Plant Archives Vol. 26, Supplement 2, 2026 pp. 1511-1515 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2026.v26.supplement-2.179

SEASONAL INCIDENCE AND POPULATION DYNAMICS OF FALL ARMYWORM (*Spodoptera frugiperda*) ON MAIZE IN THE CAUVERY DELTA REGION OF TAMIL NADU, INDIA

U. Priyanga* and R. Kannan
Department of Agricultural Entomology, Annamalai University, 608002, Tamil Nadu, India.
*Corresponding author E-mail: pereyanka1999@gmail.com
(Date of Receiving : 16-03-2026; Date of Revision : 24-04-2026; Date of Acceptance : 24-05-2025)

ABSTRACT

A field investigation was conducted during *Rabi* 2023-2024 and *Kharif* 2024 to study the seasonal incidence and population dynamics of Maize Fall Armyworm in Cauvery Delta Region. Larval incidence and per cent infestation levels were assessed weekly, and were correlated with seasonal weather data. During *Rabi*, the initial infestation of 0.36 larvae/plant was recorded in the 51st meteorological standard week (MSW) wherein the peak incidence of 2.39 larvae/plant with 87 per cent infestation was observed during 5th MSW (last week of January 2024). In *Kharif*, the incidence started in the 39th MSW (0.31 larvae/plant), with a peak of 2.74 larvae/plant and 82 per cent infestation was recorded during 43rd MSW (last week of October 2024). The peak incidence of Fall Armyworm coincided with the vegetative and reproductive stages of the crop. Correlation study revealed a positive association between minimum and maximum temperatures, whereas rainfall and relative humidity showed negative association in both the seasonal population. The investigation imparted the importance of climatic variables in triggering infestations, emphasizing the utility of climate-based forecasting in timely IPM methods.

Keywords **:** Seasonal incidence, Maize, *Spodoptera frugiperda*, Weather parameters, Correlation.

Introduction

Maize (*Zea mays* L.) as "Queen of Cereals" have originated in Mexico and due to its exceptional productivity, adaptability, and multipurpose utility, ranked third in cereal crop production next to wheat and rice globally (Painkra *et al*., 2019). In India, maize serves as an essential source of human food, livestock feed, and raw material for various industrial products including starch, ethanol and oil owing to its richness in nutrition (72% carbohydrates mainly starch, 10% protein, and 4% lipids, offering about 365 kcal per 100 grams) (Ranum *et al.*, 2014). Maize crop is vulnerable to attack by numerous insect pests across all growth stages *viz.*, stem borers, cutworms, armyworms, white grub, sap feeders etc. (Reddy and Trivedi, 2008; Capinera, 2008). The fall armyworm (*Spodoptera frugiperda*), origin of America, has emerged as a major invasive pest in Asia and Africa. First Indian report of *Spodoptera frugiperda* was made in July 2018 in Karnataka and late. Rapidly expanded to various states including Tamil Nadu, Maharashtra, Telangana, Andhra Pradesh, and Odisha (Padhee and Prasanna, 2019). In Tamil Nadu ~1.2 lakh hectares of maize fields in Perambalur, Tiruchirapalli, Dindigul, and Erode districts. Have experienced severe damage due to FAW. Its wide host range, prolific reproductive potential, long-distance migration, and adaptability to diverse climates pose significant challenges to its control (Rojas *et al.* 2004 and Chimweta *et al.* 2019). India witnessed a decline in maize output from 28.75 million tonnes in 2017–2018 to 27.72 million tonnes in 2018–2019 from its incursion. Understanding the seasonal behaviour of this pest and its relationship with weather parameters is vital for devising location-specific management strategies for which the present investigation was aimed at documenting the seasonal incidence patterns of fall armyworm on maize during the *Rabi* and *Kharif* seasons under the Cauvery Delta Zone, along with an analysis of how climatic variables influence pest population dynamics.

