

# Influence of weather on the seasonal incidence of insect pests on groundnut in the scarce rainfall zone of Andhra Pradesh

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**ABSTRACT :** Pheromone trap catches *H. armigera* showed a positive correlation with mean temperature. The correlation analysis with weather parameters revealed that, Tmax and Tmin have significant positive correlation with *Spodoptera litura* trap catch and the RH-I showed significant negative correlation. The influence of weather parameters on the incidence of GLM recorded significant positive correlation with Tmax and Sunshine hours and significant negative correlation with RH-I.

**Key Words :** *Aproaerema modicella*, *Spodoptera litura*, Influence of weather, Seasonal incidence

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Groundnut is one of the principal oilseed crops grown in India, covering nearly half of the area under oilseeds. The total area under groundnut in India is 6.70mha with a total production of 7.16m tonnes. Andhra Pradesh ranks first with an area of 1.76m ha and annual production of 0.95m tonnes. In Southern districts of Andhra Pradesh, Anantapur is the largest producer of groundnut with a total production of 0.11m tonnes grown in an area of 0.89mha (CMIE, 2010).

The average yield in the state is lower than national average. Among the several reasons for this cause, poor plant protection measures especially in rainfed groundnut are important. In Andhra Pradesh eight species of insect pests are considered to be economically important. They are gram caterpillar *Helicoverpa armigera* (Hubner), leaf miner *Aproaerema modicella* (Deventer), tobacco caterpillar *Spodoptera litura* (Fabricius), thrips *Scirtothrips dorsalis* (Hood), *Frakliniella scultzei* (Trybom) and *Thrips palmi* (Kamy). Hence the present study was contemplated to know the influence of weather on the seasonal incidence of pests on rainfed groundnut.

## RESEARCH PROCEDURE

The experiment was conducted both in the research

station, Anantapuram and farmers fields in the district. Five plants were selected randomly in each plot and they were tagged for recording the observations on insect pests viz., leaf miner and thrips, at three days interval and presented standard week wise starting from 20 DAS to harvesting of the crop. The pheromone trap data of lepidopteran defoliators viz., *S. litura*, *H. armigera*, *A. modicella* were also recorded.

Incidence of leaf miner *A. modicella* assessed in terms of larvae present on 5 marked plants of each plot. Data on per cent defoliation was recorded by counting the number of damaged leaves and total number of leaves per plant. The population of thrips was recorded by counting the number of thrips present in unopened tender leaves (terminal) on each of the five randomly selected plants per plot.

## RESEARCH ANALYSIS AND REASONING

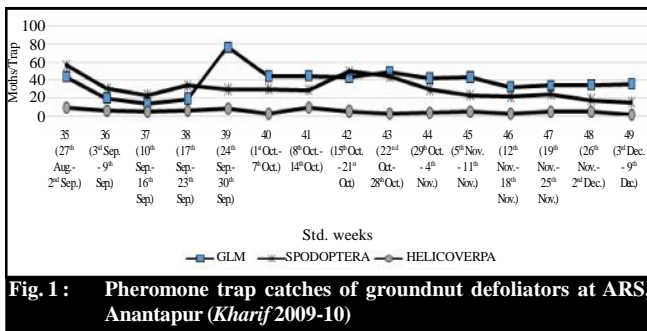
The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

### Seasonal incidence of insects pests in the Agricultural Research Station, Anantapur 2009-Kharif:

#### Population dynamics of GLM :

Pheromone trap catches of leaf miner was started in

the 32<sup>nd</sup> Std. week with peak trap catch of 76.8 moths/trap during the last week of September (39<sup>th</sup> Std. week). During the months of October and November the trap catch was around 32.4 to 48.9 moths/trap. Thus the moth activity was observed in the entire season during 2009, *Kharif* in the Research Station. However, the incidence on the crop was observed on 21<sup>st</sup> August, 2009 with 8.02 per cent damage. The no. of webs ranged from 0.86 to 8.4 per plant. The incidence was very high with 6.10 to 7.3 webs/plant during the entire September month. During this period the live larvae and pupae were ranged from 6 to 7 and 6-5, respectively (Fig. 1).



