



## POPULATION DYNAMICS OF LARVAE OF FALL ARMY WORM *SPODOPTERA FRUGIPERDA* (J E SMITH) IN MAIZE

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### ABSTRACT

The present study was conducted during kharif 2022 at the Agricultural Research Farm, Baba Raghav Das Post Graduate College, Deoria. The variety Vivek Maize hybrid 53 was sown with a spacing of 45x 20 cm. The result revealed that the fall army worm *Spodoptera frugiperda* (J E Smith) larvae appeared in the field during 5<sup>th</sup> week of August (35<sup>th</sup> SMW)-1.67 larvae/ plant and reached peak during 3<sup>rd</sup> week of October (42<sup>nd</sup> SMW)- 4.16 larvae/ plant. The correlation studies revealed that the weather parameters viz. maximum and minimum temperature, maximum and minimum relative humidity and rainfall were negatively correlated with the incidence.

**Key words:** Maize, *Spodoptera frugiperda*, fall army worm, population dynamics, correlation, regression, multiple linear regression, larva, kharif, insect, pests, whorl, standard week

Maize (*Zea mays* L.) belongs to family-Poaceae was domesticated more than 9,000 years ago in Southern Mexico/Meso America (Awika, 2011; Kennett et al., 2020). In India maize is cultivated during rainy (kharif) and winter (rabi) seasons. There are several factors responsible for the reduction of maize yield, among them the insect pest damages are the major one. The primary insect pests of maize are spotted stem borer (*Chilo partellus* S.), army worm (*Mythimna separata* W.), cut worm, (*Agrotis ipsilon* R.), sugarcane leaf hopper (*Pyrilla perpusilla* W.), corn earworm (*Helicoverpa armigera* H.) and fall armyworm (*Spodoptera frugiperda*) (Kumar et al., 2020). Among these the most devastating insect pest is the fall armyworm (FAW), *Spodoptera frugiperda* (J E Smith) belonging to family Noctuidae of the order Lepidoptera. This invasive pest often known as the autumn army worm, was reported for the first time in India in maize 2018 (Ganiger et al., 2018). It attack corn crop from the vegetative to generative phase, but in the vegetative phase, damage is more (Prasanna et al., 2018). Damage to corn cobs and leaves can result in significant yield losses up to 40% in Honduras 72% in Argentina and 21-53% in Africa. This study evaluates its seasonal incidence.

### MATERIALS AND METHODS

The present study was conducted during kharif 2022 at the Agricultural Research Farm, Baba Raghav Das Post Graduate College, Deoria district (26°6' to 26°48' N 83°29' to 84°11'). The variety Vivek Maize hybrid 53

was sown with a spacing of 45x 20 cm. The incidence of *S. frugiperda* was recorded by visual inspection of plant whorl. The deadheart formed plant was opened by scraping leaf sheath and larval counts were taken on randomly selected ten plants. The observation were also taken from the cob after cob emergence till harvesting. Meteorological parameters like temperature (minimum and maximum), relative humidity and rainfall were recorded. The weather parameters were converted into weekly mean values against standard meteorological weeks. Correlation was worked out to understand the impact of weather parameters using multiple regression model.

### RESULTS AND DISCUSSION

The incidence of *S. frugiperda* was initiated during 5<sup>th</sup> week of August (35<sup>th</sup> SMW) with a population of 1.67 larvae/ plant. The population increased during 1<sup>st</sup> week of September (36<sup>th</sup> SMW) and declined further in 37<sup>th</sup> SMW. Thereafter, an increasing trend of population was recorded from 2<sup>nd</sup> week of September (37<sup>th</sup> SMW) until harvesting. The population of *S. frugiperda* reached to its peak during 3<sup>rd</sup> week of October (42<sup>nd</sup> SMW) with a population level of 4.16 larvae/plant just before harvesting (Fig.1). These findings are supported by Paul and Deole (2020) who reported that the incidence of *S. frugiperda* appeared during 2<sup>nd</sup> week of September (37<sup>th</sup> SMW) and reached to its peak in the fourth week of September (39<sup>th</sup> SMW). Nivetha et al. (2022) noticed the incidence during 38<sup>th</sup> SMW which reached its peak



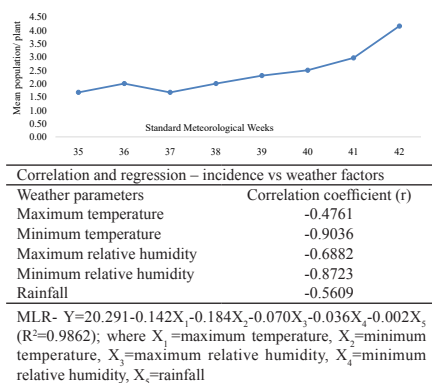


Fig. 1. Incidence pattern of *S. frugiperda*

during 42<sup>nd</sup> SMW. Kalyan et al. (2019) observed that the infestation initiated in the 3<sup>rd</sup> week of July (29<sup>th</sup> SMW) and reached its peak in 3<sup>rd</sup> week of August (33<sup>rd</sup> SMW). Rojas et al. (2004) found the peak activity during June to September.

