International Research Journal of Education and Technology
ISSN 2581-7795

Seasonal incidence of leaf eating caterpillar, *Spodoptera litura* (Fab.) infesting soybean

Bhumika Solanki[1], A.M. Bharadiya[2], A.M. Parmar[3], T.S. Bhuva[4]

[1]Research Scholar, Dept. of Entomology, Junagadh Agricultural University, Junagadh (India)

[2]Associate Research Scientist, Junagadh Agricultural University, Junagadh (India)

[3]Research Scholar, Dept. of Entomology, Junagadh Agricultural University, Junagadh (India)

[4]Research Scholar, Dept. of Entomology, Junagadh Agricultural University, Junagadh (India)

ABSTRACT

The activity of leaf eating caterpillar, *S. litura* was commenced from 30th SMW *i.e.* third week of July (1.05 larva per plant) which gradually increased and attained a peak of 4.10 larva per plant during 36th SMW coinciding with the first week of September. Thereafter, *S. litura* population started declining and reached a minimum during the 42nd SMW (0.98 larva per plant) coinciding with the third week of October. Finally, the pest population disappeared from the field after the fourth week of October. Correlation studies between meteorological parameters and the *S. litura* population showed significant negative correlation with maximum temperature (r= -0.522*) and positive significant correlation with minimum temperature (r= 0.527*), relative humidity (r= 0.617*) and rain fall (r= 0.555*). Whereas, non-significant negative correlation with bright sunshine hours (r= -0.475) and wind speed (r= -0.159).

Key words: seasonal incidence, *S. litura* and soybean

1. INTRODUCTION

Soybean [*Glycine max* (L.) Merrill.] belonging to family Leguminosae, sub-family Papilionaceae, is one of the important oilseed cash crops of India. It is a unique crop with high nutritional value, thus it is also known as the “Miracle bean, Golden bean and Crop of the planet”. It provides 40% protein, well balanced in essential amino acids, 20% oil, rich in poly unsaturated fats especially Omega 6 and Omega 5 fatty acids, 6-7% total minerals, 5-6% crude fiber and 17-19% carbohydrates [2]. From the nutritional point of view, soybean contains 43.2% protein and 20.00% of edible oil and is also a good source of phosphorus and lecithin. It also contains a good amount of potassium, sulphur and vitamin E. Soybean protein is mainly rich in amino acids like leucine, methionine and threonine that the human body requires. For vegetarians, it is known as "Poor Man's Meat".

Soybean crop having luxuriant growth with succulent leaves attracts several insect pests for feeding, oviposition and shelter. About 65 species of insects have been reported to attack soybean from cotyledon to the harvesting stage in Karnataka [6]. Among the various insect pests reported in India the leaf eating caterpillar, *S. litura* is found to be the major one [1].

Spodoptera litura, otherwise known as the tobacco cutworm or cotton leafworm, is a nocturnal moth in the family Noctuidae. *S. litura* is a serious polyphagous pest in Asia, Oceania and the Indian subcontinent. *S. litura* is an economically important polyphagous pest in India and is considered one of the major threats to the present-day intensive agriculture and changing cropping patterns worldwide, next only to *Helicoverpa armigera* (Hubner). The pest occurs in India, Pakistan, Bangladesh, Sri Lanka, South East Asia, China, Korea, Japan, Philippines, Indonesia, Australia, Pacific Islands, Hawaii and Fiji [4].

The larvae of *S. litura* start eating leaves along the midrib and proceed gradually to the margins [3]. The grownup larvae feed for a short time on a lower surface of the leaf and migrate to the ground where they feed on young seedlings of many plant varieties [8].

