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Seasonal incidence of tobacco caterpillar (*Spodoptera litura* Fab.) on groundnut (*Arachis hypogea* L.) and it's correlation with different abiotic factors

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Abstract

The field experiment was conducted during *kharif* 2019 at Instructional farm of BTC College of Agriculture and Research Station, Bilaspur, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). The studies revealed that the first incidence of tobacco caterpillar appeared in first week of august *i.e.*, 32th SMW, and attended peak (1.67 larvae/mrl) during the second week of September *i.e.*, 37th SMW. The correlation studies revealed that minimum ($r = 0.533$), and average ($r = 0.571$) temperature had significant positive correlation, while the other weather parameters showed non significant correlation with tobacco caterpillar.

Keywords: tobacco caterpillar, seasonal incidence, correlation, abiotic factors

Introduction

Groundnut (*Arachis hypogaea* L.), is known for its nutrients and edible oil content and cultivated in about 30 million ha area globally. China being leading producer followed by India, USA. Major growing states in India are Gujrat, Andhra Pradesh, Tamil Nadu, Karnataka, Rajasthan and Maharashtra. In India, groundnut is one of the major oil-seed crops with cultivating area of 5.3 million ha with production of 9.1 million ton and productivity of 1731 kg/ha, according to Food Agriculture Organization. (Anonymous, 2017-18) ^[1].

As nutritive point of view, groundnut is very vital in the lives of poor as the seed is very rich in protein (26%) and edible oil content (45-50%) and nearly half of the 13 essential vitamins and 7 of the 20 essential minerals crucial for average human growth and maintenance. It also utilizes as high quality livestock fodder. In addition to proteins, groundnut is fine source of zinc, phosphorus, calcium, boron and iron. (Rao *et al.*, 2013) ^[8]

Red Hairy caterpillars *Amsacta albistriga* (Walker), *A. moorei*, Leaf miner *Aproaerema modicella* (Deventer), Bihar hairy caterpillar *Spilosoma obliqua* (Walker), Tobacco caterpillar *Spodoptera litura* (Fabricius), Aphids *Aphis craccivora* (Koch), Thrips *Thrips plami* (Karny) and Leaf hopper *Empoasca kerri* (Pruthi) are destructive insect pests of groundnut in India (Gadad, 2013) ^[3].

In India, reasons of low productivity of groundnut crop were attributed to extensive harm by numerous insect pests, among them tobacco caterpillar (*Spodoptera litura* Fabricius) is most severe pest particularly as *rabi* season crop. (Chandrayudu *et al.*, 2015) ^[2].

Studies in India revealed that every year 15-20 % of total oilseed produced lost directly or indirectly due to insect pest attack. In groundnut several insect pests cause substantial yield losses to the crop. (Ghewande *et al.*, 1997) ^[5]

Hence, the present investigation were undertaken to study the seasonal incidence of tobacco caterpillar on groundnut crop in the prevailing agro climatic conditions of Chhattisgarh, which would enable for evolving a suitable management schedule against the pest.

Materials and Methods

The experiment was conducted at Instructional Farm of Barrister Thakur Chhedilal College of Agriculture and Research Station, Bilaspur, a constituent college of Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh). To study the seasonal incidence of major tobacco caterpillar of groundnut and it's correlation with different weather parameters during *kharif* 2019. The groundnut sowing in the plot size of 10 m × 9.60 m with planting distance of 30 cm × 10 cm during third week of July with following all the improved recommended package of practices for raising the crop except plant protection measures.

To record the observation on larval population of tobacco caterpillar infesting groundnut crop, three randomly selected spots of one meter row from the seasonal plot and leaving border rows. Larval count was made by shaking the plant gently over a white cloth placed between the rows. Weekly observations were taken after sowing till its harvest; average number of caterpillars found per meter row was carried out.