**Fig. 1 :** Pheromone trap catches of groundnut defoliators at ARS, Anantapur (Kharif 2009-10)

**Incidence of *Spodoptera litura* :**

The incidence of *S.litura* in terms of moth catch was started in the 32<sup>nd</sup> Std. week. One peak was observed in 35<sup>th</sup> Std. week and the other in the 42<sup>nd</sup> Std. week. The rainfall received during 38<sup>th</sup> (52.4 mm), 39<sup>th</sup> (25.6) and 40<sup>th</sup> std. week (24.6mm) might influenced the highest trap catch in 42<sup>nd</sup> (50moth/trap) and 43<sup>rd</sup> (44.0 moth/trap) Std . weeks. After 44 Std. week the trap catch was slowly decreased from 29.5 (44 std. week) to 15.25 moths/trap (49<sup>th</sup>Std. week) (Fig.1).

**Incidence of *Helicoverpa armigera* :**

The *H. armigera* trap catch was low during the entire period under report. The moth catch was in the range of 1.5 to 9.0 moths/trap.

**Incidence of thrips :**

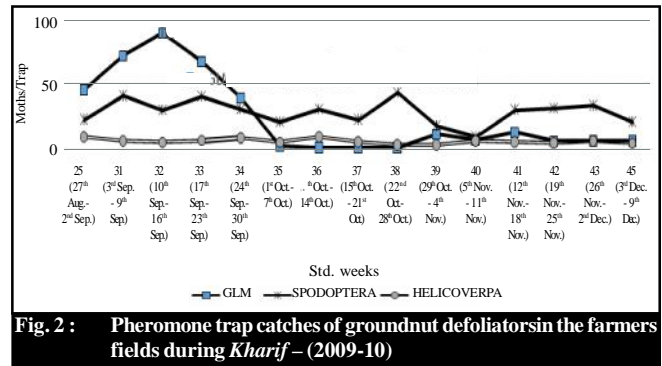
The thrips incidence ranged from 1.0 to 3.21 per plant. Two peaks were observed viz., during 37<sup>th</sup> Std. week (3.21 thrips/plant) and 43<sup>rd</sup> Std. week (3.1/plant). The dry spell for 27 days from 3/10/09 to 29/10/09 during the month of October, 2009 might influenced the thrips incidence. Low incidence in the range of 1.0 to 1.8/plant during November, 2009 might be due to continuous rains from 4/11/09 to 17/11/09 (78.2 mmm) and high RH-1(86-95%) and RH-2 (51-91 %).

**Incidence of insect pests on groundnut in the farmers fields Kharif-2009 :**

**Incidence of GLM :**

The peak incidence of GLM, in terms of trap catch was

observed during 32<sup>nd</sup> Std. week (89.01). However, the trap catch ranges from 39.11 to 45.66 for the period from 25<sup>th</sup> to 34<sup>th</sup> std. week. During the month of September the trap catch was low except in the last week (11.29 moths/trap). During the month of October the 42<sup>nd</sup> week recorded a peak trap catch of 12.88 moth per trap. From 42<sup>nd</sup> Std. week onwards the trap catch was declined (Fig. 2).



**Fig. 2 :** Pheromone trap catches of groundnut defoliators in the farmers fields during Kharif - (2009-10)

**Incidence of *S. litura* :**

The moth catch was started from 25<sup>th</sup> Std. week attained peak position of around 40 moths per trap in three Std. weeks viz., 31<sup>st</sup> (40.60) 33<sup>rd</sup> (40.30) and 38<sup>th</sup> Std. week (43.20 moths per trap), But a sudden decline in the trap catch was observed in the 40<sup>th</sup> Std. week (9.5 moths/trap) and afterwards there is an increase in trap catch with around 30 moths per trap (Fig. 2).

**Incidence of *H. armigera* :**

The pheromone moth catches of *H. armigera* was very low during the entire period under report. However, The initial trap catch (9.0 moths/trap) started in the month of June in 25<sup>th</sup> Std. week. 34<sup>th</sup> and 36<sup>th</sup>. Std. week, two peaks were observed the population was reduced to 2.75/trap in the 39<sup>th</sup> Std. week and slowly increased during 43<sup>rd</sup> Std. week (6 moths/trap).

**Incidence of Thrips :**

The number of thrips per plant ranged from 1.19 to as high as 39.64 thrips. The incidence was high from the initial crop growth period 29.44 thrips/plant (25<sup>th</sup> Std. week) and attained to its peak of 39.64 thrips (33<sup>rd</sup> Std. week) and 39.24 thrips (32<sup>nd</sup> Std. week) with a small decline in 34<sup>th</sup> Std. week (23.25 thrips /plant) again raised to 37.7 and 36.9 thrips per plant during 35<sup>th</sup> and 36<sup>th</sup> Std week, respectively. During the entire period of September month the pest load was high and then declined in the subsequent November month.

