

## Seasonal Incidence of Defoliators and Girdle Beetle of Soybean (*Glycine max*) and its Correlation with Weather Factors

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**ABSTRACT:** Soybean crop is adversely affected by attack of major defoliators and borers viz., tobacco caterpillar, green semilooper and girdle beetle. Population density of insect pests fluctuates with changing weather conditions. Abiotic factors regulate seasonal incidence, population count and development rates of the pests. The trial was conducted during kharif 2019 at College of Agriculture, Tikamgarh, Madhya Pradesh to find out the occurrence of defoliators and girdle beetle of soybean. Present study revealed that the incidence of defoliator pests viz., Green semilooper, (*Thysanoplusia orichalcea*) and Tobacco caterpillar started from third week of August (33<sup>rd</sup> standard week) with a population of 0.2/mrl (Metre row length) and reached at its highest level during the second week of September (37<sup>th</sup> standard week) with a population of 5.0/mrl and 3.2/mrl. The incidence of girdle beetle was initiated from third week of August (33<sup>rd</sup> standard week) with 1.18 girdle/mrl and reached its peak during first week of October (40<sup>th</sup> standard week) with 5.08 girdle/mrl. Correlation studies revealed that maximum temperature showed significantly positive correlation ( $r = 0.71$ ) with green semilooper larval population. Whereas minimum temperature observed positive correlation ( $r = 0.46$ ) with green semilooper larval population while morning and evening relative humidity, sunshine and rainfall was found to be negatively correlated ( $r = -0.24, -0.01, -0.13, -0.29$  respectively) with green semilooper larval population but to the non-significant level. While correlation studies with tobacco caterpillar exhibited significant negative correlation ( $r = -0.71$ ) with rainfall and positive correlation with maximum and minimum temperature. While morning and evening relative humidity were found to be negatively correlated ( $r = -0.23, -0.20$  respectively) to non significant level. However rainfall exhibited significant positive correlation ( $r = 0.71$ ) with the infestation of girdle beetle. The sunshine morning and evening relative humidity were found to be negatively correlated ( $r = -0.17, -0.03, -0.06$  respectively) with the incidence of this pest to the level of non-significance. Other abiotic factors maximum and minimum temperature was positively correlated (0.22, 0.23) with non-significant impact on the incidence of girdle beetle.

**Keywords:** Seasonal incidence, Semilooper, Tobacco caterpillar, Girdle beetle.

### INTRODUCTION

Soybean is one of the most important crops of the world largely grown in United States of America, Brazil, Argentina, China, and India and its plays very crucial role in international trade (Baig *et al.*, 2017). It is a unique crop with high nutritive value, providing 40 per cent protein and 20 per cent edible oil besides minerals and vitamins (Sasvihalli *et al.*, 2017). In India soybean is cultivated in 12.19 Million ha with production of 9.3 metric tons and average productivity of 763 kg/ha (USDA 2019). Major production of soybean comes from Madhya Pradesh, Maharashtra and Rajasthan. In Madhya Pradesh, cultivated area of soybean is 51.952 lakh ha with production of 40.107 lakh tons and

productivity 772 kg /ha. Soybean area under Tikamgarh district is 0.175 lakh ha with the production of 0.146 lakh million tones and productivity 834 kg/ha is respectively during 2019 (SOPA 2019). Soybean crop is attacked by more than 300 insect's species, out of them only a few attain major pest status. The soybean crop is attacked by these pests from seedling stage to maturity and cause nearly 25% reductions in yield. Earlier studies conducted by many worker (Sonule *et al.*, 2019; Chaturvedi *et al.*, 1998) have indicated that The green semilooper (*Chrysodeixis acuta* Walker), tobacco caterpillar (*Spodoptera litura*) and girdle beetle (*Obereopsis brevis* Swedenbord) are among the most common soybean pests in central India. The distribution, host plant, biology, symptoms of damage

and various control measures for the management of major insect pest of soybean to enhance the productivity is also reported by Gaur and Mogalapu (2018). The low productivity of soybean both at national and state level is attributed to a biotic and abiotic stresses like drought, insect pest and disease. Among these biotic stress defoliator and stem borer often pose a serious threat to soybean production and impairing quality of the produce in many ways (Singh and Singh 1990). Keeping this point in view, present investigation was conducted to note the seasonal incidence of defoliators and stem borer to know the status of pests for applying need based IPM strategy.

## MATERIALS AND METHODS

Experimental trial was conducted at College of Agriculture, Tikamgarh (M.P.) with soybean cultivar-JS-9560 during *Kharif* 2019. Row to row distance was 30 cm and plant to plant was 5 cm. All the agronomical practices, except the package recommended for insect pests management were adopted to raise a good crop. The data were recorded on the incidence on insect pest from the initiation of the defoliator and girdle beetle and continued till harvesting of the crop at weekly intervals. The incidence of green semilooper and tobacco caterpillar were recorded per meter row length by counting number of larvae at five places and mean was calculated. The population of girdle beetle was recorded per meter row length at five places. The healthy and girdled damaged plant were counted and percent plant infestation was calculated at the time of harvesting. Weekly data on weather parameters were also recorded. The data so obtained was then subjected to statistical analysis for correlation and test of significance.