The weekly meteorological data on temperature, relative humidity, rainfall and sunshine hours were also recorded for whole of the cropping season from the meteorological observatory located at BTC CARS, Bilaspur (C.G.). The obtained data were correlated with various abiotic factors and correlation coefficients were worked out as suggested by Snedecor and Cochran, 1967^[10]. The graphical representation was applied to depict the seasonal incidence of the lepidopteran defoliators (Fig. 1)

Results and Discussion

The seasonal incidence of tobacco caterpillar was observed on groundnut var. JL -774 starting from first week of August 2019 to last week of October 2020 at weekly interval (Fig 1). The first incidence of tobacco caterpillar was recorded on the crop in the first week of August (32th SMW) at vegetative stage of crop. The peak population (1.67 larvae/ mrl) was attained during the second week of September (37th SMW). The weather conditions prevailed during this period were maximum (30.20 °C), minimum (23.50 °C) and average (26.85 °C) temperatures, morning (94.00%), evening (79.90%) and average (86.94%) relative humidity, Rainfall (3.50mm) and sunshine hours (3.10 hrs.). More or less confiding with Karad *et al.*, (2017)^[6] Gaur *et al.*, (2015)^[4] and Sundar *et al.*, (2018)^[11] recorded the peak activity of *S. litura* during the last week of August (49 DAG).

Correlation co-efficient was worked out between the number of tobacco caterpillar larvae and the weather factors *viz.* temperature (maximum and minimum), relative humidity (morning and evening), rainfall and sunshine hours (Table 1). The correlation studies of tobacco caterpillar with different weather parameters showed a significant positive correlation with, minimum temperature ($r = 0.533$) and average temperature ($r = 0.571$), while remaining weather parameters were not found to be significantly correlated with tobacco caterpillar. The regression equation between tobacco caterpillar and minimum temperature ($y = 0.1319x - 2.1679$, $R^2 = 0.2481$) depicts that at every unit increase in minimum temperature, the infestation level increases by 0.1319 units (Fig. 2) and for average temperature ($y = 0.2181x - 5.0129$, $R^2 = 0.326$) depicts that at every unit increase in average temperature, the infestation level increases by 0.2181 units (Fig. 3).

The correlation studies showed that the incidence of tobacco caterpillar was affected only by temperature, which indicated that the fall in temperature increasing the population of tobacco caterpillar.

The present findings are in agreement with Reddy *et al.*, (2016)^[9] reported that significant positive correlation with minimum temperature ($r = 0.481$), while non- significant positive correlation with relative humidity ($r = 0.359$), Sundar *et al.*, (2018)^[11] who reported that correlation coefficient between abiotic factors (maximum temperature and relative humidity) and *S. litura* population was non significant, according to Mohapatra *et al.*, (2018)^[7] the population of tobacco caterpillar showed non-significant positive correlation with maximum temperature.

