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POPULATION DYNAMICS OF *SPODOPTERA LITURA* (FAB.) IN GROUNDNUT

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ABSTRACT

A field experiment was conducted at Main Oilseeds Research Station, J.A.U., Junagadh in 2023 during the *kharif* season to investigate the population dynamics of *S. litura* in groundnut. The activity of *S. litura* began in the 31st standard meteorological week (SMW) in fourth week of July, with 0.83 larvae per plant initially. During the third week of August, the 34th SMW recorded the first peak of 2.64 larvae per plant. After a slight decrease in numbers, a second peak was seen in the 38th week SMW, in third week of September, with 3.17 larvae per plant. In the following weeks, there was a decrease in the number of larvae, reaching its lowest during the 44th SMW, which fell on the fifth week of October, with 0.05 larvae per plant. The correlation studies showed a significant positive correlation between larval population and minimum temperature, morning relative humidity, morning and evening vapour pressure ($r = 0.616^*$, 0.514^* , 0.638^* and 0.587^*).

Key words : Population dynamics, Groundnut, *S. litura*, Weather parameter.

Introduction

Groundnut (*Arachis hypogaea* L.) is a leguminous oilseed crop native to South America. As the king of oilseeds, it is the fourth most important oilseed in the world. It is the largest source of edible oil and ranks 13th among food crops in the world (Ramanathan, 2001). India comes ranked second to China in terms of groundnut production. Of all the groundnut growing states in India, Gujarat has the largest share in terms of area and production. In Gujarat, the area under groundnut cultivation is 17.09 lakh hectares, with an annual production of 28.14 lakh tonnes and a productivity of 1647 kg/ ha (APEDA, 2022).

Groundnut yield is affected by direct pest damage or by pests such as disease vectors. More than a hundred insect species have been reported on groundnut in India (Amin, 1988). Among the various insect pests infesting this crop in Gujarat, the tobacco caterpillar *S. litura* is considered the most important pest due to its polyphagous nature and prevailing favorable climate, it occurs throughout the year. The newly hatched and early instar

larvae of *S. litura* feed together on the underside of the leaf, resulting in leaf skeletonization and severe leaf destruction in later stages, leaving only petioles and branches, scraping chlorophyll and causing total yield loss up to 15-30 percent (Ghewande and Nandagopal, 1997); more than 180 crops (Isman *et al.*, 2007).

The study of population dynamics is useful for obtaining information about the population of *S. litura* in groundnut crops. Correlating pests with various weather parameters such as temperature, relative humidity, wind speed, bright sunshine, evaporation, rainfall and rainy days provides valuable information and based on this information, a predictive model can be developed to predict their occurrence and ultimately farmers can plan plant protection strategies.

Materials and Methods

To study the population dynamics of *S. litura* in groundnut, the variety, GJG-9 was sown at Main Oilseeds Research Station, Junagadh Agricultural University, Junagadh during the *kharif*, 2023. The crop was grown

in plot size of 20 m × 20 m with a spacing of 45 cm x 10 cm between rows and plants, respectively. Plot was divided into 30 equal quadrates measuring 1 m × 1 m. Throughout the experiment, standard agronomical practices were followed and no insecticides were applied. Observations on the number of *S. litura* larvae were recorded weekly from one week after germination until harvest. This was done on three randomly selected plants from each quadrate. The mean population of *S. litura* larvae was worked out separately.

Correlation study

The weekly meteorological data was obtained from the meteorological observatory of Junagadh Agricultural University, Junagadh. A simple correlation was calculated between pest population and various abiotic factors such as temperature (maximum and minimum), relative humidity (morning and evening), bright sunshine, rainfall, wind speed and vapour pressure (morning and evening), as well as rainy days to assess their impact.

Results and Discussion

The data on the population of *S. litura* (Table 1 and Fig. 1) indicate that the activity of *S. litura* started in the 31st SMW, the 4th week of July, with 0.83 larvae per plant. The first peak of 2.64 larvae per plant occurred in the 34th SMW, coinciding with the 3rd week of August. There was a slight reduction to 2.12 and 2.07 larvae per plant in the following weeks (35th and 36th SMW, respectively). The population increased again in the 37th SMW, the 2nd

week of September, to 2.22 larvae per plant and reached a second peak of 3.17 larvae per plant in the 38th SMW coinciding with the 3rd week of September. After that, the larval population continued to decline each week, reaching a minimum of 0.05 larvae per plant in the 44th SMW *i.e.*, the 5th week of October.

