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Study the incidence and period of activity of *Spodoptera litura* on soybean

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Abstract

Experiments were carried out during, *Kharif*, season 2015, to evaluate the incidence and period of activity of *Spodoptera litura* on soybean crop. The highest tobacco caterpillar infestation during *Kharif* season with mean population of 4.3 larvae / mrl was recorded during last week of august at 49 DAG. Thereafter an abrupt decline in larval population was observed in fourth week of September with an average of 1.2 larvae/mrl at 84 DAG mainly due to high humidity coincided with heavy infection of parasitic fungus, *Beauveria bassiana* during the period. Peak parasitism of *Beauveria bassiana* was found during last week of September. Peak larval population of the tobacco caterpillar, *Spodoptera litura* showed positive and significant correlation with rain fall. (($r=0.75$))

Keywords: *Spodoptera litura*, *Beauveria bassiana*, mean population, positive correlation

1. Introduction

Soybean [*Glycine max* (L.) Merrill] has occupied important place in agriculture and in the oil economy of the country. Commonly known as 'Soya' is a unique crop with high nutritional value, providing 40 percent protein and 20 percent edible oil besides minerals and vitamins. Soybean is native to East Asia, Soybean is mostly grown for oil (20%) and protein (40%) around the world. It also contains 6-7% total mineral, 5-6% crude fiber, 5% ash and 35% carbohydrates^[1]. Soybean crop helps in building up the soil fertility by fixing atmospheric nitrogen through the root nodules and also through leaf fall on the ground at maturity. The multiple-pest complex of soybean crop poses serious limitations in the intensification of soybean cultivation in different agro climatic regions of India. Among the defoliators *Spodoptera* is one of the important pests cause yield loss. *Spodoptera litura* (Fab.) is an economically important polyphagous insect. Which is widely distributed throughout Asia. Causing considerable economic loss to many field, vegetables and fruit crops. Crop loss due to insect varies between 10 to 30 percent for major crops. In case of severe infestation, the entire crop is damaged badly, thus causing 40 percent defoliation of leaf area. It is indicated that climatic changes affect the activity of tobacco caterpillar. Therefore, knowledge of how insect pests respond to climate variation is of fundamental importance in understanding insect pest management. Keeping these in view, field experiment was conducted to address the importance and impact of weather on *Spodoptera litura* incidence on soybean crop.

2. Material and Methods**2.1 Studies on seasonal incidence of *Spodoptera litura* on soybean**

As per the package practices of soybean variety JS 335 was sown in area of 1000 sq.m.in rows at 40 cm apart. The first appearance and population of insect pest was recorded at 7 days intervals starting from germination to harvest of the crop.

2.2 Observations

A weekly observation on the number of larvae of the test insect pest was recorded from ten randomly selected spots of one- meter row length. The larval counts were noted throughout the crop season commencing after one week of germination till maturity. Also recorded the observations of egg and larval population of *Spodoptera* were worked out.

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3. Results

3.1 Studies on seasonal incidence, nature of damage and correlation with abiotic factors on population buildup of tobacco caterpillar of soybean

During *Kharif* season of 2015 tobacco caterpillar was observed infesting soybean crop at different stages of crop growth.

3.1.1 Seasonal incidence of tobacco caterpillar

The infestation of tobacco caterpillar started at 28 DAG, in the third week of August 2015 with an average of 1.0 larvae/mrl. There after population of the pest abruptly

increased in last week of August with an average of 4.3 larvae/mrl at 49 DAG. Thereafter, population of the pest slightly decreased in first week of September with an average 3.5 larvae/mrl at 56 DAG. Further, an abrupt decline in larval population was observed in last week of September with an average of 1.2 larvae/mrl at 84 DAG mainly due to high humidity coincided with heavy infection of parasitic fungus, *Beauveria bassiana* during the period. During this season from 1st week of October, larval population declined due to infection of parasitic fungus *Beauveria bassiana* and finally disappeared from the soybean field in last week of September. (Table 1)

Table 1: Seasonal incidence of tobacco caterpillar in soybean during kharif 2015.

