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SEASONAL INCIDENCE OF LEAF EATING CATERPILLAR (*Spodoptera litura* Fabricius) IN GROUNDNUT ECOSYSTEM DURING RABI SEASON

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Abstract

Field experiments were carried out to study the seasonal incidence of *S. litura* on groundnut during rabi 2010 and 2011 at Variyankaval, Ariyalur district, Tamil Nadu. The results indicated that incidence of *S. litura* was noticed from 7th MSW (0.5 larva/meter row) and the maximum population was observed during 13th MSW (3.80 larva per meter row) followed by 10th MSW (2.95 larvae per meter row) during *rabi* 2010. The highest per cent infestation of leaflets recorded during 13th MSW (60.1 %) followed by 10th MSW (48.5 %) and 12th MSW (44.6 %). The population increased gradually and reached peak during 12th MSW (4.56 larvae/mrl) which coincided with maximum per cent infestation of leaflet (57.50%) during *rabi* 2011. Correlation analysis in both seasons (*rabi* 2010 and 2011) on groundnut revealed that R.H and wind speed showed significant negative association, while maximum temperature, minimum temperature and rainfall exhibited positive association with larval incidence of *S. litura*.

***Keywords*:** Seasonal incidence, rabi, *Arachis hypogaea*, *Spodoptera litura*

Introduction

Groundnut (*Arachis hypogaea* L.) is an important oil seed crop of tropical and sub-tropical regions of the world. India ranks first in groundnut cultivation with an area of 5.53 m ha and occupies second place in production (9.67 million tonnes) with productivity of 1750 kg ha^{-1}. In India, groundnut is mostly grown in five states *viz.,* Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka and Maharashtra which accounts for 80 per cent of total area and 84 per cent of total production of groundnut. The national average yield of *rabi* groundnut is higher (1600kg/ha) than *kharif* (1000kg/ha) (NICRA, 2011). Among the major groundnut producing states of India, Tamil Nadu ranks fourth in acreage (0.76 m ha) with total production of 0.83 million tonnes. The reasons for low productivity may be several, of which insect pest damage is the major one. Insect pests are recognized as one of the major constraints on groundnut production causing severe losses to groundnut in India (Vikram Singh, 1980). Among these insect pests, red hairy caterpillar causes up to 75 per cent, leaf miner causes up to 49 per cent, jassids causes yield losses up to 17 per cent, thrips causes up to 17 per cent yield losses.

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 and 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 groundnut crop.

Materials and Methods

Field experiment was conducted in farmer's field, at Variyankaval village, Jayankondam, during *kharif* and *rabi* seasons 2010-2011 to study the seasonal incidence of *S. litura* infesting groundnut. The popular cultivar TMV 2 was sown with a spacing of 30 x 10 cm. The plot size was 5 m x 5 m and replicated three times. All the recommended agronomic practices were followed in the cultivation of the crop except the plant protection measures. In each season, beginning from 30th day after sowing, observations were made on larval population, foliage damage at weekly interval. Observations were made at weekly interval on leaflet damage in a randomly selected meter row and expressed as per cent leaflet damage. Absolute larval population was also recorded from same meter row.

The natural incidences of *S.litura* were correlated with weather parameters. The data on weather parameters *viz.,* maximum, minimum temperature (C^o), relative humidity (RH), wind velocity, and rain fall were recorded daily at automatic weather station Jayankondam and presented as weekly average. The

mean weather data that prevailed seven days prior to each observation were calculated to work out correlation studies. The data were analyzed by multiple correlation and regression to study the relation between weather parameters and per cent incidence of larvae. (Gomez and Gomez, 1984).

Results and Discussions

1. Seasonal incidence of *S. litura* in groundnut ecosystem during *rabi* 2010 and 2011

The incidence of *S. litura* was noticed from 7th MSW (0.5 larva/meter row) and the maximum population was observed during 13th MSW (3.80 larva per meter row) followed by 10th MSW (2.95 larvae per meter row) during *rabi* 2010. The highest per cent infestation of leaflets recorded during 13th MSW (60.1 %) followed by 10th MSW (48.5 %) and 12th MSW (44.6 %) (Fig 1). While in *rabi* 2011 indicated that the incidence of *S. litura* was observed in 8th MSW and population of *S. litura* larvae ranged from 0.72 to 4.56 larvae per meter row length (mrl). The population increased gradually and reached peak during 12th MSW (4.56 larvae/mrl) which coincided with maximum per cent infestation of leaflet (57.50%) (Fig 2). Overall the results indicated that incidence of *S.litura* was observed from 7th MSW to 13th MSW, whereas maximum per cent incidence was noticed 12th and 13th MSW.

