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ASSOCIATION OF PHEROMONE TRAP CATCH OF *S. LITURA* AND *H. ARMIGERA* WITH FIELD INCIDENCE AND WEATHER PARAMETERS IN TOBACCO, COTTON AND CHICKPEA

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A study was conducted to understand the association of pheromone trap catch of *S. litura* and *H. armigera* with field incidence and weather parameters in tobacco, cotton and Bengalgram in CTRI Research Station, Guntur. It was observed that the peak catch of *S. litura* moths in pheromone traps in nursery was recorded during the third week of September followed by a decline. Maximum incidence of this pest was observed in tobacco nurseries after two weeks of peak catch of moths was recorded in traps. Thus a general lag period of two weeks was observed between the peak catch of moths in pheromone traps and maximum incidence of the pest in the nurseries. Similar lag period of two weeks was observed between peak moth catch and maximum incidence of this pest in the field crop also. A strong association of pheromone trap catch and field incidence of *H. armigera* was observed in case of non-Bt cotton when maximum incidence and pheromone trap catch were recorded during second week of November. It was observed that 78-87% variability in pheromone trap catch could be explained by weather parameters in case of *S. litura*. There was a significant positive association between pheromone trap catch and the rainfall. The variability in the field incidence of *S. litura* could be explained by weather parameters to an extent of 74-82% in tobacco nurseries and rainfall exhibited a strong positive association with field incidence. In the case of field crop 52- 74% of variability in the incidence of this pest could be explained by weather parameters and here too rainfall had a strong positive association. The variability in the incidence of *H. armigera* in non-Bt cotton could be influenced by weather parameters to an extent of 78-82% (except during 2008-09) and during these years rainfall had a significant positive influence whereas minimum temperature had a significant negative influence on the incidence of this pest.

INTRODUCTION

Monitoring of pests in the field is a prerequisite in any integrated pest management strategy (Dent, 1993). Pheromone traps have been routinely used to monitor the activity of pests in the vicinity of a crop (Singh and Sachan, 1991; Patil *et al.,* 1992). However, the extent of pheromone trap catch of any pest indicates or predisposes the incidence of the pest in the field is not very clear in case of many crops and pest species. Hence the present study aims to understand the extent to which moth catch of *H. armigera* in pheromone traps reflects the population of the pest in the field and also the influence of weather parameters on the pheromone trap catch and field incidence in tobacco, cotton and chickpea.

MATERIALS AND METHODS

Each of the three crops (tobacco, cotton and chickpea) were planted in an area of one acre in the research farm of CTRI Research Station, Guntur. Four pheromone traps were installed in each field and lures in the traps were changed after every 15 days. The catch of the moths in each trap was counted daily and expressed as mean moths trapped/ trap/ week. Data on the population of pest were recorded at weekly interval on 50 random plants at three random spots starting from 15 days of germination/ transplanting of the crop. To understand the association between moth catch and field infestation moth activity in pheromone traps for the $(n-1)^{th}$ week was regressed with larval count of n^{th} week. Larval population in the field was regressed with weather parameters to understand the effect of weather parameters on field incidence of the pest. In the case of *S. litura,* data on pest population and damage were recorded both in the nursery and field crop of tobacco and

the same were regressed with pheromone trap catch and weather parameters.

RESULTS AND DISCUSSION

It was generally observed over the three-year experimentation that the peak catch of *S. litura* moths was recorded during the third week of September followed by a decline and the maximum incidence of this pest was observed in tobacco nurseries after two weeks of peak of moths in traps. Thus, a general lag period of two weeks between the peak catch of moths in pheromone traps and maximum incidence of the pest in the nurseries was observed (Fig. 1).

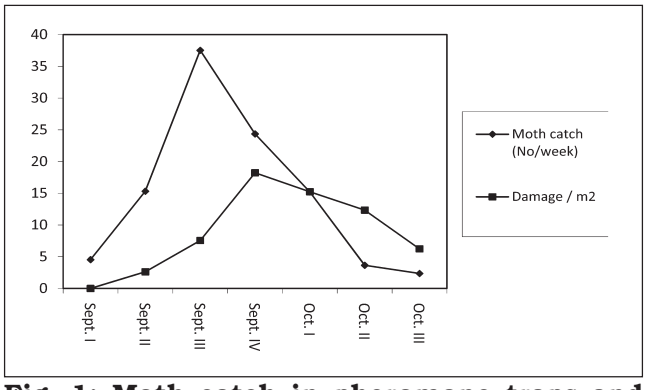

Fig. 1: Moth catch in pheromone traps and incidence of *S. litura* in tobacco nurseries

The peak catch of moths did not follow a fixed pattern in all the three years of study. Usually maximum number of moths were trapped in pheromone traps during November fourth week or December first week. Here too, a lag of two weeks was observed between peak moth catch and maximum incidence of the pest in the field (Fig. 2).