Date of observations	Larvae/mrl	No of Larvae infected by biocontrol agent <i>B.bassiana</i> (field) <i>B.bassiana</i> /mrl (field)
11.8.15 (28 DAG)	1.0	0.2
18.8.15 (42DAG)	3.5	1.3
25.8.15 (49DAG)	4.3	0.2
1.9.15 (56DAG)	3.5	0.5
8.9.15 (63DAG)	1.8	1.0
15.9.15 (70 DAG)	1.5	0.0
22.9.15 (77DAG)	1.2	0.4
29.9.15 (84 DAG)	1.2	1.0
6.10.15 (91 DAG)	1.0	-

3.1.2 Correlation of meteorological parameters with tobacco caterpillar, *Spodoptera litura*.

Correlation between maximum, minimum temperature, relative humidity and rain fall with tobacco caterpillar population was worked out (Table 2). From the table, it is clear that the correlation coefficient between abiotic factors (maximum temperature, minimum temperature and relative humidity) and larval population was non-significant. In contrast to the above factors the correlation coefficient between larval population and rain fall was significant. A positive correlation between larval population and minimum temperature and rain fall were noted ($r= 0.28$ and 0.75

respectively). However, a significantly positive correlation was observed between rain fall (0.745 mm) and larval population. Further, a negative and weak correlation was observed between maximum temperature and humidity (-0.65 and -0.60) and larval population. The maximum and minimum temperature during the incidence of tobacco caterpillar was between 27.2°C to 33.6°C and 19.81°C to 22.54°C respectively. The rainfall ranged between 2.3 to 162.1 mm and relative humidity ranged from 93.57 to 98.71. Rain fall play an important role and seems to be favorable in population buildup of tobacco caterpillar in soybean. (Fig-1, Table-2)

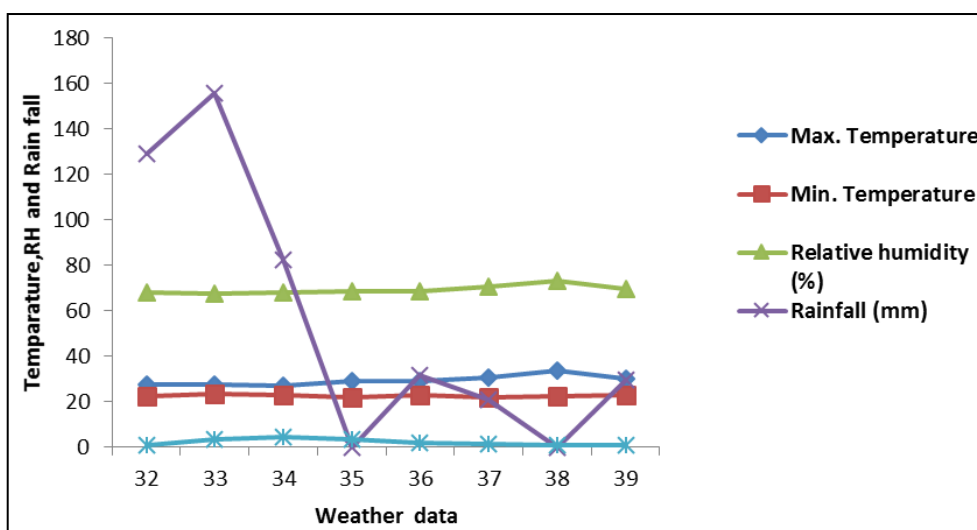


Fig 1: Correlation of meteorological parameters with population of tobacco caterpillar.

Table. 2: Correlation coefficient of population of Tobacco caterpillar, *Spodoptera litura* (Fabricious) with Meteorological parameters.

S. No	Correlation of larval population	'r' value	't' cal.	't'tab
1	Maximum temperature	-0.65	-1.45	2.36
2	Minimum temperature	0.28	0.77	2.36
3	R H %	-0.60	-1.36	2.36
4	Rainfall(mm)	0.75*	2.96	2.36

*Significant at 5%level

4. Discussions

4.1 Studies on seasonal incidence, period of activity and effect of abiotic factors on population buildup of *Spodoptera litura* on soybean

During *Kharif* season of 2015, tobacco caterpillar was observed infesting soybean crop at different stages of crop growth. The pests are a defoliator. The incidence and injuriousness of tobacco caterpillar in September also favored the multiplication of parasitic fungus, *Beauveria bassiana*, which might have reduced the larval population. During the period of activity, the pest devoured leaves, flowers and young pods, which collaborate with the findings of many investigators.