Similarly, Dodiya *et al.* (2024) observed that the infestation of *S. litura* in groundnut begun during the third week of July (29th SMW) and reached at peak level (2.50 larvae/plant) during the 3rd week of September (37th SMW) with 90.33 per cent damaged plant. Mishra *et al.* (2023) revealed that *S. litura* initiated with mean larval population of 0.21 larvae per plant in 31st standard week. Parmar *et al.* (2023) observed that the infestation of *S. litura* touched its peak with 2.4 larvae/meter row length (mrl) in the 3rd week of September. Solanki *et al.* (2022) observed that *S. litura* was commenced from 30th SMW *i.e.* third week of July (1.05 larva/plant), which gradually increased and attained a peak of 4.10 larva/plant during 36th SMW coinciding with the first week of September. Mishra *et al.* (2021) revealed that the first incidence of tobacco caterpillar in groundnut appeared in the first week of August *i.e.*, 32nd SMW and attended peak (1.67 larvae/mrl) during the second week of September *i.e.*, 37th SMW. Ahir *et al.* (2017) revealed that the incidence of tobacco caterpillar (0.20 caterpillar/plant) appeared in 2nd week of September and reached its peak in the 2nd week of October with a mean of 1.40 caterpillar/plant. Thereafter, the population declined gradually and reached

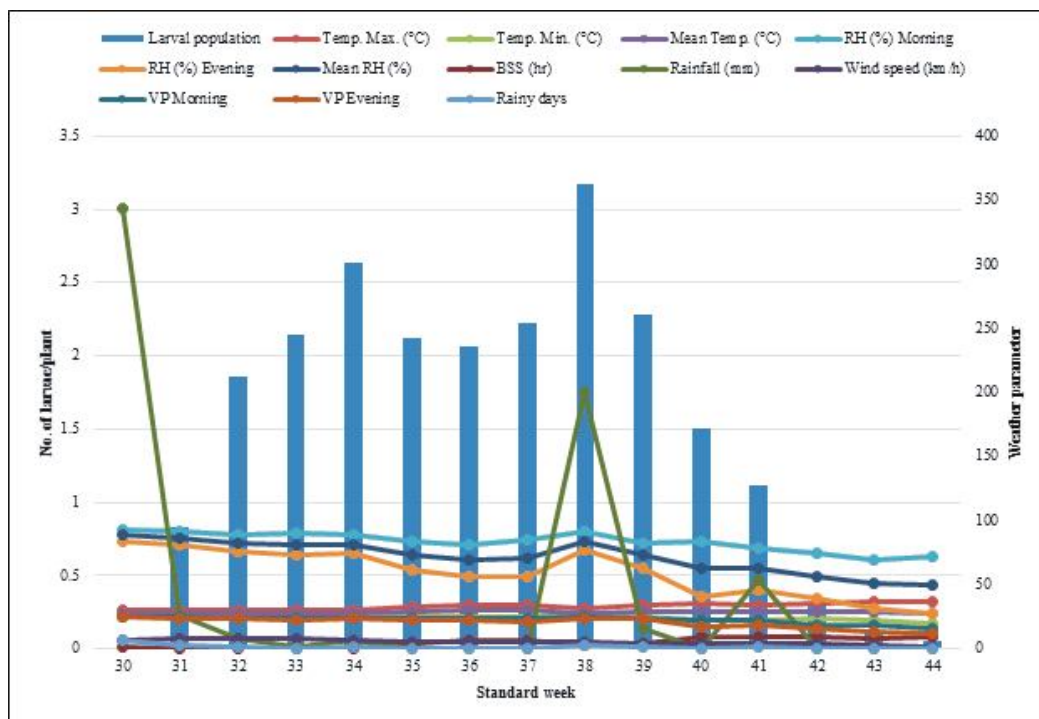


Fig. 1 : Population dynamics of *S. litura* in relation to weather parameters during kharif, 2023.

Table 1 : Population dynamics and per cent leaf damage due to *S. litura* in groundnut during *kharij*, 2023.