Materials and Methods

The present investigation was executed at the experimental farm located in Vallampadugai village, Kumaratchi Taluk, Cuddalore District under the Cauvery delta region of Tamil Nadu. The site is situated at 79.6992° E longitude and 11.3472° N latitude, with an elevation of nine meters above mean sea level. The study was conducted across two cropping seasons: *Rabi* 2023–2024 and *Kharif* 2024, focusing on the seasonal incidence of fall armyworm (*Spodoptera frugiperda*) in maize. The maize hybrid used in the study was VNR 4226, cultivated under a spacing of 75 cm × 30 cm. Except for plant protection applications, all recommended agronomic practices were uniformly followed throughout the experimental plots. Observations began from 15 days after sowing (DAS) and continued on a weekly basis for both seasons. Daily meteorological data was collected at Annamalai University Meteorological Unit, including rainfall, relative humidity (RH), maximum temperature (Cº), and minimum temperature (Cº). The mean weather data from that week were evaluated and displayed as meteorological standard week (MSW) to conduct association studies. The data was analysed using correlations among climatic indicators, larval population, and per cent infestation. The number of larvae per plant and the proportion of plants infested were noted. Counting the number of larvae per plant enabled the larval population to be monitored. The percentage of plant infestation was examined and determined using the Davis and Williams (1992) technique.

$$\text{Infestation Percentage} = \left(\frac{\text{Number of infested plants}}{\text{Total number of plants observed}}\right) \times 100$$

Results and Discussion

The infestation of *Spodoptera frugiperda* during 2023-2024 commenced in the 51st Meteorological Standard Week (MSW) corresponding to the fourth week of December and gradually increased, reaching its peak (2.39 larvae/plant) during the 5th MSW (first week of February). Subsequently, the larval population declined progressively and remained active for nine weeks, with 1.29 larvae/plant recorded at the 12th MSW (fourth week of March). During the Rabi season, the percent infestation was at its lowest (23%) during the 2nd Meteorological Standard Week (MSW), corresponding to the second week of January. A peak infestation of 87 per cent was recorded during the 5th MSW (first week of February), followed by a steady decline over subsequent weeks. The infestation persisted for nine weeks, recording 63 per cent by the 12th MSW (fourth week of March) (Table 1). The data on larval population and percent infestation of *Spodoptera frugiperda* during the Kharif 2024 season (Table 2). The infestation commenced on 39th Meteorological Standard Week (MSW), corresponding to the September fifth week, a minimum population of 0.22 larvae per plant. The larval population peaked at 2.74 larvae per plant during the 40th MSW (October first week). After the peak population showed a gradual decline and remained active for up to nine weeks, reaching 0.33 larvae per plant by the 52nd MSW (fourth week of December).

The percent infestation was at its minimum (20%) during the 48th Meteorological Standard Week (MSW), corresponding to the fifth week of November, and reached a peak of 43 Per cent in the 43rd MSW (fourth week of October). The infestation persisted for up to nine weeks, with 30 per cent infection observed by the 52nd MSW (fourth week of December). These observations are consistent with earlier studies by (Kumar *et al.*2020), who similarly reported that *Spodoptera frugiperda* infestation during the *Kharif* season was the highest in the second fortnight of July and lowest in the second fortnight of October. During the *Rabi* season, the peak incidence was reported in the first fortnight of November, with the lowest occurrence in the second fortnight of the same month. Similarly, (Reddy *et al.* 2020) reported maximum infestation during the third week of August on 45-day-old maize crops in the *Kharif* season.

Table 1 : Seasonal occurrence of *Spodoptera frugiperda* in Maize crop ecosystem during *Rabi* 2023-2024.

Meteorological Standard Week (MSW)	Weather parameters				*Rabi* season	
	Temperature (^{0}C)		Rainfall (mm)	RH (%)	No. of Larvae /Plant	Percent infestation
	Max.	Min.				
51	29.6	19.6	9.6	82	0.36	35
52	29.9	19.0	045.1	83	0.22	24
1	29.3	19.7	058.0	85	0.25	28
2	28.6	19.6	157.0	86	0.14	23
3	29.8	18.3	000.0	80	0.42	31
4	30.7	17.8	000.0	77	1.15	59
5	30.4	19.3	000.0	72	2.39	87
6	30.6	17.6	000.0	75	0.29	25
7	31.0	18.7	000.0	76	1.84	46