4.1.1 Tobacco caterpillar (*Spodoptera litura*)

The infestation of tobacco caterpillar started at 28 DAG, in the second week of August 2015 with an average of 1.0 larvae/mrl. After that population of the pest abruptly increased in last week August with an average of 4.3 larvae/mrl at 49 DAG. Thereafter, population of the pest follow decrease trend in first week of September with an average 3.5 larvae/mrl at 56 DAG and abrupt decline in fourth week of September with an average of 1.2 larvae/mrl at 84 DAG mainly due to high humidity coincided with heavy infection of parasitic fungus, *Beauveria bassiana* during the period. From last week of September, larval population declined due to infection of parasitic fungus *Beauveria bassiana* and finally disappeared from the soybean field in last week of September.

Earlier, Kumar *et al.* (1998) [2] estimated Population densities of *Spilosoma obliqua* (Walker) and *Spodoptera litura* (F.). During the crop growth period maximum around the second half of October. Solangi *et al.* (2001) [5] reported that maximum population of tobacco cutworm (*Spodoptera litura* F.) was 11.72 per plant, which recorded 12.25 percent damage in the crop at 19.97 °c temperature and 75.8 percent relative humidity. Sailaja Rani *et al.* (2006) observed that, the pest activity for ten weeks commencing from the 46th to 3rd standard week with a peak larval density of 23.83 per ten plants during the 52nd standard week with respect to *S. litura*. In present study peak larval density 4.3 larvae/mrl was observed in 49th standard week days after germination.

Sharma and Ansari (2007) [4] evaluated *Spodoptera litura* mortality due to infection by *Beauveria bassiana* and *Nomuraea riley*, and parasitism by *sturmia* species. The mean larval population in the soybean field increased up to the 3rd week of August then declined significantly during the 4th week. The average mortality due to *B. bassiana* and *N. riley* ranged from 7.7% for larvae collected during the first week of August to 58.9% for larvae collected during the 4th week of August. In present investigation *Spodoptera litura* mortality due to infection of parasitic fungus *B. bassiana* was observed during first week of August to last week of September, 2015. Reported that the presence of *Spodoptera* was noticed two weeks after sowing and continued to exist up till harvesting of the crop. The peak incidence of pest occurs around 50-60 days after sowing, and all weather parameters together can have influence up to 90% on the incidence of *Spodoptera*. However in present investigation the *spodoptera* appeared on the crop 28 days after germination and remained active up to before harvest of the crop.

Yadav *et al.* (2015) [6] reported the Infestation of tobacco caterpillar started in the third week of August, 2010 at 42 DAG, recording 0.2 larva/mrl. The larval activity slightly

increased and reached maximum in second week of September at 70 DAG with an average of 2.80 larvae/mrl. Gadhiya *et al.* (2014) investigated on population dynamics of *Helicoverpa armigera* (Hubner) and *Spodoptera litura* (Fabricius) infesting groundnut variety CG 20 and observed that the activity of *H. armigera* and *S. litura* began in 1st week of March and 4th week of February, respectively and continued up to 3rd week of May, with a peak activity during 16th standard week i.e. 3rd week of April.

5. Conclusions

These parasitic fungus manifested variable seasonality trends which seem to be connected with their preferable life stages of *Spodoptera litura* abundance on the crop. Out of 50 soybean genotypes/varieties screened against tobacco caterpillar, Two varieties HIMSO 1685, PS 1347 were found highly resistant, Five varieties namely RVS 2007-6, RVS 2008-24, SL-955, NRC-86 and SL-688 were found to be resistant against tobacco caterpillar. The information obtained in the study could be helpful in soybean breeding programs aimed at developing the varieties resistant against defoliators.

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