The present observations on *S. litura* incidence are in agreement with the findings of Hanamant Gadad *et al.* (2013) who stated that the seasonal incidence of *S. litura* started from 6th meteorological standard week (MSW) and reached its peak during the 11th MSW with 19.50 per cent leaf damage and declined thereafter. Similar observations were noticed by Vinoth Kumar *et al.* (2009) who indicated that the presence of *S. litura* was noticed two weeks after sowing and continued to exist till harvesting of the crop. AICRP, 2012 showed that the incidence of *S. litura* was high in Cuddalore and Ariyalur districts during *rabi* 2011 and 2012. The peak incidence of pest was occured around 60-70 days after sowing. Occurrence of *S. litura* to the tune of 4 to 45 per cent was noticed during pod formation stage in *rabi* season in the coastal region of Karnataka (AICRP, 1994). Sreenivasulu *et al.* (2003) found that the highest number of egg masses were observed during the 2nd week of February and the highest number of larvae/20 m^2 during the 4th week of February.

2. Influence of weather parameters on larval incidence of *S.litura* on groundnut during *rabi* 2010 and 2011

The result of correlation study revealed that R.H (r = - 0.457) and wind speed (r = - 0.427) showed significant negative association, while maximum temperature (r = 0.366), minimum temperature (r = 0.028) and rainfall (r = 0.581) exhibited positive association with mean larvae of *S.litura* per meter row during *rabi* 2010. The mean larval population of *S.litura* per meter row was found negatively significant correlation with R.H (r = - 0.427) and wind speed (r = - 0.490) on groundnut during *rabi* 2011. The maximum temperature (r = 0.409) and minimum temperature (r= 0.152) showed positive correlation during *rabi* season 2011. The results of the correlation study in both seasons (*rabi* 2010 and 2011) on groundnut revealed that R.H and wind speed showed significant negative association, while maximum temperature, minimum temperature and rainfall exhibited positive association with mean larvae of *S. litura* per meter row. The results of present investigation were in agreement with Nadaf and Kulkarni (2006) who observed that minimum temperature was highly significant with larvae of *S. litura*. Selvaraj *et al.* (2010) found that built up *S. litura* population showed a negative correlation with wind velocity. Morning and evening relative humidity and rainfall exhibited non significant and negative relationship with population of *S. litura* infesting onion crop in Guntur area (Sailaja Rani, 2006). Similar results were noticed by AICRP, (1993) who found that the relative humidity and rainfall proved negative relationship with population of *S. litura* infesting groundnut crop in Junagadh area in Gujarat. The minimum temperature, evening relative humidity, morning and evening vapour pressure showed negative effect on larval development of *S. litura,* whereas correlation analysis showed non-significant difference between various abiotic factors and leaf damage caused by *S. litura* infesting castor crop in Gujarat (Thanki *et al*., 2003). Satyanarayana *et al.* (2010) observed the incidence of *S. litura* in terms of larval population showing non-significant relationship with maximum temperature, relative humidity and wind speed. The present findings are contrary to Harish Kumar Netam *et al.* (2013) who found that there existed a significantly positive correlated between *S.litura* larvae and morning relative humidity and Balaparameswara *et al.* (2006) found that the incidence of *S.litura* was not significantly correlated with temperature, relative humidity and wind speed. This might be due to variation in location and distribution of R.H.

