*Forage Res.,* **47** (3) : pp. 372-375 (2021) **http://forageresearch.in**

# THREAT OF FALL ARMYWORM INVASION AND ITS HOST EXPANSION ON FODDER CROPS

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**(Received : 12 December 2021; Accepted : 30 December 2021)**

**SUMMARY**

The fall armyworm, *Spodoptera frugiperda* (Lepidoptera: Noctuidae), is a dreaded invasive insect pest native to the Americas. Because of its fast expansion throughout Africa and Asia, it poses a serious challenge to the food and fodder security of millions of poor households. A total of 52 varieties of 25 different fodder crops were screened for the presence of different stages of *S. frugiperda* at the technology demonstration plot, ICAR-IGFRI, Jhansi. The study confirms FAW incidence on 25 fodder varieties belonging to seven fodder crops. The highest percent incidence was recorded on fodder maize *cv* J 1006 (84.62), whereas the lowest incidence was recorded on Guinea grass *cv* BG-2 (2.2). The highest damage scale of FAW was recorded on bajra *cv* Moti Bajra (7.8±1.58), whereas the lowest damage was recorded on Nandi grass (3±1.1). The incidence of *S. frugiperda* on Nandi grass, *Setaria sphacelata* (4.17), and Anjan grass, *Cenchrus ciliaris,* was the first documentation report as a host plant.

**Key words :** Fall armyworm, Fodder crops, Fodder maize, Anjan grass, damage scale, BN hybrid

Invasive arthropods are posing a threat to the natural ecosystem human and animal health. These non-native species have more remarkable adaptation and dispersal ability (Kenis *et al.*, 2009; Jenkins, 2003). Insects constitute a large part of invasive fauna worldwide, which affect biodiversity directly and indirectly. It has direct influence by feeding on new host plants, hybridization of an alien species with a native species, and causing imbalance to natural biocontrol (McLaughlin and Dearden, 2019). In addition, the invasive insects have indirect influence by competing for resources, acting as a vector of disease, pollination disruption, moreover through cascading effects (Kenis *et al.*, 2009). India is home to 173 invasive species, including 47 species of the agricultural ecosystem, 23 of which are insects (Rathee and Dalal, 2018; Singh *et al*., 2020).

The fall armyworm, *Spodoptera frugiperda* (Lepidoptera : Noctuidae), is a dreaded insect pest native to the western hemisphere. The pest entered the African continent in 2016 later entered the Indian subcontinent (2018), where it wreaked havoc on a variety of food and fodder crops (Goergen *et al.,* 2016; Sharanabasappa *et al.,* 2018; Keerthi *et al.,* 2021a). This polyphagous insect is known to exist in two sympatric host-plant strains. The "corn strain" (C strain) feeding primarily on maize and sorghum, and the "rice strain" (R strain) is mostly associated with rice and related grasses. Its rapid spread poses a serious threat to the food and fodder security of millions of poor households in Africa and Asia (Early *et al.,* 2018). The FAW completes its life cycle within 32-46 days and exhibits high competitiveness with other native species. Divya *et al.* (2021) reported that the FAW might replace the stem borer complex of maize due to their intraguild feeding habit. With the availability of a broad host range and high fecundity, the FAW may become endemic to the Indian subcontinent and may become a key pest of many food crops. Globally many researchers report the incidence and damage of FAW on many food crops. However, only a few reports in India document the impact of FAW on fodder crops and grasses. Hence, the present study aims to document the incidence, damage, and host range of FAW on fodder crops, which helps understand the population dynamics

