University of Agricultural and Horticultural Sciences
Shivamogga

One day workshop on

Identification and Management of Fall Armyworm on Maize

Authors:
Dr. Sharanabasappa, Dr. Kalleshwaraswamy C.M.,
Dr. Shivanna B.K., Maruthi M.S. and Pavithra H.B.
Department of Entomology, College of Agriculture, Shivamogga.

February-2019
Introduction

The fall armyworm (FAW), *Spodoptera frugiperda* (J. E. Smith) (Lepidoptera: Noctuidae) native to Americas is considered as one of the important invasive polyphagous pests.

It is found in several countries such as Brazil, Argentina and USA causing economic losses in a variety of crops such as maize, soybean, cotton and beans. In 2016, it was reported from Africa.

In India, this pest was first reported in May 2018 on maize from Davanagere and Shivamogga districts by Dr. Sharanabasappa and Dr. Kalleshwaraswamy C.M., UAHS Shivamogga Scientists and further molecular confirmation by Dr. R. Asokan at Molecular Entomolgy Lab, IIHR, Bengaluru. The presence of this pest is reported in all the southern states and few northern states of India. In all these places it is causing devastating damage to maize, sweet corn, baby corn and sorghum. Now this pest is also reported from neighbouring countries such as Bangladesh, Thailand, Sri Lanka and Myanmar.

**Reasons for outbreak of this pest :-**

1) High fecundity - which can lay upto 1000 eggs.
2) Wide host range - having more than 553 hosts.
3) Long migration power - which can migrate 300 km in a day.
4) Less number of natural enemies in its new habitat has made it difficult to manage this pest.

**Biology of fall armyworm**

**Fall armyworm has 4 main stages of development :**

- **Egg**
  - Incubation period: 2 to 3 days

- **Larva**
  - Larval period: 14 to 19 days

- **Pupa**
  - Pupal period: 14 to 19 days

- **Total life cycle**: 32 - 46 days
Egg stage

Gravid female lays eggs in clusters ranging from 55 to 888 on the upper or lower leaf surface of the maize plant, base of the plant and also in leaf whorls covered with layer of scale by female moth. The eggs are dorsoventrally flattened, golden yellowish in colour and turns to black colour before hatching. Female moth can lay eggs which varies from 835 to 1169. Incubation period ranges from 2-3 days.

Larval stage

First instar larvae are greenish in colour with a black head and turns greenish brown in the second instar. The third instar is brownish with three dorsal and lateral white lines. Fourth to sixth instars are brownish black with three white dorsal lines and a light lateral line. Black tubercles are found dorsally on the body which bears spines. The frons has a white inverted “Y” line on head and 4 black dots in a square form on 8th abdominal segment. Each larva passes through six distinct instars spread over a period of 14-19 days.

Identification of FAW Caterpillar
Prepupal & Pupal stage

During the prepupal period the full-grown larva stops feeding, initially turns greenish and later bright brown in colour. Pupation takes place in soil and duration of the pupal period is about 9 to 12 days.

Adult stage

Forewing of male is shaded with gray and brown, with triangular white patch at the apical region and circular spot at the center of the wing. The forewings of females are uniform greyish brown to a fine mottling of gray and brown. The hind wing is silver-white with a narrow dark border in both male and female. The total life cycle of male and female moth ranges from 32-43 and 34-46 days, respectively.

Symptoms of attack

Young age caterpillars (1-3 instar stage) feed on leaves and cause window pane-like damage, initially appearing as only “scratch” on the leaf.

As the caterpillars grow, they feed on large amounts of leaf tissue causing large ragged and elongated holes on leaves, leading to a shredded appearance.
Stage of the crop

Its incidence starts when the crop is around 10-12 days after sowing. In early stage of the crop 2-3 larvae are noticed and later single larva per plant is noticed.

Scouting and monitoring for timely action

Regular field visit and early observation of symptoms of fall armyworm is essential for its effective management.

This can be done by proper scouting, which involves walking in crop fields in a systematic pattern to physically look for larvae or damage by the pest every alternative days, starting from crop emergence stage onwards.

Walk in a “W” patterns to examine a number of plants at ten stop points depending on the size of the farm and lookout the followings

2. Green, brown or black larvae inside the leaf whorl particularly young maize crop.
3. Early-feeding / “leaf scratching” lesions.
4. Ragged and elongated holes on the leaves.
5. Damage on tassels and ears.

**Adhoc recommendation for the management of FAW**

The following are the key measures and should be applied in an integrated management approach (combining several intervention measures) since every positive action has an additive effect:

1. Ploughing before onset of rains to expose pupae to predators and sunlight.
2. Crop rotation with Groundnut, Sunflower and Bajra
3. Area wide sowing early in June and avoid late sowing in the month of August
4. Installation of pheromone traps (2 traps per ac) at the time of sowing
5. Handpicking and squashing egg masses and neonates.
6. Spraying of neem based insecticides @ 2 ml per lit of water
7. Spraying of *Nomuraea rileyi* @ 2 g or *Metarrhizium anisopliae* @ 2 g per lit of water
8. Use of insecticides like Lambda cyhalothrin 5 EC @ 1 ml per lit. or Chlorantraniliprole 18.5 SC @ 0.4 ml per lit. or Emamectin benzoate 5 SG @ 0.5 g per lit. or Spinetoram 11.7 SC @ 0.4 ml per lit. of water. The spray should be directed to the plant whorls and top leaves.
9. To delay insecticide resistance development, use insecticides in rotation having different modes of action (above insecticides in alternate)
Natural enemies of Fall armyworm

Braconid parasitoid

Earwig

Tachinid fly

Nomuraea rileyi

25 days old maize crop infested by Fall armyworm
For any enquiries, contact:

**Dr. Sharanabasappa or Dr. Kalleshwaraswamy C.M.**
Department of Entomology  
College of Agriculture,
University of Agricultural and Horticultural Sciences,  
Navile, Shivamogga-577 204  
Email: sharanu.deshmukh@gmail.com / kalleshwara@gmail.com

Financial Assistance by:
**Director of Research**  
University of Agriculture and Horticultural Sciences,  
Shivamogga-577 204