WAS	SMW	Month	No. of <i>S. litura</i> larvae/plant	Temperature (°C)			Relative humidity (%)			BSS (hr)	RF (mm)	WS (km/h)	VP		Rainy days
				Max	Min.	Mean	Mor.	Eve.	Mean				Mor.	Eve.	
3	30	July	0	30.1	25.3	27.7	93	84	89	1.1	343.2	7.1	25	25.1	7
4	31		0.83	29.9	25.3	27.6	91	81	86	0	26	8.2	24.5	24.1	3
5	32	August	1.86	30.3	25.5	27.9	89	76	83	0.3	8.1	8.5	23.7	23.1	1
6	33		2.15	30.3	25.4	27.9	90	73	82	0.5	0.9	7.8	24	22.9	0
7	34	September	2.64	30.8	25.2	28.0	89	74	82	0.8	6.8	6.7	24	23.3	1
8	35		2.12	32.8	24.6	28.7	84	62	73	4.1	0	5.7	23.4	22.3	0
9	36		2.07	34.4	25.11	29.8	81	57	69	6.8	0	5	23.2	22.2	0
10	37	October	2.22	34	25.3	29.7	85	56	71	6.1	0	5.9	24.1	20.9	0
11	38		3.17	31.2	24.8	28.0	91	77	84	2.5	199.6	5.5	24.8	24	3
12	39	October	2.28	33.7	25.3	29.5	83	63	73	4.1	16.1	4.1	23.3	23.6	1
13	40		1.50	35.5	23	29.3	84	41	63	9.7	0	3.9	21.8	16.9	0
14	41		1.12	34.7	23	28.9	79	46	63	9.3	53.4	3.7	21.8	18.7	1
15	42		0.30	35.1	23.1	29.1	74	39	57	9.1	0	3.6	19	16	0
16	43		0.12	36.6	21.8	29.2	70	31	51	8.6	0	2.6	18.1	13.8	0
17	44	0.05	36.3	19.7	28.0	72	28	50	8.7	0	2	16.3	12	0	

WAS: Week After Sowing
 WS: Wind speed
 RF: Rainfall
 BSS: Bright sunshine hours
 SMW: Standard Meteorological Week
 VP: Vapour pressure

a minimum level of 0.40/plant during 4th week of October. These findings are in accordance with present outcomes. Meena and Dudwal (2017) revealed that the peak activity of *S. litura* in soybean observed during 36th-39th standard week (SW) that fall during early to mid-September. Nandagopal *et al.* (2006) concluded that the incidence of *S. litura* male moth in groundnut was abundant during the season and reached peak during August to September.

Correlation studies between population of *S. litura* and weather parameters

A study on effect of various weather parameters on fluctuation of *S. litura* population in groundnut (Table-2) indicated that minimum temperature ($r = 0.616^*$), morning relative humidity ($r = 0.514^*$), morning ($r = 0.638^*$) and evening vapour pressure ($r = 0.587^*$) had significantly positive correlation with *S. litura* population. In contrast, Mean temperature ($r = 0.101$), evening ($r = 0.466$) and mean relative humidity ($r = 0.486$) and wind speed ($r = 0.370$) was positively correlated with larval population but non-significant. While, maximum temperature ($r = -0.369$), bright sunshine hours ($r = -0.385$), rain fall ($r = -0.137$) and rainy days ($r = -0.200$) showed statistically negative non-significant correlation with larval population.

Dodiya *et al.* (2024) revealed that larval population of *S. litura* had significant positive correlation with morning relative humidity as well as morning and evening vapour pressure. Mishra *et al.* (2021) also exhibited that significant positive correlation with minimum temperature and non-significant positive correlation with evening and mean relative humidity, while, negative non-significant correlation with rainfall. Bangale *et al.* (2019)

Table 2 : Correlation matrix of weather parameters and *S. litura* population.

Weather parameter	Mean no. of <i>S. litura</i> larvae/plant
Maximum Temperature (°C)	-0.369
Minimum Temperature (°C)	0.616*
Mean Temperature (°C)	0.101
Morning Relative humidity (%)	0.514*
Evening Relative humidity (%)	0.466
Mean Relative humidity (%)	0.486
Bright Sunshine hours (hr)	-0.385
Rainfall (mm)	-0.137
Wind speed (km/hr)	0.370
Morning Vapour Pressure (mm in Hg)	0.638*
Evening Vapour Pressure (mm in Hg)	0.587*
Rainy days	-0.200

*Significant at 5% ($r = \pm 0.514$)

**Significant at 1% ($r = \pm 0.641$) N = 15

reported that larval population of *S. litura* had non-significant negative correlation with bright sunshine hours, rainfall and rainy days in soybean. Thus, these findings are in accordance with present outcomes. Satyanarayana *et al.* (2010) revealed that *S. litura* during post rainy season on groundnut had non-significant relationship with maximum temperature, relative humidity and wind speed, while, it showed significant correlation with minimum temperature.

Conclusion

The peak incidence of *S. litura* (2.64 and 3.17 larvae/plant) was observed in 34th and 38th SMW (3rd week of August and 3rd week of September). The correlation matrix reveals that the population of *S. litura* exhibited a significant positive correlation with minimum temperature, morning relative humidity and vapour pressure. However, there was non-significant negative correlation found with maximum temperature, bright sunshine hours, rainfall and rainy days, while non-significant positive correlation with evening relative humidity and wind speed.

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