks), caterpillars reach maturity, at which point they fall to the ground to pupate.

Pupae

In the soil, the caterpillar transforms into a reddish-brown pupa. It is challenging to monitor or see this stage. The caterpillars may weave together leaf fragments and other materials to create a

protective covering on the soil surface known as a "cocoon" if the earth is too hard when they are pupating. The maize cob may also contain pupae.



Fig.4: Pupa

When it's warm out, the pupal stage lasts 8 to 9 days, but in colder climates it can last up to 30 days.

Adult

Moths are active at night, particularly on hot, muggy nights. The moths' dark grey colour

makes them hard to spot, especially when they're lying on the ground or close to it, although in some instances if the population is dense, some may be discovered resting on the crop in the field. There is an obvious (visible) white mark on the male forewing.



Fig.5: Adult moth

Adult life is thought to last an average of 10 days, with a range of 7 to 21 days. Although some egg laying can continue for up to three weeks, the female typically lays the majority of her eggs during the first four to five days of adulthood.

How to identify harm caused by the fall armyworm on maize

At almost every stage of development, starting when the plant is young and even while it is on the cob, caterpillars eat maize. Caterpillar damage to the leaves can occasionally be severe and interfere with the plant's capacity to produce healthy cobs and excellent grain. Maize suffers severe "window pane" damage as a result of leaf eating.



Fig. 6: Damage symptoms

The leaves have large, elongated, irregular holes. caused when feeding by the large caterpillars. Larger caterpillars create the uneven, elongated holes in leaves, while smaller caterpillars cause the transparent or window-like spots. The most typical damage symptoms in the early whorl stage are window panes, however these might be mistaken for damage from other stem borers. You can tell if it's autumn armyworm by looking for the real larvae that are munching on the leaves. When eating, bigger caterpillars create wider holes that result in ragged whorled leaves and a sawdust-like substance called "frass." Large lumps of frass are produced by fresh feeding.

Managing fall armyworm

- ❖ Use certified high-quality seed that has been approved for the region. The seed should have good germination, be free of diseases, and have other desired characteristics like high yields.
- ❖ Increase plant health by maintaining proper plant spacing, managing the soil, and providing crops with adequate nutrition through the application of organic or inorganic fertiliser or by intercropping legumes that fix nitrogen. Crops can better survive pest infestations and avoid damage with the aid of practises that increase plant vigour.
- ❖ In plots with varying ages, avoid planting late or in stages. All the female moths in an area will come to your field to deposit their eggs if it is one of the few late-planted plots.

Tools for Fall armyworm invasion control

Pesticides are expensive, may pose health concerns to people and cattle, and may kill natural enemies and other useful creatures in the ecosystem, even if they offer a degree of crop protection that cannot be assured by alternative methods. Extreme care must be used when using them.

1. Choose pesticides that are labelled, nationally registered, readily available locally, have a minimal health risk, are target specific, and degrade quickly. Products that are illegal or fake must be avoided. Rotate between pesticide groups with various mechanisms of action to prevent resistance. A maximum of two to three sprays are advised per season.
2. Use of the Fall armyworm pheromone trap for moth monitoring and mass capture. Pheromones have been employed to monitor pest populations, catch large numbers of animals, and prevent mating. In certain places of the world, pheromones have proven a beneficial technique for keeping an eye on male populations.
3. Light traps can be used to trap both male and female insects, helping to control adult Fall armyworm. The mature moths were caught in black light traps.
4. Under small scale production, hand selecting the egg masses during frequent field field inspection assists helps the pest control the hand picking

the egg masses during regular field field inspection. The vast majority of farmers who employed these methods acknowledged that they were "fairly successful."

5. Utilizing *Trichogramma pretiosum*, an egg parasitoid, as a biological control agent aids in the management of the

Fall armyworm. These methods improve the environment and human health while assisting in insect management.

6. As a last option, the use of pesticides like spinosad and chlorantraniliprole helps to lower the moth Population.