TABLE 1
Incidence and damage scale of fall armyworm, *S. frugiperda* on the different fodder crops

| S. No. | Host plant | Variety | Percent pest infestation | Damage scale | Remarks |
|---|---|---|---|---|---|
| 1. | Bajra, | Giant bajra | 61.11 | 5.8±1.05 | Egg masses were not observed |
| | *Pennisetum glaucum* | APFB-9-1 | 32.14 | 6.5±0.96 | |
| | | RBB-1 | 6.67 | 4.83±0.98 | |
| | | Moti Bajra | 32.73 | 7.8±1.58 | |
| | | BAIF Bajra 1 | 23.40 | 5.5±0.87 | |
| | | AFB-3 | 42.59 | 5.3±2.14 | |
| | | AVKB-19 | 59.09 | 6.7±1.02 | |
| 2. | BN Hybrid, | CO-5 | 54.17 | 4.78±1.79 | |
| | *Pennisetum purpureum* × *P. glaucum* | BNIGFRI-6 | 66.67 | 4.7±1.16 | |
| | | PBN-342 | 12.50 | 4.5±0.71 | |
| | | PBN-351 | 13.33 | 7.5±0.71 | |
| | | BNIGFRI-3 | 40.00 | 5.5±1.29 | |
| | | BNDNH-6 | 33.33 | 3.2±1.47 | |
| | | BNH-11 | 48.39 | 5.6±2.89 | |
| | | CO-6 | 46.67 | 5.42±1.93 | |
| 3. | Pennisetum hybrid | BBSH-1 | - | - | |
| 4. | Guar, | BG-1 | - | - | Free from pest and diseases |
| | *Cyamopsis tetragonoloba* | BG-2 | - | - | |
| 5. | Fodder sorghum, | CSV 33 MF | 7.32 | 3.5±0.45 | |
| | *Sorghum bicolor* | MP Chari | 25.33 | 5.5±1.28 | |
| 6. | Fodder maize, | Trihybrid | 56.25 | 2.44±0.55 | Presence of egg masses was observed. |
| | *Zea mays* | COHM-8 | 57.89 | 7.5±1.66 | Grass hopper damage was observed. |
| | | African tall | 63.04 | 6.35±1 | |
| | | J 1006 | 84.62 | 7.67±1.22 | |
| 7. | Guinea grass, | BG-1 | - | - | Presence of egg masses was observed |
| | *Megathyrsus maximus* | BG-2 | 2.2 | 3.2±1.35 | |
| | | BG-4 | 33.33 | 3.11±0.78 | |
| 8. | Cowpea, | BL-1 | - | - | Aphid incidence was recorded |
| | *Vigna unguiculata* | BL-2 | - | - | |
| | | UPC-5286 | - | - | |
| | | UPC-622 | - | - | |
| | | Kohinoor | - | - | |
| | | MFC-08-14 | - | - | |
| 9. | Rice bean, | Bidhan-1 | - | - | |
| | *Vigna umbellata* | Bidhan-2 | - | - | |
| 10. | Anjan grass, | Anjan-1 | 4.35 | 4±0.58 | |
| | *Cenchrus ciliaris* | Anjan-2 | - | - | |
| 11. | Sen grass, *Sehima* sp | | - | - | |
| 12. | Bahia grass, *Paspalum notatum* | | - | - | |
| 13. | Blue panic grass, *Panicum antidotale* | | - | - | |
| 14. | Rodes grass, *Chloris gayana* | | - | - | |
| 15. | Nandi grass, *Setaria sphacelata* | | 4.17 | 3±1.1 | |
| 16. | Signal grass, *Brachiaria* sp | | - | - | |
| 17. | Congo signal grass, *Brachiaria* sp | | - | - | |
| 18. | *Setaria sphacelata* | | - | - | |
| 19. | *Cymbopogon pendulus* | | - | - | |
| 20. | *Cenchrus setigerus* | | - | - | |
| 21. | Dhavalu grass, *Chrysopogon* | | - | - | |
| 22. | Lampa grass, *Heteropogon* | | - | - | |
| 23. | Vetiver, *Vetiveria zinzanoids* | | - | - | |
| 24. | Indian bluegrass, *Bothrichloa intermedia* | | - | - | |
| 25. | Marvel grass, *Dichanthium* sp | | - | - | |

throughout the year. In addition, it helps in developing a sustainable strategy for comprehensive management in the Indian context.

