

Destruction of Maize Crop By Fall Armyworm (*Spodoptera frugiperda*) In Karnataka

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Abstract

After demolish corn field area of sub-saharan Africa, the fall armyworm (*Spodoptera frugiperda*) entered in India in 2018. The pest infestation has already spread to most of the states in India. An origin of America, the *Spodoptera frugiperda* has spread through trade routes to Africa and Asia. There is no alternative to get rid of this prodigious eater of maize plant and scientists suggest a multi-pronged approach calculate on geographical location and extent of the infestation. Maize monoculture and excessive use of pesticides that boost resistance have turned the fall armyworm into a severe pest. A shift towards agro-ecological approaches like natural, organic farming and multiple cropping systems could help to control the pest attacked. Maize farmer in many parts of Karnataka state were taken by shock in July 2018 when an unknown caterpillar attacked their maize crop. This new pest was identified by the scientists very quickly.

Introduction:-

Maize (*Zea mays* L.) is also known as Corn. It is a monocot plant belongs to Poaceae family. It the third most important crop followed by Rice and wheat. The leafy stalk of the crop generates pollen inflorescences and independent ovuliferous inflorescence called as ears, which yield kernels. Maize becomes the predominant food in most of the world. The inflorescences firmly cover by numerous layers of cob leaves generally known as husks. When the tassel mature and in favourable conditions anther on the tassel yawn & discharge pollen. Microspores are Anemophilous (scatter by wind) and because of its huge settling velocity, most pollen grain falls nearby the tassel. Expanded stigmas known as silks come up from the whorl of husk leaves at end of the ear. The fruit pericarp is combined with the seed

coat known as caryopsis. They are of various colours: blackish, bluish, purple, green, red, white and yellow. Ploidy level of maize is diploid and the chromosome number is 20.

After destroying maize fields of Africa, the fall army worm has entered in India in 2018. A native of America, the fall armyworm (*Spodoptera frugiperda*) has spread through commerce routes to Africa and Asia. The destructive caterpillar arose and spread expeditiously in Africa in 2016 and since then ravages millions of hectares of maize crop in all regions of Africa. By 2018 fall armyworm has been identified and proclaimed in almost all sub-saharan Africa countries. Fall armyworm (*Spodoptera frugiperda*) flaked in the fields of chikkaballapur, Bangalore. The worm has disseminated very fast through the maize fields of India and within a month it has proliferated in more than 14 states of the country. The dissemination of fall armyworm through the Indian subcontinent has been particularly fast in 2019. This year, the biggest sufferer so far has been farmers in the northeast states, where a aggregate of 10,772 hectares of maize has been affected (Fenta, *et al.*, 2019). FAW is the severe insect pests to manage in the field of maize. Late sown crops & late maturing hybrids are mostly attacked by FAW. Severe leaf feeding damage and direct injury to the cob causes by FAW. All the developmental stages of crop are destroying by Fall armyworms; it will concentrate on late sown that not yet silked. There may the possibility to manage the fall armyworm when larvae are small. Early tracking down & exact timing of insecticide application are important. Leaves are the place where the spherical eggs are laid in group 50 to 150. Initial symptoms of FAW resembles with European corn borer infestation. Common symptoms are small spores and feeding of the leaves that emerging from the whorl. Introductory symptoms of infections are similar; thresholds and control measures are differing.

Feeding of FAW occurs during the day and night, but they are mostly active in the morning and afternoon time. Late pre-tassel maize stage is most commonly damaged. Patched appearance to the leaves identical to grasshopper damage cause by larger FAW larvae which eat up huge amounts of leaf tissue. Large larvae mostly found deep in the whorl often below a plug of yellowish brown frass (fine powdery refuse). Underneath this plug larvae are guarded somewhat from insecticide application. Crops often from whorl damage without any reduction in yield. As the plants begin with tassel, larvae will move to the ear.

The ear may be partially or fully destroyed. Infection to the cob may be much more serious than leaf infection (Birhanu Sisay *et al.*, 2019).

Fall armyworm (*Spodoptera frugiperda*)

More than 80 crop species and economically important cultivated cereals like rice, sorghum, maize and the legumes as well as vegetable crops and cotton feed by Fall Armyworm (*Spodoptera frugiperda*). It is native to tropical and subtropical regions of the Americas. The significant yield loss should be occurring if the infestations are high.



Fig. 1. Adult Fall armyworm

About fall armyworm

The fall armyworm, *Spodoptera frugiperda* have migratory behaviour due to its sporadic pest nature. This species does not enter diapauses, so it migrates from warmer climates such as southern parts of India. The adult fall armyworm can be travelled over 100 km/night. The larvae hatched on the plants where the fall armyworm lays the eggs then starts feeding on the same plant. The female moth can lay up to a total of 1000 eggs in her lifetime. The eggs of FAW are white in colour and later turn into brown. They hatch in 2-3 days (**fig. 2 & 3**).



Fig. 2. Eggs mass of FAW



Fig. 3. Hatched mass of FAW(Neonate larvae)

The larvae has six stages initially are brown in colour and later turn into dark green. Fall armyworm larvae are seen in groups. The larva of fall armyworm can be identified by four

characteristic spots on the last second segment forming a square. Maize, millets, vegetables, rice, sugarcane and sorghum are mainly preferred by the larvae of fall armyworm for infestation. Due to the strong flying ability, it has spread to most of the tropical countries and has entered even India. If the eradication of the pest is delayed, it can cause huge loss to crop yield. Moth scales and fine bristles cover the egg masses from which the larvae come out with 3 to 5 days covering the whole whorl. Larvae possess light yellow stripes three each with light tan to black colour. It has red blotch wavy stripe on either side with four pairs of abdominal fleshy prolegs additional to the pair present at the end of the body. The features of fall armyworm are resembles with armyworm & corn earworm, only difference in the inverted “Y” mark present on the front of head. Brown head with dark honeycombed marking is present on the head of fall armyworm (**fig. 3**). Four dark spots arranged in a square on the 8th abdominal segment present in FAW (**fig. 4**). FAW have several generations per year and it causes severe yield losses if not managed timely.