## RESULTS AND DISCUSSION

**Green semilooper.** The green semilooper population was started from 3<sup>rd</sup> week of August (33<sup>rd</sup> standard week) with a population of 0.2 larvae/mrl. The peak activity (5.0 larvae/mrl) of the pest was observed during 37<sup>th</sup> SW (09 September to 15 September) which was almost identical to the study observed by Babu *et al* (2016) the peak incidence of green semilooper was observed during 33-34 SW, 33-36 SW and 37-39 SW in 2012, 2013 and 2014 respectively in the finding of indicating a close conformity to present findings. These findings leads to a conclusion that peak incidence of green semilooper may be observed at September due to the environmental conditions prevailed at that month. According to Raju *et al.* (2014) reported that the green semilooper population was initiated during last week of July, 2012 with 1 to 2 larvae/mrl and an average of 0.9 larvae/mrl which are not match with the present findings. Kujur (2011) reported that the population of *S. litura* reached its highest level during last week of August with 31.2°C maximum temperature, 24.4°C minimum temperature, morning and evening R.H. 93% and 76%, respectively and a rainfall of 62.8 mm. Correlation studies revealed that maximum temperature ( $r = 0.71$ ) showed significantly positive correlation with green semilooper. Whereas minimum temperature

( $r = 0.46$ ) exhibited positive correlation with non-significant level. However morning relative humidity ( $r = -0.24$ ), evening relative humidity ( $r = -0.01$ ), sunshine ( $r = 0.13$ ) and rainfall (0.29) observed negative correlation at non-significant level with green semilooper population. Kalyan and Ameta (2017) also reported that green semilooper population was significantly positive correlated which is in agreement with the present results.

**Tobacco caterpillar.** The tobacco caterpillar *Spodoptera litura* (Fab.) was started in the 3<sup>rd</sup> week of August (33<sup>rd</sup> standard week) with a larval population of 0.88 larvae/mrl which reached its peak during the 2<sup>nd</sup> week of September (37<sup>th</sup> standard week) with a larval population of 3.2 larvae/mrl. At that time maximum and minimum temperature were 31.6°C to 24.6°C respectively, with morning and evening relative humidity 90.4% to 86.9% respectively, and rainfall 13.0mm. Choudhary (2009) observed that the scattering of *Spodoptera obliqua* (Walker) and *Spodoptera litura* was seen on soybean crop from August to October. Babu *et al.* (2015) exhibited that the moth populations of *S. litura* were active from August to mid-October and declined sharply in late October. The highest appearance was observed during the month of September-October and corresponded with maximum activity of egg masses and larval populations in soybean contributed to the outbreak of this pest during the reproductive stage of the crop. Tomar and Bhargawa (2018) recorded the green Semilooper, (*Chrysothrips acuta*), tobacco caterpillar, (*Spodoptera litura*), as the major damaging pest of soybean crop. Damaging infestation was recorded up to 13.5%. The highest mean level of Girdle beetle (9.7 larvae/ meter/ row) were observed during 3<sup>rd</sup> week of September 35 (SMW). Sonule *et al.* (2019) also reported similar result of first incidence of *S. litura* 0.20 larvae / mrl in 32<sup>nd</sup> Standard Meteorological Week. The population of *S. litura* gradually increased in next few weeks and reached at its highest level during 36<sup>th</sup> SMW with 1.20 larvae /mrl.

Correlation studies indicated that rainfall exhibited significant negative correlation ( $r = -0.71$ ) with larval population of tobacco caterpillar. In previous investigation negative correlation of rainfall ( $r = -0.55$ ) was reported by Nayaka (2013) which is in agreement with the present results indicating that rainfall acts as a factor affecting tobacco caterpillar population at any place.

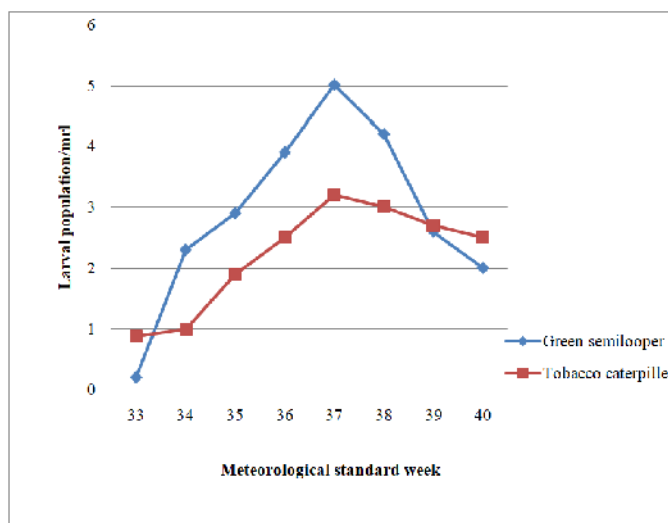
**Girdle beetle.** Girdle beetle population was started in 3<sup>rd</sup> week of August (33<sup>rd</sup> standard week) with 1.18 girdle per meter row length. The highest incidence of the pest 5.08 girdle/mrl was recorded during 1<sup>st</sup> week of October (40<sup>th</sup> standard week). At the same time the maximum and minimum temperature were 31.1°C and 21.6°C, respectively, and morning and evening relative humidity were 88.9% and 62.7% respectively with 8.1mm rainfall. Lal *et al.* (2014) Observed that the maximum occurrence of girdles was observed on stem (24%), petiole (21%), petiolet (13%) and branch (10%) during second week of September. The similar movement of infestation was recorded up to 3<sup>rd</sup> week of