3. Influence of weather parameters on per cent leaflet damage by *S. litura* on groundnut during *rabi* 2010 and 2011

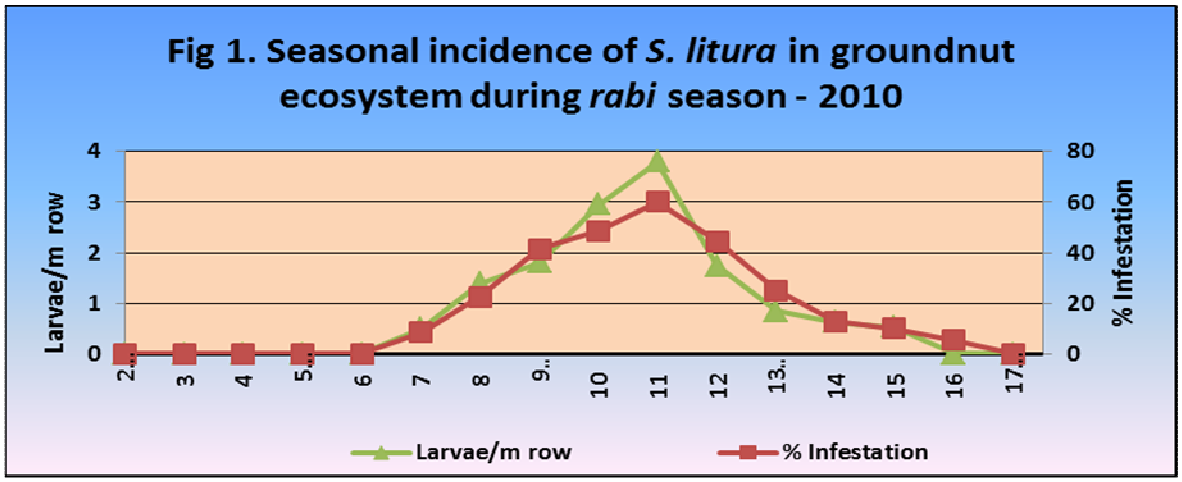
The result of correlation study indicated that R.H showed significant positive association, while minimum temperature was positively correlated with per cent leaflet damage but it was not significant. However, maximum temperature, wind speed and rainfall

exhibited negative association with mean per cent leaflet damage by *S. litura*. Similar findings were also reported by Selvaraj *et al.* (2010) who reported that the correlation matrix between the weather factors and *S. litura* damage per cent revealed that a significant positive correlation existed with morning relative humidity, sunshine hours and dewfall, whereas a significant negative correlation was recorded with wind speed. According to Singh *et al.* (1990) during *rabi* season the effect of individual weather parameters on the abundance of *S. litura* was not significant.

The regression equation $Y= -203 + 2.29^{*} X_1 - 1.79^{NS} X_2 + 0.472^{NS} X_3 - 0.700^{NS} X_4 - 1.24^{NS} X5$ (*Rabi* 2010), $Y = 334.03 + 2.14^{*} X_1 - 2.22^{*} X_2 + 1.20^{NS} X_3 - 0.187^{NS} X_4 + 0.431^{NS} X_5$ (*Rabi* 2011) fitted to *S. litura* damage and meteorological factors. The coefficient of determination (R^2) indicated that 52.5% and 54.5% variation in *S.litura* damage due to effect of meteorological factors during the *rabi* 2010 and 2011 respectively.

Conclusions

In *rabi* seasons overall, the results indicated that incidence of *S. litura* was observed from 7th MSW to 13th MSW, whereas maximum per cent incidence was noticed during 12th and 13th MSW. It was concluded that correlation analysis in both seasons (*rabi* 2010 and 2011) on groundnut revealed that R.H and wind speed showed significant negative association, while maximum temperature, minimum temperature and rainfall exhibited positive association with mean larvae of *S. litura*. The result of correlation study indicated that R.H showed significant positive association, while minimum temperature was positively correlated with per cent leaflet damage but it was not significant. However, maximum temperature, wind speed and rainfall exhibited negative association with mean per cent leaflet damage by *S.litura*.