8	33.2	19.2	000.0	70	2.04	55
9	32.2	19.1	000.0	73	2.25	62
10	33.5	18.3	000.0	70	0.29	23
11	34.8	18.9	000.0	69	1.01	47
12	34.2	19.4	000.0	71	1.29	45

Mean of three replications

Table 2 : Seasonal occurrence of *Spodoptera frugiperda* in Maize crop ecosystem during *Kharif* 2024

Meteorological standard Week (MSW)	**Weather parameters**				***Kharif* season**	
	Temperature (^{0}C)		**Rainfall (mm)**	**RH (%)**	**No. of Larvae/Plant**	**Percent infestation**
	Max.	**Min.**				
39	35.9	21.0	012.4	68	0.31	39
40	34.5	20.0	066.6	71	0.22	25
41	32.2	19.7	058.2	78	0.89	52
42	30.6	19.4	071.2	80	2.07	76
43	33.7	19.6	042.6	73	2.74	82
44	32.6	19.7	018.6	76	1.79	69
45	31.2	18.8	004.6	79	1.34	62
46	29.7	18.7	159.1	87	0.36	41
47	30.0	18.2	007.6	79	0.28	37
48	26.6	19.8	208.3	89	0.08	20
49	31.1	18.6	003.0	79	1.18	56
50	28.6	17.4	118.4	85	0.25	25
51	30.0	17.9	1.80	76	0.49	47
52	30.3	17.8	23.2	78	0.33	30

Mean of three replications

The survey indicated that during the *Rabi* season, the vegetative stage of maize experienced the highest larval population and per cent infestation. In contrast, during the *Kharif* season, peak infestation was observed during both the vegetative and reproductive growth stages. Capinera (2017) noted that *S. frugiperda* larvae are capable of feeding throughout both stages of crop development. Similarly, (Georgen *et al.,* 2016) and (Deole and Paul 2018) reported that fall armyworm damage can occur across all stages of crop growth. However, (Midega *et al.,* 2018) emphasized that infestation during the reproductive stage can alter cob structure. (Murua *et al.,* 2006) observed that larval populations tend to remain relatively stable during the vegetative phase but decline during the reproductive stage. The substantial infestation observed between 42 and 56 days after sowing in the present study concurs the findings of (Prasanna *et al.,* 2018), who reported that larvae predominantly feed in the whorl region during the vegetative to tasselling stages of maize.

Correlation between meteorological parameters and fall armyworm incidence

Correlation analysis to assess the relationship between meteorological factors and the incidence of *Spodoptera frugiperda* was carried out for the data collected during *Rabi* 2023–2024 and *Kharif* 2024 (Tables 3 and 4). In the Rabi season, a positive relationship was noticed between larval population and temperature (both minimum (r = 0.124) temperatures and maximum (r = 0.385) temperatures). Meanwhile larval incidence negatively significant correlated with rainfall (r = –0.460) and relative humidity (r = –0.607*). Likewise, per cent infestation by the fall armyworm showed a positive correlation with minimum (r = 0.102) and maximum (r = 0.249) temperatures, while a negative correlation with rainfall (r = –0.517) and relative humidity (r = –0.438) was observed. During the *Kharif* 2024 season also the larval population was positively associated with maximum (r = 0.311) and minimum (r = 0.213) temperatures, even then correlations were not statistically significant. Negative association was observed between larval population *vs* relative humidity (r = –0.247) and rainfall (r = –0.303). A similar pattern was noted in percent infestation data. The positive correlations with temperature suggest that elevated temperatures may support faster development and increased feeding activity of FAW larvae, particularly during the vegetative stages of maize. On the other hand, the negative associations with relative humidity and rainfall could be attributed to the adverse effects of excessive moisture on larval survival or reduced oviposition activity during extended rainy periods (Rojas *et al.,* 2004; Kumar *et al.,* 2020; Reddy

et al., 2020). Supporting this, (Pazhanisamy *et al.,* 2019) reported a similar negative correlation between rainfall and *Spodoptera litura* incidence. (Parameshwari *et al.,* 2021) and (Kalyan *et al.,* 2019) also recorded weather-driven variations in FAW trap catches, highlighting the pest's sensitivity to climatic conditions. These findings underscore the importance of weather-based monitoring for the early prediction and effective management of FAW outbreaks.