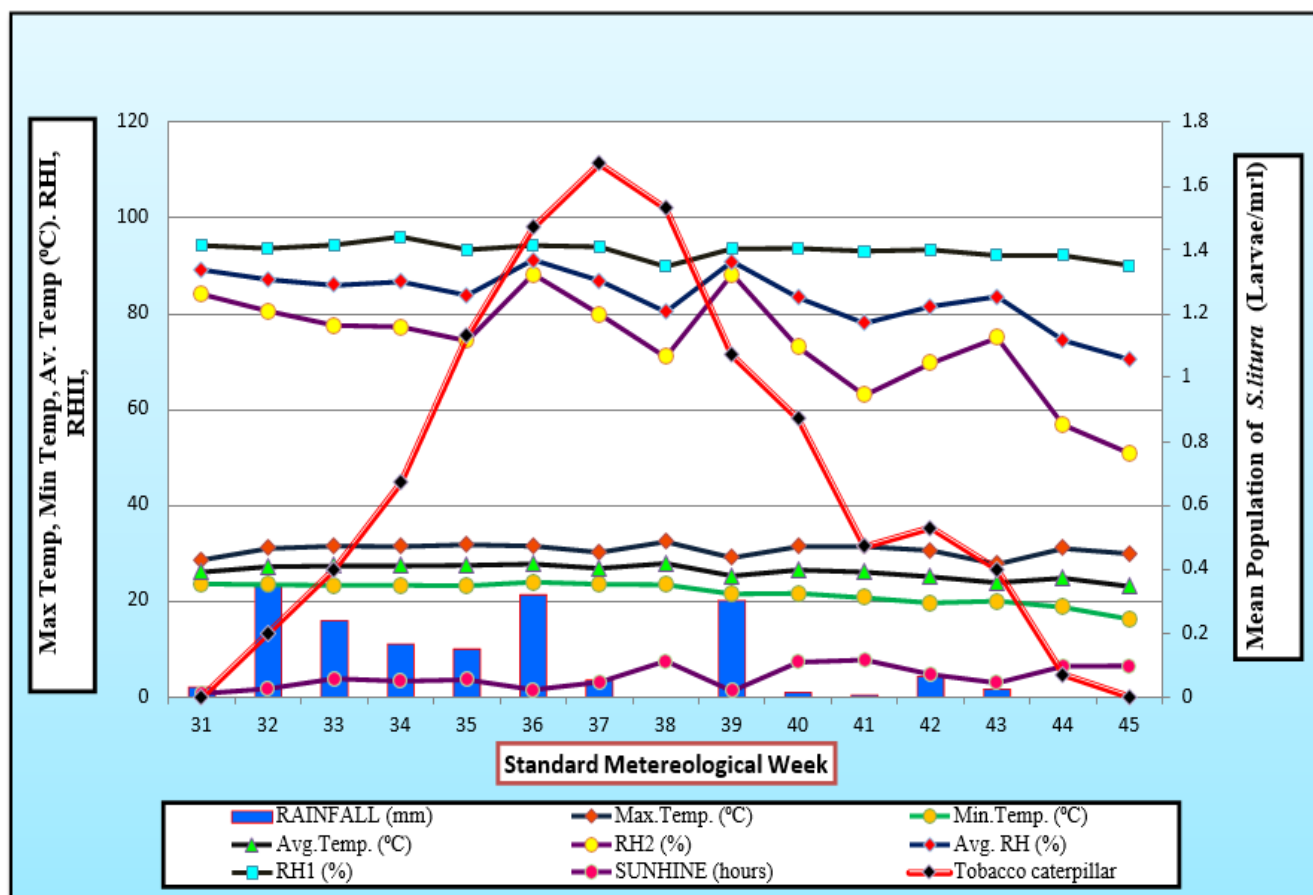


Fig 1: Seasonal incidence of tobacco caterpillar, *S. litura* Fab. on groundnut at Bilaspur during kharif 2019

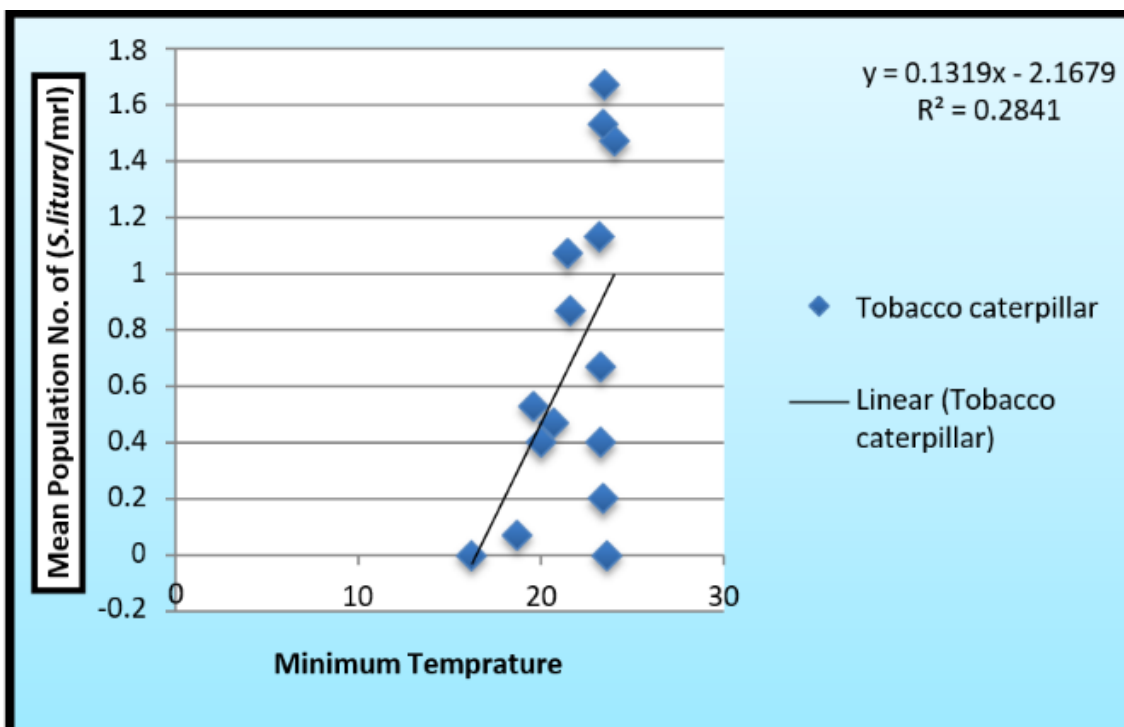


Fig 2: Regression of Tobacco caterpillar infestation on minimum Temperature (°C)

