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Monitoring of Pink Bollworm, *Pectinophora gossypiella* (Saunders) (Lepidoptera: Gelechiidae) through Sex Pheromone Traps

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ABSTRACT: The pheromone-based trapping is a prerequisite in determining the population dynamics of a pest, which in turn helps to take up suitable management practices. The specific sex pheromone traps were used to monitor the adult male population of pink bollworm, *Pectinophora gossypiella* (Saunders) in the Main Agricultural Research Station, Raichur, Farmer field and also at cotton ginning mills in Raichur. The lures of traps were changed at an interval of 60 days and data were collected weekly. The attraction of male moths of PBW started, at the beginning, of the first week of September and continued till the third week of April at the Main agriculture research station, Raichur and also in the Farmer field whereas, in cotton ginning mills the activity seen throughout the year. The peak catches of the pink bollworm were observed during the last week of December in the Main agriculture research station, Raichur (31.49/trap/week). Whereas in farmer fields peak catches were observed during the second week of January (34.36/trap/week).

Keywords: *Pectinophora gossypiella*, Sex pheromone, Surveillance, Cotton boll worms.

INTRODUCTION

One of the most significant cash crops in terms of economics and society, cotton is used as a raw material in the textile industry. More than 80 countries around the world's tropical and subtropical climates are where this is grown. Four nations produce 70% of the world's cotton, namely China (27%), India (22%), the United States (13%), and Pakistan (8%) (Anonymous, 2013). The second-largest cotton producer is India. Cotton's 2016–17 production figures are 105 lakh hectares, 351 lakh bales, and 568 kg per hectare, respectively(Anonymous, 2017). The American bollworm, *Helicoverpa armigera* (Hubner), Spotted bollworm, *Eariasvittella* (Fabricius), and pink bollworm, *Pectinophora gossypiella* (Saunders) are the three bollworms most frequently found in cotton farming (PBW) (Naik *et al*., 2014). It has recently become a serious danger to *Bt* cotton cultivation as well as cotton farming in southern and central India. A pink bollworm infestation results in locule damage of up to 55% and a 35–90% decrease in seed cotton yield. The countries loss due to this pest was estimated at 6525 metric tons of lint worth Rs 1216 million (Agarwal and Katiyar 1979) and under unprotected condition known to cause 2.81 to 61.87 per cent loss in seed cotton yield, 3.44 to 37.83 per cent loss in germination, 2.12 to 47.13 per cent loss in oil content and 10.66 to59.15 per cent loss in normal opening of bolls (Patil, 2003). Since the pink bollworm feeds internally, the larval stage is shielded from predators and parasitoids while inside the fruiting structure, making pink bollworm control challenging. Studying the pink bollworm population dynamics over a reasonable time period enables the prediction of the degree of damage, which in turn enables the use of effective timing of the appropriate treatment. This reduces the need for chemical application, thereby lowering the cost of protection and potential environmental risks. With these information in hand, the current investigation was carried out to determine the pink bollworm activity peaks.

MATERIAL AND METHODS

Seasonal activity of pink bollworm moths was studied in MARS, farmer's field and in the processing unit of cotton ginning mills by using sex pheromone traps during 2017-18 season. Pheromone traps baited with pectin lure were used to monitor the pest. Eleven such pheromone traps were installed in MARS and ten traps in farmer field but in cotton ginning mills, the number of traps was 15 because we were selected four cotton ginning mills where three cotton ginning mills were installed with four traps but at one cotton ginning mill was installed with three traps. In the field, traps installation was done by keeping the minimum of 30–

40-meter distance between two traps. The individual trap was hanged on bamboo sticks. Height of all the traps were maintained according to the crop height in such a way that lures of each trap were one foot above the crop canopy. Traps and lure were changed at 60 days interval. Observation on the number of moths trapped in each trap was recorded at weekly interval.

RESULTS AND DISCUSSION

Main Agricultural Research Station, Raichur. To monitor the activity of pink bollworm, *P. gossypiella* sex pheromone baited sleeve traps were installed and observation were carried out from July 2017 to April 2018 and data revealed that the moth activity was less from second week of July to second week of October. The higher activity of moth was started from third week of October and continued till third week of April. The peak catches of moths were recorded during fifth week of January 1014.55/trap/week which was followed by fourth week of December 990.91/trap/week, first week of January 925.45/trap/week and third week of December 915.00/trap/week (Table 1).