**Incidence of insect pests in groundnut in the Research Station Rabi 2009-10 :**

**Incidence of GLM :**

Leaf miner and thrips are the important pests during *Rabi*, 2009. The incidence of GLM in terms of trap catch was started

in the month of December, 2009 (49<sup>th</sup> Std. week) (5.16 moths/trap). With gradual increase in the trap catch from 50<sup>th</sup> Std. week (19.16) the trap catch attained to its peak by 2<sup>nd</sup> Std. week (88.12) (moths per trap). During the two Std. weeks viz., 2<sup>nd</sup>, 3<sup>rd</sup> the trap catch was low with 13.64 and 18.48, respectively and during the 5<sup>th</sup> Std. week the trap catch was increased to 75.44 moths/trap and attained to its peak during 6<sup>th</sup> Std. week (130.76 moths/trap). The population was suddenly declined from 7<sup>th</sup> Std. week (3.04 moths/trap) and slightly raised after wards and recorded 17.16/trap during 9<sup>th</sup> Std. week (Fig.3).

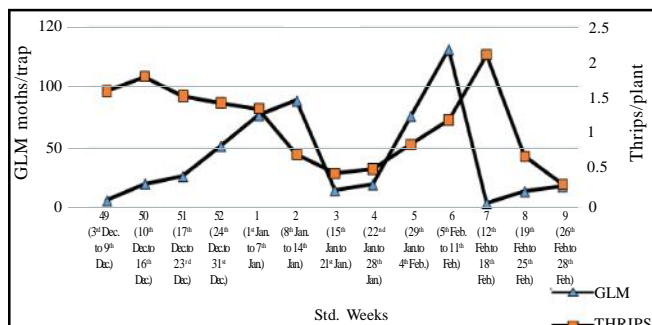


Fig. 3 : Incidence of groundnut pests in ARS, Anantapur (Rabi 2009-2010)

**Incidence of thrips :**

The incidence of thrips was very low during the period under report (0.32 to 2.1thrips/plant). The incidence started during the month of December in the 49<sup>th</sup> Std. week (1.6 thrips /plant) and declined from 2<sup>nd</sup> to 6<sup>th</sup> Std. week (0.73 to 1.20) and attained to its peak during the 7<sup>th</sup> Std. week (2.1 thrips/plant). Harvir Singh (2005) reported peak population of thrips during third and last week of August coinciding with dry spell after moderate rainfall.

**Incidence of insect pests in groundnut in the farmers fields Rabi 2009-10 :**

**Incidence of GLM :**

During Rabi, 2009-10, the incidence of GLM was low in the farmers fields and this might be due to continuous mass trapping of GLM with Pheromones. The incidence of GLM was started in the month of December, 2009 (3.34 moths/trap) and increased thereafter. The peak population was observed in the 1<sup>st</sup> Std. week (48.35 moths/trap) and declined in 2<sup>nd</sup> and 3<sup>rd</sup> Std. week (19.99 and 7.30 moths/trap) from 4<sup>th</sup> Std. week onwards the population was increased and attained to its peak during 6<sup>th</sup> Std. week (106.86 moths/trap). However, the crop was harvested in the month of February 2<sup>nd</sup> fort night (Fig. 4).

**Incidence of thrips :**

The incidence was low during the period under report and ranged from 0.47 to 2.10 thrips/plant.

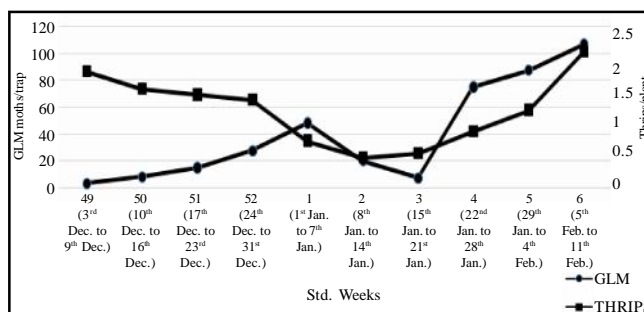


Fig. 4 : Monitoring of groundnut pests in the farmers field during Rabi-2009-10

**Influence of weather parameters on insect pests of groundnut:**

**H. armigera :**

Pheromone trap catches of *H. armigera* showed a positive correlation with mean temperature (0.41131). However, these results were in conformity with the findings of Upadhyay et al. (1989) (Table 1) The regression analysis with weather parameters indicated that 51 per cent of influence on trap catch of *H. armigera* with the regression equation of  $Y = -59 + 1.484 T_{max} + 0.321 RH-2 + 0.489 SSH + 0.77 Rainfall$  and  $-2.19 Rainy\ days$ . However the influence due to rainy days is negative (Table 3).