Table 3 : Correlation between meteorological parameters and weekly observations of larval population and infestation of *Spodoptera frugiperda* during *Rabi* 2023-2024

Rabi season (2023-24)	Weather parameters			
	Max. Temp (^{o}C)	Min. Temp (^{o}C)	Relative Humidity	Rainfall
Larval population	0.385	0.124	-0.607*	-0.460
Infestation	0.249	0.102	-0.438	-0.517

* Significant at 0.05 probability level

Table 4 : Correlation between meteorological parameters and weekly observations of larval population and infestation of *Spodoptera frugiperda* during *Kharif* 2024

Kharif season (2023-24)	Weather parameters			
	Max. Temp (^{o}C)	Min. Temp (^{o}C)	Relative Humidity	Rainfall
Larval population	0.311	0.213	-0.247	-0.303
Infestation	0.341	0.195	-0.282	-0.428

Conclusion

The study reveals that the larval population and percent infestation of Maize Fall armyworm (*Spodoptera frugiperda)* during *Rabi* 2023–2024, first commenced on the 51st Meteorological Standard Week (MSW), corresponding to the fourth week of December. The population peaked in the 5th MSW (first week of February) and remained active until the 9th MSW (first week of March). A positive correlation was recorded with both minimum and maximum temperatures with the insect incidence, while rainfall and relative humidity showed negative associations. In *Kharif* 2024, the incidence began earlier, in the 39th MSW (fourth week of September), reached its peak in the 43rd MSW (fourth week of October), and persisted until the 52nd MSW (fourth week of December). Similar to the *Rabi* season, larval population and percent infestation were positively associated with temperature variables, whereas negative correlation was observed with relative humidity and rainfall. These findings underscore the critical role of temperature in influencing the development, survival, and infestation patterns of *S. frugiperda*.

References

Capinera, J.L. (2008). Fall armyworm, *Spodoptera frugiperda* (JE Smith) (lepidoptera: noctuidae). *Encyclopedia of entomology*, Springer, Dordrecht. 1409-1412. https://doi.org/10.1007/978-1-4020-6359-6_3747

Capinera, J.L. (2017). Fall armyworm, *Spodoptera frugiperda* (J.E. Smith) (Insecta: Lepidoptera: Noctuidae). Extension Service, *University of Florida*. 1-6.

Chimweta, M., Nyakudya, I. W., Jimu, L., and Bray Mashingaidze, A. (2020). Fall armyworm [*Spodoptera frugiperda* (J. E. Smith)] damage in maize: management options for flood-recession cropping smallholder farmers. *International Journal of Pest Management*, **66**(2), 142-154. https://doi.org/10.1080/09670874. 2019.1577514

Davis, F. M., Ng, S. S., and Williams, W. P. (1992). Visual rating scales for screening whorl-stage corn for resistance to fall armyworm. *Technical bulletin – Mississipp Agricultural and Forestry Experiment Station.* **186**, 1-9. https://www.cabidigitallibrary.org/doi/full/10.5555/19931170718

Deole, S. and Paul, N. (2018). First report of fall armyworm, *Spodoptera frugiperda* (J. E. Smith), their nature of damage on maize crop at Raipur, Chhattisgarh. *Journal of Entomology and Zoology Studies*, **6**(6), 219-221. http://dx.doi.org/10.22271/j.ento.2020.v8.i6k.7944

Goergen, G., Kumar, P. L., Sankung, S. B., Togola, A. and Tamo, M. (2016). First report of outbreaks of the fall armyworm *Spodoptera frugiperda* (J.E. Smith) (Lepidoptera: Noctuidae), a new alien invasive pest in West and Central Africa. *PloS One*, **11**(10), 19. https://doi.org/10.1371/journal.pone.0165632

Kalyan, D., Mahla, M.K., Ramesh Babu, S., Swaminathan, S., Meena, A.K. and Kalyan, R.K. (2019). Population dynamics of fall armyworm, *Spodoptera frugiperda* (J.E. Smith) on maize. *Indian Journal of Applied Entomology*, **33**(2), 110-114.