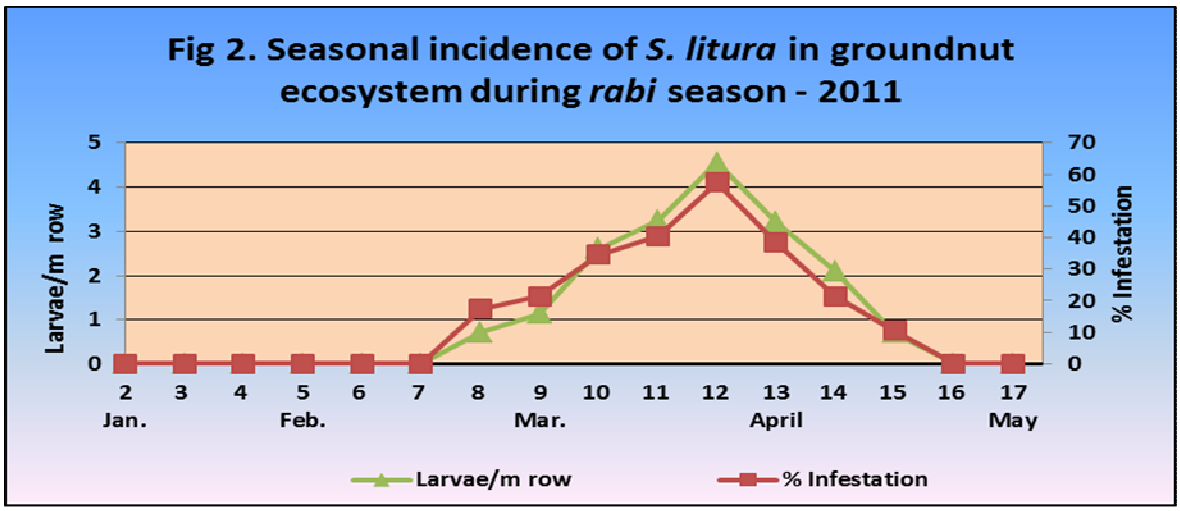


Table 1 : Seasonal incidence of *S. litura* in groundnut ecosystem during *rabi* seasons

Month	Std week	Seasonal incidence of *S. litura* during Rabi seasons					
		***Rabi* 2010**				***Rabi* 2011**	
		% infestation of leaflets	No. of Larvae/m row	Month	Std week	% infestation of leaflets	No. of Larvae/m row
Jan.	2	0	0	Jan.	2	0	0
	3	0	0		3	0	0
	4	0	0		4	0	0
Feb.	5	0	0	Feb.	5	0	0
	6	0	0		6	0	0
	7	8.5	0.5		7	0	0
	8	22.5	1.4		8	17.4	0.72
Mar.	9	41.5	1.8	Mar.	9	21.5	1.14
	10	48.5	2.95		10	34.5	2.60
	11	60.1	3.80		11	40.5	3.24
	12	44.6	1.74		12	57. 5	4.56
April	13	25.2	0.84	April	13	38.4	3.2
	14	12.8	0.63		14	21.5	2.1
	15	10.1	0.52		15	10.5	0.7
	16	5.5	0		16	0	0
May	17	0	0	May	17	0	0
SEd		0.265	0.0318	SEd		0.312	0.0120
CD (0.01)		0.729	0.0874	CD (0.01)		0.859	0.0331

Mean of three replications, Date of sowing: 2.01.10 & 6.01.11 MSW- Meteorological standard week

Table 2: Correlation between weather parameters and weekly observations on larval population of *S. litura* in groundnut.

Mean *S.litura* larva/mrl	**Weather parameters**				
	Max. Temp.(C)	**Min. Temp.(C)**	**RH (%)**	**Wind speed** (kmph)	**Rainfall (mm)**
***Rabi* 2010**	0.366	0.028	-0.457*	-0.464*	0.366
***Rabi* 2011**	0.409	0.152	-0.427	-0.490*	0.190

** Significant at 0.05 probability level * Significant at 0.01 probability level

Table 3: Multiple linear regression analysis of *S.litura* larval population (Y) and weather parameters (X) in groundnut during *rabi* 2010 and 2011. **(n= 16)**

Variables	**Partial regression coefficient**	**Standard error**	**'t ' value**	**r^2**
***Rabi* 2010**				
X1=Max. Temperature	0.581	0.225	2.58 *	0.516
X2=Min. Temperature	- 0.500	0.195	-2.55*	
X3=Relative Humidity	0.044	0.102	0.431 ^{NS}	
X4= Wind speed	-0.116	0.226	-0.512^{NS}	
X5= Rainfall	-0.527	0.486	-1.61 ^{NS}	
***Rabi* 2011**				
X1=Max. Temperature	0.917	0.615	2.49*	0.390
X2=Min. Temperature	-0.561	0.406	-2.38*	
X3=Relative Humidity	0.224	0.212	1.05 ^{NS}	
X4= Wind speed	-0.031	1.12	-0.026 ^{NS}	
X5= Rainfall	-0.012	1.26	-0.016 ^{NS}	

NS= Non significant * Significant P = 0.05 CD (P=0.05): 2.13

** Highly significant P = 0.01 CD (P= 0.01): 2.95

References

AICRP, (1994). Annual Progress Report for all India Co-ordinated Research project on Groundnut. *Gujarat Agric. Univ.,* Junagadh, Gujarat, pp. E32-E35.

