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Seasonal incidence of fall army worm, *Spodoptera frugiperda* (Smith) infesting maize crop at Raipur (Chhattisgarh)

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Abstract

The field experiment were conducted at Research Cum Instructional Farm at IGKV, Raipur (C.G.) during *kharif* 2018, to know the seasonal incidence of fall army worm, *Spodoptera frugiperda* infesting maize crop. Fall army worm, *Spodoptera frugiperda* appeared during 37th SMW i.e. 2nd week of September with a mean population of 0.12 larva/plant. The peak population were observed in the fourth week of September with a mean population of 0.56 larva/plant. Thereafter, the population declined gradually and reached to a minimum level of 0.16 larva/plant during 4th week of October (42nd SMW).

The correlation between fall army worm, *Spodoptera frugiperda* and abiotic parameters during *kharif* 2018 results indicated that the population demonstrated a significant positive correlation with maximum temperature ($r=0.586$).

Keywords: Correlation, maize, incidence, fall army worm

Introduction

Maize or corn (*Zea mays* L.) is a crop of global importance, which holds a unique position in world agriculture. Maize belongs to the family of Poaceae, originated from South America, from where it was taken to all parts of the world.

In India maize production estimated about 20240 tonnes in *kharif* and 8470 tonnes in *rabi*. Although in 2018-19 production were decreased by 20220 tonnes in *kharif* and 7580 tonnes in *rabi* (Indiastat). In Chhattisgarh, it is well informed in an area of 226.79 hec. With productivity of 2458 kg/hec. of *kharif* season. Although 74.45 ha. Area and 1950 kg/ha. Productivity of *rabi* season in 2017-18 (Annualreport 2017-18).

Although 139 insect pests cause varying degree of damage to maize crop, only about a dozen of these are quite serious and require control measures like maize stalk borer, pink stem borer, and shoofly are the insects of national importance while the armyworm, jassids, thrips, pyrrilla, grasshoppers, white grub, cut worms, hairy caterpillars, termites, and the leaf miner are more serious regional level insect pests (NIPMP, 2001). Amongst the most serious pests shoot fly and maize stem bore, (*Chilo partellus* Swinhoe, *Sesamia inferens* Walker) occurs as serious pests in India (Manjunath, 2013).

The fall army worm is a lepidopteran pest that feeds in large numbers on leaves and stems of more than 80 plant species, causing major damage to economically cultivated grasses such as maize, rice, sorghum, sugarcane but also other vegetable crops and cotton. The literature on this pest is extensive (Ashley *et al.*, 1989) [2].

On maize, if 5% of seedlings are cut or 20% of whorls of small plants (during the 1st 30 days) are infested, it is recommended that an insecticide be applied (King and Saunders, 1984) [4]; on sorghum the pest threshold level is regarded as one (or two) larvae per leaf whorl and two per head (Pitre, 1985) [5].

The studies on seasonal incidence of insect pests and their natural enemies of maize crop and their correlation with the weather parameters provide basic information about seasonal occurrence of insect pests and their natural enemies. This provides an opportunity for the development of management strategies significant for the control of these pests.

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Materials and Methods

A field experiment was conducted at Research Cum Instructional Farm at IGKV, Raipur, (C.G.) during *kharif* 2018 under field condition to know the occurrence of insect pests on maize. The popular hybrid genotype was raised and maintained without insecticide application to study the occurrence of major insect pests on maize in relation to abiotic factors viz., maximum temperature, minimum temperature, relative humidity (morning and evening), wind velocity and sunshine hours.

To determine the seasonal incidence of insect pests on maize crop, weekly populations were recorded on randomly selected twenty five plants from four corners and center starting from 15 days after germination to the late stage of the cropping season.

The occurrence of fall armyworm, *Spodoptera frugiperda* (Smith) was observed by devastating sampling of 25 randomly selected plants at five different locations of plot. Then, the symptoms seen in foliar damage of plant and count the number of larvae of *Spodoptera frugiperda* at seven days interval starting from 15 days after germination till harvest of the crop.

The data was statistically analyzed by subjecting to the correlation between weather parameters and the population of insect pests which were determined using the Karl Pearson's coefficient of correlation formula:

$$r = \frac{\sum XY - \frac{\sum X \sum Y}{N}}{\sqrt{(\sum X^2 - \frac{(\sum X)^2}{N})(\sum Y^2 - \frac{(\sum Y)^2}{N})}}$$

Where,

R_{xy} = Simple correlation coefficient

X = Variable i.e. abiotic component. (Average temperature, relative humidity and total rainfall)

Y = Variable i.e. mean number of insect pests per plant

N = Number of observations.