Kumar, N. V., Yasodha, P. and Justin, C. G. L. (2020). Seasonal incidence of maize fall armyworm *Spodoptera frugiperda* (JE Smith) (Noctuidae; Lepidoptera) in Perambalur district of Tamil Nadu, India. *Journal of Entomology and Zoology Studies*, **8**(3), 1-4. https://www.entomoljournal.com/archives/2020/vol8issue3/PartA/8-2-294-462.pdf

Midega, C. A. O., Pittchar J. O., Pickett, J. A., Hailu, G. W. and Khan, Z. R. (2018). A climate adapted push-pull system effectively controls fall armyworm, *Spodoptera frugiperda*(J. E. Smith), in maize in east Africa. *Journal of Crop Protection*, **105**, 10-15. https://doi.org/10.1016/j.cropro.2017.11.003

Murua, G., Molina-Ochoa, J. and Coviella, C. (2006). Population dynamics of the fall armyworm, *Spodoptera frugiperda* (Lepidoptera: Noctuidae) and its parasitoids in northwestern Argentina. *Journal of Florida Entomologist*, **89**(2), 175-182. https://www.jstor.org/stable/ 4092463

Padhee, A. K. and Prasanna, B. M. (2019). The emerging threat of Fall Armyworm in India. *Indian Farming*, **69**(1), 51-54. http://oar.icrisat.org/id/eprint/11057

Painkra, G. P., Bhagat, P. K., Painkra, K. L., Gupta, S.P., Sinha, S. K., Thakur, D. K. and Lakra,A. (2019). A survey on fall armyworm, *Spodoptera frugiperda* (Lepidoptera: Noctuidae, J.E.Smith) in maize crop in northern hill zone of Chattisgarh. *Journal of Entomology and Zoology Studies*, **7**(6), 632-636. https://www.entomoljournal.com/archives/2019/vol7issue6/PartK/7-5-201-426.pdf

Parameshwari, D., Pazhanisamy, M. and Muralikrishnan, L. (2021). Influence of weather parameters on population dynamics of fall armyworm, *Spodoptera frugiperda* (J. E. Smith) on maize. *International Journal of Entomological Research*, **6**(6), 87-90. https://www.entomologyjournals.com/assets/archives/2022/vol7issue10/7-8-16-583.pdf

Pazhanisamy, M., Senthil kumar, M. and Sathyaseelan, V. (2019). Seasonal incidence of leaf eating caterpillar, *Spodoptera litura* (Fabricius) in groundnut ecosystem during Kharif season. *Plant Archives*. **19**(2), 3351-3354. https://www.cabidigitallibrary.org/doi/pdf/10.5555/20219950676

Prasanna, B.M., Huesing, J.E., Eddy, R. and Peschke, V.M. (2018). Fall armyworm in Africa: A guide for integrated pest management. *1st ed.;* CIMMYT: CDMX, MEXICO. **7,**109

Ranum, Peter, Pena-Rosas, J. P. and Garcia-Casal, M. N. (2014). Global maize production, utilization and consumption. *Annals of the New York Academy of Sciences*, **1312**(1), 105-112. https://doi.org/10.1111/nyas.12396

Reddy, K. J. M., Kumari, K., Saha, T. and Singh, S. N. (2020). First record, seasonal incidence and life cycle of fall armyworm, *Spodoptera frugiperda* (JE Smith) in maize at Sabour, Bhagalpur, Bihar. *Journal of Entomology and Zoological Studies*., **8**(5), 1631-1635. https://www.entomol journal.com/archives/2020/vol8issue 5/PartW/8-5-93-214.pdf

Reddy, Y. V. R. and Trivedi, S. (2008). Maize Production Technology. *Academic Press.* 190-192.

Rojas, J. C., Virgen, A. and Malo, E. A. (2004). Seasonal and nocturnal flight activity of *Spodoptera frugiperda* (Lepidoptera: Noctuidae) monitored by pheromone traps in the coast of Chiapas, Mexico. *Florida Entomologist*, **87**(4), 496-503. https://www.jstor.org/stable/3496434.