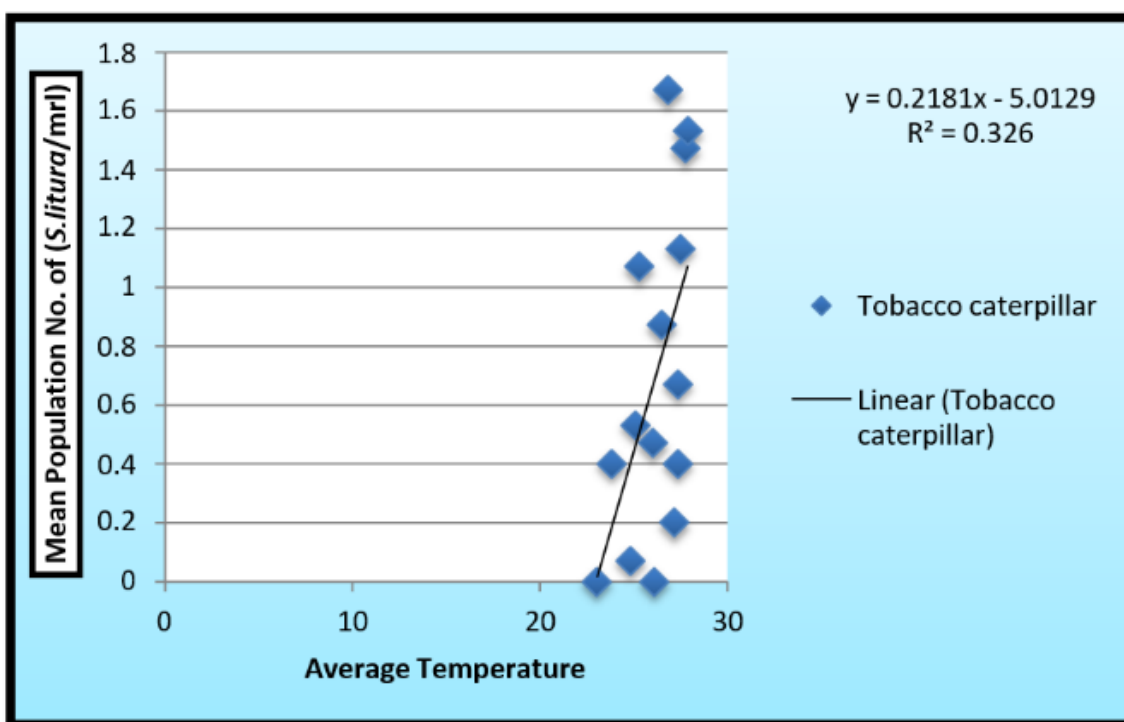


Fig 3: Regression of Tobacco caterpillar infestation on average Temperature (°C)

Table 1: Correlation (r) and regression (byx) coefficient between meteorological parameters and larval population of tobacco caterpillar on groundnut crop

Meteorological parameters	Tobacco caterpillar	
	r	byx
Maximum Temperature (°C)	0.361	-
Minimum Temperature (°C)	0.533*	0.131
Average Temperature (°C)	0.571*	0.218
Morning RH (%)	0.065	-
Evening RH (%)	0.475	-
Average RH (%)	0.418	-
Sunshine (hrs.)	0.182	-
Rainfall (mm)	-0.047	-

*Significant at 5%

Conclusion

The seasonal incidence studies of the pest revealed that the first appearance of tobacco caterpillar was recorded on the crop in the first week of August (32th SMW) at vegetative stage and its activity remained continued up to the last week of the October (44th SMW) at pre maturity stage, while highest population (1.67 larvae/mrl) was recorded during second week of September (37th SMW) at pre flowering stage of the crop.

The correlation studies between the tobacco caterpillar and various weather parameters showed significant positive correlation with minimum temperature (r = 0.533) and average temperature (r = 0.571), while other parameters were

not found significantly correlated with the larval population of the pest.

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