September. Yeotikar *et al.* (2015) reported that the population of *S.litura* and *H. armigera* was found negligible in larval number. Incidence of girdle beetle was initial started in 30<sup>th</sup> SMW by recording 1.36% infestation and reached at harvest 61.22%. While stem tunneling due to stem fly was observed 59.45 % at crop maturity stage. Peak population (3.00 larvae/mrl) of green semilooper was recorded during 34<sup>th</sup> SMW. Kujur (2011) reported that the peak activity of the girdle beetle was found in the second week of

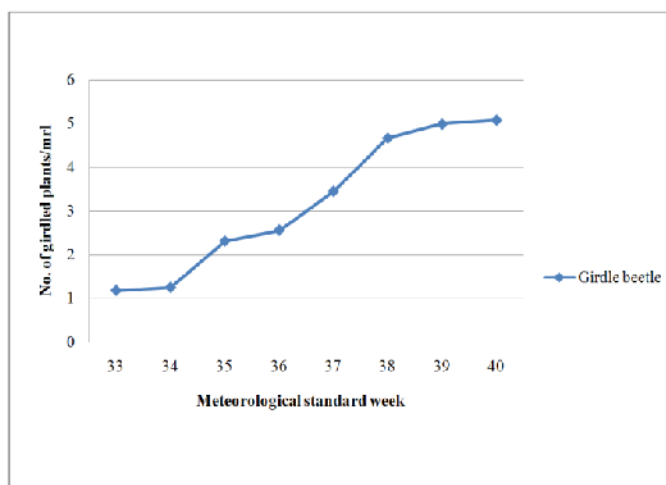
September when the maximum and minimum temperature 28.8°C and 24.5°C, morning and evening relative humidity were 94% and 87% and rainfall was 2136.4 mm. Population of girdle beetle was correlated with weather parameters and revealed that the rainfall showed significant positive correlation ( $r=0.71$ ) with the infestation of girdle beetle. The significantly positive correlation of girdle beetle with rainfall is reported by Gaur *et al.* (2015); Yeotikar *et al.* (2015). These findings are also support with present study.

**Table 1: Seasonal incidence of defoliator pests and girdle beetle on soybean during kharif 2019.**

Standard week	Period		Mean larval population /mrl		Girdle plant/mrl
	From	To	Green Semilooper	Tobacco Caterpillar	
33	12.08.2019	18.08.2019	0.2	0.8	1.18
34	19.08.2019	25.08.2019	2.3	1.0	1.25
35	26.08.2019	01.09.2019	2.9	1.9	2.31
36	02.09.2019	08.09.2019	3.9	2.5	2.56
37	09.09.2019	15.09.2019	5.0	3.2	3.45
38	16.09.2019	22.09.2019	4.2	3.0	4.67
39	23.09.2019	29.09.2019	2.6	2.7	4.99
40	30.09.2019	06.10.2019	2.0	2.5	5.08



**Fig. 1.** Incidence of defoliator pests on soybean.



**Fig. 2.** Incidence of girdle beetle on soybean.

**Table 2: Correlation study between major insect pests of soybean with weather parameters.**

Insect pests	Temperature (°C)		Relative humidity (%)		Rainfall (mm)	Sunshine hours (hrs)
	Maximum	Minimum	Morning	Evening		
Green semilooper	0.71*	0.46	-0.24	-0.01	-0.13	-0.29
Tobacco caterpillar	0.46	0.01	-0.23	-0.20	-0.71*	0.15
Girdle beetle	0.42	0.23	0.03	-0.06	0.71*	-0.17

\*Significant at 5% level

## CONCLUSION

It may be concluded from the study that the maximum activity of green semilooper and tobacco caterpillar were recorded during the second week of September, however the peak incidence of girdle beetle was recorded during first week of October. Correlation studies exhibited that among the various abiotic factors, maximum temperature exhibited significant positive correlation with green semilooper, whereas, Tobacco caterpillar population, exhibited significant negative correlation with rainfall. While the incidence of girdle beetle indicated significant positive correlation with rainfall.

## FUTURE SCOPE

The present study will help to monitoring the insect pest and make a suitable strategy for the timely management of major insect pest.

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**Conflict of Interest.** None.

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