The incidence of *S. frugiperda* larvae was negatively correlated with all the weather parameters viz., maximum temperature, minimum temperature, maximum RH, minimum RH and rainfall. Results revealed highly negative correlation with minimum temperature and minimum RH having r-value of -0.903 and -0.872, respectively; a moderate negative correlation with maximum temperature, maximum RH and rainfall having r-value of -0.476, -0.688 and -0.561, respectively. Darshan and Prasanna (2023) and Paul and Deole (2020) partially support the present results. Kumar et al. (2020) observed a significant negative correlation of rainfall with the incidence of *S. frugiperda*. The weather parameters together influenced the *S. frugiperda* to an extent of 98.62% with  $R^2$  of 0.9862. The multiple regression model was  $Y = 20.291 - 0.142X_1 - 0.184X_2 - 0.070X_3 - 0.036X_4 - 0.002X_5$  whereas  $X_1$  = maximum temperature,  $X_2$  = minimum temperature,  $X_3$  = maximum RH,  $X_4$  = minimum RH and  $X_5$  = rainfall. Thus, it was concluded that the incidence of *S. frugiperda* initiated during 5<sup>th</sup> week of August and attained its peak in 3<sup>rd</sup> week of October. The negative correlation with all the weather parameters and weather factors together influence the incidence to an extent of 98%.

#### ACKNOWLEDGEMENTS

This research was supported by the Department of Entomology, BRDPG College Deoria, UP which provide us all the required facilities during the period of experimentation. Dr Devendra Yadav, Dr Amrendra Pratap Singh, Dr Sushil Kumar and Dr Sania Tyagi,

Asst. Professors, Department of Entomology are also acknowledged.

#### FINANCIAL SUPPORT

No funds were received.

#### AUTHOR CONTRIBUTION STATEMENT

AV analysed the data and drafted the initial manuscript, RK was the advisor of the research, BKG and AKS helped in collecting the data from experimental field.

#### CONFLICT OF INTEREST

No conflict of interest.

#### REFERENCES

- Awika J. 2011. Major cereal grains production and use around the world. Advances in cereal science: implications to food processing and health promotion. American Chemical Society Atlantic City, N J, Washington DC. pp. 1-13.
- Darshan R, Prasanna P M. 2023. Seasonal Incidence of Fall Army Worm *Spodoptera frugiperda* in Maize. Indian Journal of Entomology 85(2): 459-461.
- Day R, Abrahams P, Bateman M, Beale T, Clotley V, Cock M, Colmenarez Y, Corniani N, Early R, Godwin J and Gomez J. 2017. Fall armyworm: impacts and implications for Africa. Outlooks on Pest Management 28(5): 196-201.
- Ganiger P C, Yeshwanth H M, Muralimohan K, Vinay N, Kumar A R V, Chandrashekara K J C S. 2018. Occurrence of the new invasive pest, fall armyworm, *Spodoptera frugiperda* (J E Smith) (Lepidoptera: Noctuidae), in the maize fields of Karnataka, India. Current Science 115(4): 621-623.
- Kalyan D, Mahla M, Babu S R, Swaminathan R, Meena A, Kalyan R. 2019. Population dynamics of Fall Armyworm, *Spodoptera frugiperda* (J E Smith) on Maize. Indian Journal of Applied Entomology 33(2): 110-114.
- Kennett D J, Prufer K M, Culleton B J, George R J, Robinson M, Trask W R, Buckley G M, Moes E, Kate E J, Harper T K, O'Donnell L. 2020. Early isotopic evidence for maize as a staple grain in the Americas. Science Advances 6(23): eaba3245.
- Kumar N V, Yasodha P, Justin C G. 2020. Seasonal incidence of maize fall armyworm *Spodoptera frugiperda* (J E Smith) (Noctuidae; Lepidoptera) in Perambalur district of Tamil Nadu, India. Journal of Entomology and Zoology Studies 8(3): 1-4.
- Nivetha T K, Srinivasan G, Shanthi M, Gurusamy A, Vellaikumar S. 2022. Seasonal incidence and influence of weather factors on the incidence of *Spodoptera frugiperda* (J E Smith) on maize. The Pharma Innovation Journal.;11(6): 407-10.
- Paul N, Deole S. 2020. Seasonal incidence of fall army worm, *Spodoptera frugiperda* (Smith) infesting maize crop at Raipur (Chhattisgarh). International Journal of Chemical Studies 8(3): 2644-2646.
- Prasanna B M, Huesing J E, Eddy R, Peschke V M. 2018. Fall armyworm in Africa: a guide for integrated pest management. Feed the future, The U.S. government's global hunger and food security initiatives. pp. 2-9.
- Rojas J C, Virgen A, Malo E A. 2004. Seasonal and nocturnal flight activity of *Spodoptera frugiperda* males (Lepidoptera: Noctuidae) monitored by pheromone traps in the coast of Chiapas, Mexico. Florida Entomologist 87(4): 496-503.

(Manuscript Received: December, 2023; Revised: April, 2024;

Accepted: April, 2024; Online Published: May, 2024)

Online First in www.entosocindia.org and indianentomology.org Ref. No. e24839