## MATERIALS AND METHODS

A fixed plot survey was conducted during September 2020 in technology demonstration and research plots of ICAR-IGFRI, Jhansi (25°30'37.2"N and 78°32'10.5" E at 271 m above mean sea level) and its surrounding areas. A total of 52 varieties of 25 different fodder crops were grown in plots of 3 m ×3 m. The incidence and damage of FAW on different fodder crops were recorded. To record the incidence, the total number of plants was counted, and the number of plants displaying leaf damages caused by FAW larvae and with FAW frass in the whorl was recorded. The percentage of plants infested by the FAW was calculated, and the leaf damage caused by *S. frugiperda* was assessed visually and scored on a 0–9 scale (Davis and Williams, 1992). In addition, the presence of egg masses on the leaves was also recorded.

## RESULTS AND DISCUSSION

FAW larvae were identified by an inverted 'Y' shaped mark on the larval head and four black dots grouped in a square on the last abdominal segment. Furthermore, the plant's damage was confirmed by the presence of sawdust-like larvae droppings and ragged whorl leaves (Sharanabasappa *et al.,* 2018). The FAW was observed to feed on 25 plant species from seven fodder crops (Table 1). Its infestation was noticed on Bajra, BN Hybrid, Fodder sorghum, Fodder maize, Guinea grass, Anjan grass, and Nandi grass. FAW is a polyphagous pest and feeds on 353 host plants (Montezano et al., 2018). Further several researchers documented bajra (Venkateswarlu *et al.,* 2018), fodder sorghum (Keerthi *et al.,* 2021b), fodder maize (Keerthi *et al.,* 2021a), guinea grass (Prasifka *et al.,* 2009) as host plants of *S. frugiperda*. Despite the fact that Napier is frequently utilized as a component of push-push techniques for the management of maize and sorghum borer complexes, the record of FAW incidence on BN hybrid was the first documentation. Further, the incidence of *S. frugiperda* on Nandi grass, *Setaria sphacelata* (4.17), and Anjan grass, *Cenchrus ciliaris,* was the first report of documentation as a host plant with an average damage scale of 4.17 and 4.35, respectively. No egg masses were observed on bajra and BN Hybrid despite higher percent incidence and damage scale.

FAW infested all fodder crop varieties observed, including bajra, fodder sorghum, fodder maize, and BN hybrid. The highest percent infestation was observed in Fodder maize cultivar J 1006 (84.62 %), while the maximum damage scale was observed in bajra *cv Moti Bajra* (7.8). Guinea grass had the lowest percent infestation (2.2) and damage scale (3). FAW incidence on pulse crops such as guar, cowpea, and rice bean was not seen among the fodder crops observed. Similarly, no damage was observed on fodder grasses like Sen grass, Bahia grass, Blue panic grass, Rodes grass, Signal grass, Congo signal grass, *Setaria sphacelata*, *Cymbopogon pendulus*, *Cenchrus setigerus*, Dhavalu grass, *Chrysopogon*; Lampa grass, *Heteropogon*; *Vetiveria zinzanoids*, *Bothrichloa intermedia*, and Marvel grass.

Knowing the host plants of *S. frugiperda* in the newly invaded area is particularly important in the context of pest management. The new host plants help in the off-season survival of the pest, thereby maximizing crop damage potential in the forthcoming season. Hence regular monitoring of the pest is necessary to check its further spread and timely management.

## ACKNOWLEDGEMENT

Authors are thankful to the Director, ICAR-IGFRI, Jhansi and Head, Crop improvement Division for providing the facilities. This work is a part of ICAR-Indian Grassland and Fodder Research Institute in-house project entitled "Studies on invasive pest *Spodoptera frugiperda* in fodder maize (Code-CRSCIGFRISIL20190902)".

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