Table 1 : Influence of weather factors on the incidence of *Spodoptera* and *Helicoverpa*

Weather factors	<i>Helicoverpa</i>	<i>Spodoptera</i>
Tmax	0.25044	0.559498*
Tmin	0.39599	0.25681
Tmean	0.41131*	0.51464*
RH-1	-0.23520	-0.67699*
RH-2	0.02189	-0.42240
Wind velocity	0.17540	0.24999
Sun shine	-0.03413	0.20266
Rainfall	0.07767	0.06829
Rainy days	-0.12226	-0.09301
Evaporation	0.25989	0.66203*

**S. litura :**

The correlation analysis with weather parameters revealed that, Tmax (0.559498) and Tmean (0.51464) were significant positive correlation with *S. litura* trap catch and the RH-I (-0.67699) showed significant negative correlation. However, the evaporation (0.66203) also showed significant positive correlation with the trap catches of *S. litura*. These results were in conformity with the findings of Gedia et al. (2007) and Monobrullah et al. (2007), who also observed a significant positive association between male moth catches and max.temperature. The results of the present investigation indicated that various weather parameters influenced *S.litura*

**Table 2 : Influence of weather factors on the incidence of GLM**

	Current week	1 week slag	2 weeks slag
Tmax	0.24799	0.20673	-0.66990*
Tmin	0.50367*	-0.15251	-0.61051*
RH-1	-0.75913*	0.06059	0.60599
RH-2	-0.08011	-0.60788*	-0.15460
Sun shine	0.46150*	-0.12577	-0.33654
Rainfall	-0.08011	-0.60788*	-0.15460
Rainy days	-0.22656	-0.63104*	0.01821

**Table 3 : Multiple linear regression analysis**

<i>H.armigera</i>	Y= - 59+ 1.484(Tmax) + 0.321 (RH-2) + 0.489 (Ssh) + 0.077 (Rainfall)- 2.19 (Rainy days).	R <sup>2</sup> =0.55
<i>S.litura</i>	Y= -100.98 + (-) 65.82 (Tmax)-72.17 (Tmin) + 141.49 (Tmean) + 0.99 (Wind velocity) + 0.29 (Rainfall) - 3.24 (Rainy days)	R <sup>2</sup> =0.66
GLM	Y= 0.47 + 0.004( Min.Tem)+0.12 (RH-1)-0.019(RH-2)-0.26(Ssh)	R <sup>2</sup> =0.81

moth catches in pheromone trap as reported by Dubey *et al.* (2003). The MLR equation fitted with weather parameters for pheromone trap catches (Y) of *S. litura*, Y= -100.98 - 65.82 Max temp -72.17 (min T) + 0.99 wind velocity -0.29 Rainfall - 3.24 (Rainy days), contributing for 66 per cent of weather factors on *S. litura* incidence (Table 3).

**GLM :**

The influence of weather parameters on the incidence of GLM recorded significant positive correlation with Tmin (0.50367) and Sunshine hours(0.46150) and significant negative correlation with RH-I (-0.75913) (Table 2). These results were inconformity with the findings of Sherasiya and Butani (1998). Ghule *et al.* (1989) also reported significant positive correlation with Ssh and negative correlation with RH I

The meteorological data of one week slag revealed that significant negative correlation with RH-II (-0.15460), Rainfall (-0.60788) and Rainy days (-0.63104). But the meteorological data of two weeks slag reported negative and significant correlation with Min and Max temperatures (Table 2). These findings were in conformity with the reports of Lewin *et al.* (1979) and Logeswaran *et al.* (1982). The multiple regression equation fitted with weather factors for pheromone trap catches (Y) of GLM was Y=0.49 - 0.008 Min temp + 0.28 RH-1 - 0.02 RH-2 -0.32 Ssh. The regression analysis revealed that pheromone trap catches were significantly and negatively influenced by Min temp and SSh and also with RH-II and contributing for 81 per cent of weather factors on GLM incidence (Table 3).

**Thrips :**

The population of thrips in the season found to be low both in *Kharif* and *Rabi* and hence the multiple linear regression analysis could not be done.

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