



Short Communication

Seasonal dynamics of *Spodoptera frugiperda* (J.E. Smith) on maize in Himachal Pradesh

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Abstract

Seasonal dynamics of fall armyworm, *Spodoptera frugiperda* on maize was carried out at Experimental Farm, Department of Entomology and Research Farm, Department of Seed Science and Technology, CSK HPKV Palampur during *kharif* 2021 and 2022. Insect population initiated during 25th SMW and reached the peak level of 1.8 larvae per five infested plants in 27th SMW during 2021 and 1.6 larvae per five infested plants during 2022 in 30th and 31st SMW which declined thereafter and remained associated with crop till harvesting upto 39th SMW.

Key words: Fall armyworm, SMW, traps catch and plant infestation

Fall armyworm (FAW), *Spodoptera frugiperda* (J.E. Smith) (Lepidoptera: Noctuidae), damages several crops and is an invasive pest of maize (Sisay *et al.* 2018). It is one of the most destructive pests worldwide which is extended to the tropical regions of the western hemisphere from the United States to Argentina (Nagoshi 2009). It is a polyphagous pest and attacks more than 350 plant species, causing major economic damage to important cultivated crops such as sorghum, rice, wheat, sugarcane, cotton and other vegetable crops (Goergen *et al.* 2016). In India, the incidence of this pest was first observed in Shivamogga district of Karnataka on maize crop in 2018 (Sharanabasappa *et al.* 2018). Till June 2019, this pest was reported from 20 states *viz.*, Karnataka, Maharashtra, Gujarat, Madhya Pradesh, Tamil Nadu, Andhra Pradesh, Telangana, Bihar, Rajasthan, Jharkhand, Chhattisgarh, West Bengal, Uttar Pradesh, Sikkim, Nagaland, Manipur, Assam, Arunachal Pradesh, Mizoram and Meghalaya (Navik and Patil 2020). It has been reported in trap catch from Palampur during 2019 and infestation on maize crop was observed from various parts of Himachal Pradesh in 2020 (Ankita *et al.* 2020). FAW moths are able to migrate very swiftly (about 100 km each night and

approximately 500 km before laying eggs) and can thus quickly invade new locations. FAW is a notorious pest and can cause severe economic yield losses in main crops. It can cause yield losses in maize ranging from 15 to 73 per cent (Day *et al.* 2017). It was estimated that 2.45 lakh hectares of maize in India were affected by the fall armyworm during 2018 - 2019 growing season (Deshmukh *et al.* 2021).

Population dynamics of *S. frugiperda* was studied at Experimental Farm, Department of Entomology and Research Farm, Department of Seed Science and Technology, CSK HPKV Palampur. The Kanchan Gold variety was sown on 6th June, 2021 and 10th June, 2022 with spacing of 60 × 20 cm in an area of 200 m² at Experimental Farm, Department of Entomology. Two pheromone traps containing FAW lure procured from Pest Control India Pvt. Ltd. were installed at both farms for adult monitoring. Traps were observed daily and number of trapped moths were recorded. Weekly moth catch was also calculated. FAW lure was replaced regularly within one month interval. The average values of trap catches from both the sites were also worked out. For monitoring number of larvae, five infested plants were examined for the presence of larvae in both the farms at weekly intervals till

harvesting of crop. For recording plant infestation at weekly intervals, 100 plants were randomly selected and data on infested and healthy plants were recorded. Similar observations were recorded on the maize crop at Experimental Farm, Department of Seed Science, CSKHPKV Palampur. Mean values on per cent plant infestation were calculated. The per cent infestation was worked out by using the following formula:

$$\text{Per cent infestation} = \frac{\text{Number of infested plants}}{\text{Total number of plants observed}} \times 100$$

Seasonal abundance on the basis of trap catch presented in Table 1 during *kharif* 2021 showed that the appearance of moth started in 25th SMW (Standard Meteorological Week) with trap catch of 2.8 moths per trap and the highest number of adults i.e. 15 adults per trap were caught during 29th SMW. Afterwards, the population started declining gradually and reached to a minimum of 2.0 moths per trap during 36th SMW. However, during 2022, the activity of moths commenced in 26th SMW with 2.3 adults per trap. The peak activity of moths was recorded during 31st SMW with 10.8 adults per trap per week. Thereafter, the population showed declining trend with 3.0 adults per trap catch. The present findings are in close proximity with the results given by Rajisha *et al.* (2021) who also reported the peak period of adult activity during July and August with maximum trap catch (7.2 moths per trap) during the 31st SMW. Ahissou *et al.* (2022) also reported that the peak trap catch was recorded during July and August with the monthly average of 17.5 moths per trap. Such differences could be due to different agro-climatic conditions prevailing in different parts where the studies were undertaken.

The data presented in Table 2 on seasonal abundance of larval population of *S. frugiperda* on maize during *kharif* 2021 and 2022 revealed that infestation initiated in the 25th SMW with 0.6 larvae per five infested plants in 2021. The peak pest population was recorded during 27th SMW with 1.8 larvae per five infested plants and thereafter started declining and reached to a level of 0.6 larvae per five infested plants. Whereas during 2022, the infestation initiated in the 26th SMW with 0.4 larvae per five infested plants and peak pest population was recorded during 30th and 31st SMW with 1.6 larvae per five

infested plants. These results are in strong conformity with the findings of Anandhi *et al.* (2020), where maximum larvae per plant was found during 27th SMW with 3.13 to 3.36 larvae per plant and minimum during 39th SMW with 0.90 to 1.21 larvae per plant.

Table 1. Monitoring of adult activity of *Spodoptera frugiperda* on maize during *kharif* 2021 and 2022

SMW	Number of adults in trap Catch* (Mean±SD)	
	2021	2022
24	0.0	0.0
25	2.8±0.4	0.0
26	7.0±0.7	2.3±0.4
27	11.0±0.7	4.5±1.4
28	14.0±0.7	5.8±0.4
29	15.0±0.7	6.5±0.0
30	11.5±0.7	7.8±0.4
31	10.3±0.4	10.8±0.4
32	9.3±0.4	10.3±0.4
33	7.5±0.7	9.3±0.4
34	5.3±0.4	5.8±0.4
35	3.8±0.4	5.3±0.4
36	2.0±0.7	4.8±0.4
37	2.3±0.4	4.3±0.4
38	2.0±0.0	3.5±0.7
39	1.5±0.7	3.0±0.7

*Observations are mean of 4 trap catches

Table 2. Seasonal abundance of larval population of *Spodoptera frugiperda* on maize during *kharif* 2021 and 2022

SMW	Number of larvae per five infested plants*		Mean
	2021	2022	
24	0.0	0.0	0.0
25	0.6	0.0	0.3
26	1.2	0.4	0.8
27	1.8	0.4	1.1
28	1.4	0.8	1.1
29	1.4	1.0	1.2
30	1.2	1.6	1.4
31	1.2	1.6	1.4
32	1.0	1.4	1.2
33	1.0	1.2	1.1
34	0.8	1.0	0.9
35	0.8	1.0	0.9
36	0.6	0.8	0.7
37	0.0	1.0	0.5
38	0.0	1.4	0.7
39	0.0	1.2	0.6

*Observations are mean of 5 randomly taken infested plants

Conclusion

On the basis of present study on population dynamics of *S. frugiperda*, it can be concluded that the pest remained active from June onwards to November and the pest could not survive thereafter. The fall

armyworm was not found to be overwintering in Palampur situation and the cause of infestation during the succeeding year seems to be the migration of the pest which needs to be ascertained.

Conflict of interest: The authors declare that there is no conflict of interest in this article.

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