2. MATERIALS AND METHODS

To study the seasonal incidence of *S. litura* infesting soybean, the crop was sown at Main Oilseeds Research Station, Junagadh Agricultural University, Junagadh during *kharif* season of 2021. The crop was grown in a plot size of 20 m x 20 m keeping 45 cm x 10 cm spacing between row to row and plant to plant. The plot was divided into 10 equal quadrates of size 1 m x 1m. All the other agronomical operations were adopted as per the recommendations. The crop under the experiment was kept free from pesticides throughout the season. The observations on a number of larvae of *S. litura* were recorded at the weekly interval on five plants selected randomly from each quadrate, from one week after germination till the harvest of the crop. The mean population of *S. litura* larvae per plant was worked out separately.

2.1 Correlation study

The weekly meteorological data were obtained from the meteorological observatory of Junagadh Agricultural University, Junagadh. With a view to studying the impact of different abiotic factors on pest incidence, a simple correlation between pest population and weather parameters was worked out.

3. RESULTS AND DISCUSSION

A study was carried out to know the seasonal incidence *S. litura* in soybean and correlation of *S. litura* population with the weather parameters during *kharif* 2021.

The population of *S. litura* was started at 30 SMW *i.e.* third week of July (1.05 larva per plant) which increased during each successive weeks and reached at peak level (4.10 larva per plant) at 36 SMW coinciding with first week of September. Thereafter, the pest population started declining in second week of September with an average 3.93 larva met at 37 SMW. Further decline occurred in larval population after each week. Minimum population occurred during the 42th SMW (0.98 larva) coinciding at third week of October. And finally the pest population disappeared from the field after fourth week of October. Similarly, the first appearance of *S. litura* was observed after the first appearance of male moths in early to mid-August and were present in the growing season up to late September to mid-October. The peak appearance of egg masses and larval populations always corresponded with the peak activity of male moths recorded during mid-September [5]. The first appearance of *S. litura* in soybean during the 31st standard week (30 July to 5 August). The incidence increased slowly in the next few weeks. During 35th SMW and 36th SMW population was similar and recorded the highest population during 36th SMW (3 to 9 September). The population suddenly declined after 37th SMW (10 to 16 September) [7].

Table 1: Seasonal incidence of *Spodoptera litura* (Fab.) infesting soybean

Week after sowing	SMW	Month	Mean no. of *S. litura* larva/plant
3	29	July	0
4	30		1.05
5	31		1.67
6	32	August	1.98
7	33		2.47
8	34		2.96
9	35		3.45
10	36	September	4.10
11	37		3.93
12	38		3.24
13	39		2.78
14	40	October	1.12
15	41		1.10
16	42		0.98
17	43		0

SMW: Standard Meteorological Week

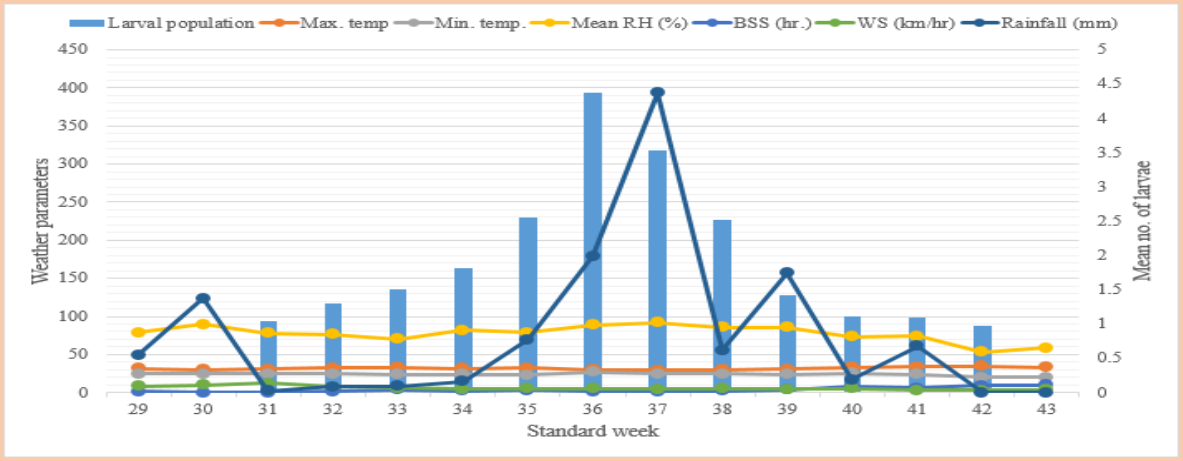

Fig. 1: Seasonal incidence of *S. litura* and its correlation with weather parameters during *kharif* 2021