AICRP, (1993). XLIIth Annual Progress Report for all India Co-ordinated Research project on Groundnut. *Gujarat Agric. Univ.,* Junagadh, Gujarat, pp.E1-E45.

AICRP, (2012). Rabi/Summer groundnut Workshop, Progress Report, 2011-2012 Project Coordinating Unit, Groundnut, *National Research Centre for Groundnut*, Junagad, pp. E1-E59.

Balaprameswara, R.A.; Rajasekhar, P.; Ramachandra, R.G. and Srinivasa, R.V. (2006). Seasonal incidence and management of *Spodoptera litura* on fenugreek. *Ann. Pl. Protec. Sci.* 14(1): 86-89.

Gomez, K.A. and Gomez, A.A. (1984). Statistical procedures for agricultural research. Wiley International Science Publications, John Wiley and Sons. New York. 680 p.

Hanamant, G.; Mahabaleshwar, H. and Balikai, R.A. (2013). Seasonal incidence of *spodoptera litura* and leafminer in *rabi*/summer groundnut. *J. Exp. Zool. India,* 16(2): 619-622.

Harish, K.N.; Gupta, R. and Soni, S. (2013). Seasonal Incidence of Insect Pests and Their Biocontrol Agents on Soybean. *Journal of Agriculture and Veterinary Science.*2 (2): 7-11.

Nadaf, A.M. and Kulkarni, K.A. (2006). Seasonal Incidence of the fruit borers, *Helicoverpa armigera* (Hubner) and *Spodoptera litura* Fabricius on chilli in Dharwad. *Karnataka J. Agric. Sci.,* 19(3): 549-552.

Sailaja, R.Z.; Subba, R.D.V.; Arjuna, R.P.; Madhumati, T. and Srinivasa, R.V. (2006). Effect of weather parameters on the population dynamics of *Spodoptera litura* (F.) and *Spodoptera exigua* (Hb.) on onion. *Andhra Agricultural Journal,* 53: 1- 2.

Satyanarayana, N.V.V.; Rao, G.R. and Rao, P.A. (2010). Incidence and management of *Spodoptera litura* (Fab.) on post rainy season groundnut. *Ann. Plant Prot. Sci.* 18(1): 22-25.

Selvaraj, S.; Adiroubane, D.; Ramesh, V. and Narayanan, A.L. (2010). Impact of ecological factors on incidence and development of tobacco cut worm, *Spodoptera litura* Fabricius on cotton. *Journal of Biopesticides,* 3(1 Special Issue): 43 – 46.

Singh, T.V.K.; Singh K.M and Singh R.N. (1990). Groundnut pest complex : IV. Regression studies to determine the associationship between jassids and thrips and weather parameters. *Indian Journal of Entomology*, 52(4): 693-701.

Sreenivasulu, B.; Naidu, V.G. and Prasad, P.R. (2003). Monitoring of *Spodoptera litura* Fabr.through sex pheromones in groundnut. *J. Appl. Zool. Res*., 14(2): 148-150.

Thanki, K.V.; Patel, G.P. and Patel, J.R. (2003). Population dynamics of *Spodoptera litura* on castor, *Ricinuscommunis. Indian Journal of Entomology,* 65 (3): 347- 350.

Vikram, S. (1980). Indian Coordinated Research Project on oilseeds to groundnut. Proceedings of the International Workshop on groundnut held at ICRISAT, Hyderbad during 13-17. Oct. 1980.

Vinoth, K.B.; Balasubramanian, T.N. and Jagannathan, R. (2009). Seasonal Incidence and Influence of Weather Factors on the Incidence of Spodoptera litura (Fab.) on Groundnut. *The IUP Journal of Life Science.* 3(1): 61-67.