The correlation coefficient (r) values were subjected to the test of significance using t-test:

$$t = \frac{r_{xy}\sqrt{n-2}}{\sqrt{1-r_{xy}^2}}$$

~ t n-2 d.f.

Where,

r = Correlation Coefficient

n = No. of observations

The calculated t-value obtained was compared with correlation coefficient table value at 5% and 1% level of significance.

Results and Discussion

Fall army worm, *Spodoptera frugiperda* appeared during 37th SMW i.e. 2nd week of September with a mean population of 0.12 larva/plant. The population slowly increased and reached to its peak in the fourth week of September with a mean population of 0.56 larva/plant. When, the maximum atmospheric temperature, minimum atmospheric temperature, and relative humidity were 32.9 °C, 25°C and 76 per cent, respectively. Thereafter, the population declined gradually and reached to a minimum level of 0.16 larva/plant during 4th week of October (42nd SMW).

The results indicated that the larvae of fall army worm population exhibited a non-significant negative correlation with total rainfall (r= -0.32), evening relative humidity (r=-0.233) and wind velocity (r=-0.341). While, it was showed significant positive correlation with maximum temperature (r=0.586). The regression equation being (Y=0.071x-2.099) indicating that with an increase in 1°C temperature there will be increase in population of larvae/plant by 0.071 per cent.

Table 1: Seasonal incidence of fall army worm, *Spodoptera frugiperda* (Smith) infesting maize genotype KSCH-972 during, *kharif* 2018.

SMW No.	Average no. of larvae of fall army worm/plant	Max. Temp. (°C)	Min. Temp. (°C)	Rain Fall (mm)	RH (%) Mor.	RH (%) Eve.	Wind Velocity (Km/h)	Sun Shine (hours)
33	0	30.3	25.3	101.2	94	79	4.1	2.9
34	0	29.0	24.6	60.4	93	79	5.5	0.6
35	0	28.3	24.1	275.0	96	86	6.8	0.2
36	0	29.2	23.9	30.2	93	57	0.5	1.1
37	0.12	32.6	25.1	0.0	90	55	2.2	6.4
38	0.32	31.0	24.1	32.8	92	68	3.5	3.6
39	0.56	32.9	25.0	11.0	93	59	1.2	7.8
40	0.56	34.0	23.8	0.0	91	44	0.7	8.0
41	0.44	32.4	22.8	0.0	87	51	2.8	7.1
42	0.16	33.4	21.3	0.0	89	40	1.0	8.5
43	0	32.9	18.9	0.0	86	48	1.1	8.3
44	0	31.0	19.6	0.0	86	49	2.6	9.3
45	0	32.3	20.1	0.0	86	49	1.8	8.7
Correlation coefficient (r)		0.586*	0.312	-0.327	0.026	-0.233	-0.341	0.350

*Significant at 5% level of significance

**Significant at 1% level of significance

SMW: Standard Meteorological Week

Similarly, Ahir *et al.*, (2017) [1] who recorded the *Spodoptera litura* followed by *Spodoptera frugiperda* population exhibited a significant negative correlation with relative humidity (r = -0.647) and total rainfall (r = 0.536) while, non significant correlation with mean atmosphere temperature. The minimum temperature, relative humidity and rainfall

proving negative relationship with population of *S. litura* infesting groundnut crop. Similarly, Yadav *et al.*, (2015) [6] in black gram also reported that population of *S. litura* showed non- significant negative correlation with rainfall and wind velocity while temperature (minimum and maximum), relative humidity (morning and evening) and sunshine

showed a non significant positive correlation. Similarly, Brahman *et al.*, 2018^[3] in soybean also reported that population of *S. litura* showed significant correlation with

maximum temperature ($r = 0.663$), whereas negative significant correlation was noticed with rainfall ($r = -0.570$).

Fig 1: Mean population of fall army worm, *Spodoptera frugiperda* during, kharif 2018.

Fig 2: Regression line between weather parameters and population build-up of *Spodoptera frugiperda*.

Conclusion

The peak period of fall army worm with a mean population of 0.56 larva/plant were seen during 40th SMW, respectively. Whereas, the fall army worm population showed significant positive correlation with maximum temperature ($r = 0.586$).

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