3.1 Correlation studies between population of *S. litura* and weather parameter

A study on effect of various weather parameters on fluctuations of *S. litura* population in soybean indicated that maximum temperature showed statistically negative significant correlation with larval population. However, the larval population has a positive significant correlation with minimum temperature, relative humidity and rain fall. While, bright sunshine hours and wind speed showed statistically negative non-significant correlation with larval population. The *S. litura* population exhibited significant negative correlation with maximum temperature (r= -0.52) and positive significant correlation with minimum temperature (r= 0.52), relative humidity (r= 0.61) and rain fall (r= 0.55), whereas non-significant negative correlation with bright sunshine hours (r= -0.47) and wind speed (r= -0.15).

Table 13: Correlation matrix of weather parameters and *S. litura* population

Weather parameters	Correlation
Maximum Temperature (° C)	-0.522*
Minimum Temperature (° C)	0.527*
Mean Temperature (° C)	0.005
Morning Relative humidity (%)	0.797**
Evening Relative humidity (%)	0.484*
Mean Relative humidity (%)	0.617*
Bright sunshine (hr.)	-0.475
Wind speed (km/hr)	-0.159
Rainfall (mm)	0.555*

*Significant at 5% (r = ± 0.514) **Significant at 1% (r = ± 0.641) N = 15

4. CONCLUSIONS

It can be concluded that the peak incidence of *S. litura* (4.10 larva per plant) occurred during 36th SMW (first week of September). The correlation matrix indicates that the *S. litura* population exhibited a significant negative correlation with maximum temperature and non-significant negative correlation with bright sunshine hours and wind velocity, whereas positive significant correlation with minimum temperature, rainfall and relative humidity.

5. ACKNOLEDMENT

The authors are highly grateful to the Director of Research, Junagadh Agricultural University, Junagadh, Gujarat (India) for providing the facilities required to conduct this experiment.

REFERENCES

[1] Babu, S. R.; Kalyan, R. K.; Ameta, G. S. and Meghwal, M. L. (2015). Analysis of outbreak of tobacco caterpillar, *Spodoptera litura* (Fabricius) on soybean. *Journal of Agrometeorology,* **17**(1): 61.

[2] Chauhan, G. S. and Joshi, O. P. (2005). Soybean (*Glycine max*) the 21st century crop. *Indian Journal of Agriculture Sciences*, **75**(8): 461-469.

[3] Edrozo, L. B. (1918). A study of tobacco worms and methods of control. *Philippines Agriculturist and Forester*, **6**(7): 195-209.

[4] Hill, D. S. (1993). Agricultural insect pests of the tropics and their control. Cambridge University Press. Cambridge, London. pp: 760.

[5] Punithavalli, M.; Sharma, A. N. and Rajkumar, M. B. (2014). Seasonality of the common cutworm *Spodoptera litura* in a soybean ecosystem. *Phytoparasitica*, **42**(2): 213-222.

[6] Rai, P. S.; Seshu reddy, K. V. and Govindan, R. (1973). A list of insect pests of soybean in Karnataka State. *Current Research*, **2**: 97-98.

[7] Sapekar, A. S.; Sonkamble, M. M. and Matre, Y. B. (2020). Seasonal incidence of major pests of soybean and its correlation with weather parameters. *International Journal of Current Microbiology and Applied Sciences*, **11**: 2555-2560.

[8] Simmond, H. W. (1925). A cutworm pest, *Prodenia litura* F. *Agricultural Circular of Department of Agriculture Fiji*,s **5**: 86-87.