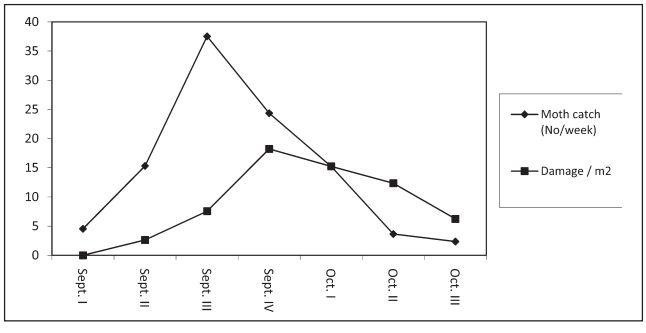

Fig. 2: Moth catch in pheromone traps and incidence of *S. litura* in tobacco field crop

The incidence of *H. armigera* was low during two out of three crop seasons in all the crops under study and no clear association of the pheromone trap catch was observed with field incidence in these years. The peak catch of moths of *H. armigera* in pheromone traps was noticed usually during the first week of November during that period the crops under study (except cotton) were not in a suitable stage for feeding of the pest. During 2009-10, a strong association of pheromone trap catch and field incidence of the pest was observed in the case of non-Bt cotton where maximum incidence and pheromone trap catch were recorded during the second week of November (Fig. 3).

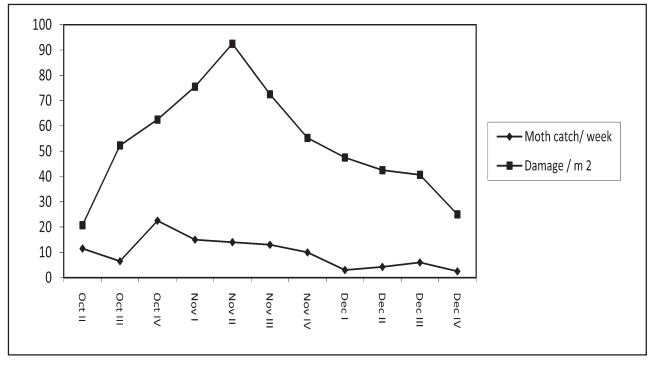

Fig. 3: Moth catch in pheromone traps and incidence of *H. armigera* in Non-Bt cotton

The pheromone trap catch of *H. armigera* and *S. litura* was regressed with weather parameters. It was observed that 78-87% variability in pheromone trap catch could be explained by weather parameters in the case of *S. litura* and there was a significant positive association between pheromone trap catch and rainfall. The association between trap catch and weather parameters was not strong in case of *H. armigera* and none of the weather parameters could significantly influence the pheromone trap catch of this pest (Table 1).

The variability in the incidence of *S. litura* could be explained by weather parameters to an extent of 74-82% in tobacco nurseries and rainfall exhibited a strong positive association with field incidence. In case of field crop 52-74% of variability in the incidence of this pest could be explained by weather parameters and here too rainfall had a strong positive association. The variability in the

incidence of *H. armigera* in non- Bt cotton could be influenced by weather parameters to an extent of 78-82% and rainfall had a significant positive influence whereas minimum temperature had a significant negative influence on the incidence of this pest.

Abiotic factors like maximum temperature and minimum temperature had positive correlation with male moth catches and larval population of *H. armigera* while, relative humidity had negative correlation in chickpea (Pawan Kumar *et al.*, 2012). It was observed that minimum temperature exerted highest positive influence on the population fluctuation of *H. armigera* followed by rainfall, relative humidity, maximum temperature and average temperature in cotton based agro-ecosystems in Pakistan (Amjad Ali and Ghulam, 2011). Significant negative correlations were found between the incidence of the three boll worms including *H. armigera* and minimum temperature, morning relative humidity, evening relative humidity, intensity of rainfall and number of rainy days in Tamil Nadu (Balasubramanian *et al.*, 1981).

It is concluded based on the study that peak moth catch in pheromone traps could be indicative of imminent damage due to *S. litura* to nurseries and field crop of tobacco in the ensuing week. Among all the weather parameters studied, rainfall appeared to have very positive influence on the incidence of *S. litura* in tobacco field crop. Similar influence of rainfall was also noted in case of *H. armigera* in non-Bt cotton.

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Table 1: Association of *H. armigera* and *S. litura* pheromone trap catch with weather parameters

Mean moths trapped / week	Regression co-efficient						Intercept	R^2
	Max temp.	Min temp.	FN RH	AN RH	Sunshine hours	Rainfall (mm)		
S. litura	5.125	-2.85	5.81	-2.74	-1.45	6.34*	-32.80	0.87
H. armigera	-2.48	-5.76	6.12	-7.52	-5.25	5.47	17.45	0.57

Significant at (P = 0.05)

Table 2: Association of field incidence of *H. armigera* and *S. litura* with weather parameters

Damaged plants / bolls / pods	Regression co-efficient						Intercept	R^2
	Max temp.	Min temp.	FN RH	AN RH	Sunshine hours	Rainfall (mm)		
S. litura (Nursery)	-0.13	-0.22*	5.70	-1.56	3.50	1.74**	-4.85	0.79
S. litura (Field crop)	-8.45	1.75	5.27	-5.74	1.45	3.50*	22.04	0.52
H. armigera (Tobacco)	-3.24	3.35	7.25	-2.40	6.25	4.65	4.25	0.48
H. armigera (Cotton non-Bt)	-1.75	- 3.25**	6.25	-5.50	4.78	2.50**	6.75	0.82
H. armigera (Chickpea)	-2.75	3.96	4.78	-2.50	6.25*	4.50	-7.25	0.65

(* Significant at P = 0.05)

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