Fig.3. Inverted ‘Y’ mark on head

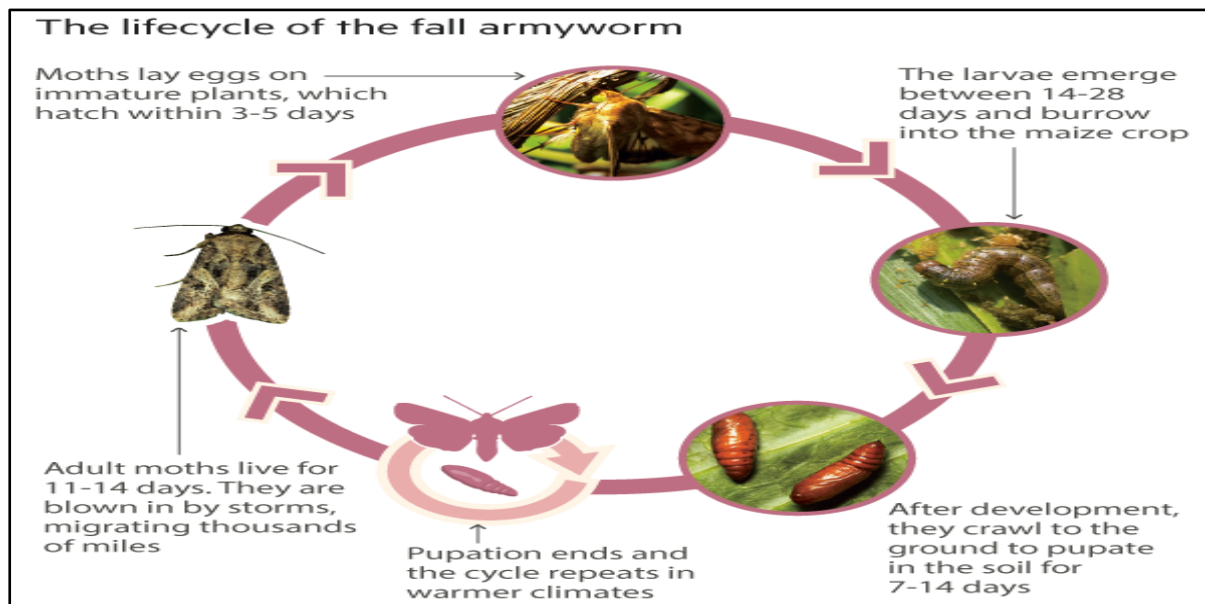


Fig.4. 4 Dark spots on 8th segment

Life cycle of fall armyworm:-

The fall armyworm has several generations per year, with the life cycle consisting of egg, six to seven larval instars, pupa and adult. Completion of the life cycle usually takes about 4 weeks in southern parts. Eggs showing pale green or white colour in beginning change to brown colour on the onset of hatching. Larvae come out of the eggs within 2-3 days which are pale in colour. There are six larval stages in which they attain brown to pale green colour at the start to dark colour at the last stage. Larval stage is of 12 to 20 days duration which depends on suitability of temperature and environmental situations. Identification of half or completely grown caterpillars is more easy. The short hairs are present on each spot of the larvae. The dark head with ‘Y’ mark present on the front. The dark brown pupa hides in the

soil and stalk for 12-14 days. 3 to 4 cm wide wings of moth with front dark brown and rear grey white colour. The life of moth around 2-3 weeks.



Management

For effective control of this pest, early detection of infestation is important. It should be more effective if the larvae are small. Good control of this pest after late finding is not possible and this is the common problem. Use of pheromone traps to monitor this insect in maize is very effective (Allan, 2019).

Physical control:

- Effective control is required when 5-25% of the plants show damage symptoms.
- It is very difficult to control larger larvae, when they are hidden under the frass plug
- Application of sawdust into the whorls leads to the aberration and desiccation of the young larvae.

Biological control:

- Naturally existing enemies acts as bio control agents. Parasitoids come under this category.

- To avoid this insect attack, avoid late maturity varieties or hybrids, also avoid staggered sowing (different date of sowing in the same area) because it will provide continuous food to fall armyworm.
- Avoid excessive application of nitrogen fertilizers because it favours the female fall armyworm to oviposition.

Cultural control:

- Shift towards agro-ecological approaches like organic farming and natural farming and multiple cropping systems could help in managing the outbreak.
- Decrease the use of over use of pesticides.

Chemical control:

- To prevent early damage of the seedlings after germination, the seed treatment might be effective.

Push-pull technology

To manage the pest such as fall armyworm Push-pull technology i.e. technology entails using a repellent intercrop (***Desmodium* as a Push**) and an attractive trap plant (***Napier Brachiaria* grass as a Pull**) is used. To attract the fall armyworm to lay eggs, *Napier* grass or *Brachiaria* grass should be planted around the maize plant. So that fall armyworm lay eggs on that grasses, but development of larvae arrested due to unavailability of nutrition (Midega *et al.*, 2018).

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