Table 1: Average number of pheromone trap catch/trap/week of pink bollworm in MARS farm, farmer field and cotton ginning mills at Raichur.

Month	Standard Week	MARS farm	Farmer field	Ginning mills
July	27	0.00	0.00	-
	28	0.64	0.00	-
	29	0.09	0.00	2.20
	30	0.09	0.00	0.73
	31	0.09	0.00	1.00
August	32	0.00	0.00	0.73
	33	0.00	0.00	0.13
	34	0.09	0.00	0.33
	35	0.09	0.80	0.53
September	36	0.18	3.40	0.60
	37	0.18	2.90	0.13
	38	0.27	4.70	0.27
	39	0.45	8.70	0.20
October	40	1.91	22.50	0.07
	41	0.18	28.80	0.93
	42	1.45	57.70	1.87
	43	4.64	136.30	3.47
	44	26.36	308.60	2.53
November	45	32.55	444.00	3.07
	46	61.82	580.10	3.60
	47	288.91	713.60	4.93
	48	478.82	941.50*	8.33
December	49	540.00	1051.00*	9.13
	50	613.45	1165.00*	8.13
	51	915.00*	1180.00*	11.07
	52	990.91*	764.00	10.93
January	1	925.45*	466.00	9.87
	2	385.27	813.50	11.67
	3	616.36	380.00	11.33
	4	473.64	151.50	13.87
	5	1014.55*	61.70	12.20
February	6	595.00	61.30	11.80
	7	253.18	18.70	14.47
	8	110.45	6.00	13.93
	9	60.00	3.70	14.00
March	10	57.36	0.10	13.87
	11	18.00	0.00	15.73
	12	6.09	0.00	14.07
	13	4.91	0.00	15.60
April	14	6.82	0.00	21.33
	15	3.00	0.00	20.27
	16	1.55	0.00	21.67
	17	0.00	0.00	19.40
	18	0.00	0.00	22.47

*Peak catches of moths caught at different locations

Farmer field, **Raichur.** To monitor the activity of pink bollworm, *P. gossypiella* sex pheromone traps were installed and data revealed that there were no moth catches from first week of July up to third week of August. The activity of moth was started from fourth week of August and continued to increase till the first week of March with the peak catches of 1180/trap/week (Table 1) and the activity were decreased in second week then suddenly increased in third week of January and from fifth week of January activity was completely decreased till the first week of March and there were no moth catches observed from second week of March till the end of April.

Cotton ginning mills, Raichur. To monitor the activity of pink bollworm, *P. gossypiella* sex pheromone baited sleeve traps were installed and observation were carried out since its act as a source of inoculums for the next season and data revealed that the activity of moths was noticed throughout the year. Activity of moths was increased from third week of October (1.87/trap/week) and continued till the last week of April (22.47/trap/week) (Table 1).

In MARS, the activity of moth was started from third week of October and continued till third week of April with four peak catches were recorded during third and fourth week of December, first week and fifth week of January where as in farmers field it was found that three peak catches during first, second and third week of December. Maximum of 1014.55 moths caught during fifth week of January whereas in farmer's field the maximum of 1180 moths caught during third week of December and at cotton ginning mills the activity of moths were seen throughout the year (Table 1).

Monitoring of pink bollworm was carried out using the sex pheromone traps, it was observed that four peak catches were recorded during third week of December, fourth week of December, first and last week of January during 2017-18 season at MARS (Fig. 1). These results are in close agreement with Sangareddy and Patil (1997) at Raichur during 1993-94 and observed the activity of moth throughout the year and five peak catches were recorded during second week of September, second week of December, third and fifth week of January and second week of February. Where Khuhro *et al*. (2015) observed that the male moth activity of *P. gossypiella* started to attract toward the pheromone traps from January to March and disappeared from April to July in every year and again their catches started from August to December. The peak moth catches 7.67/trap was recorded during the month of October, 2013 at Sindh, Pakistan.

Patil *et al*. (2007) recorded the PBW activity of moths from September months and gradually increased till the end of January and there after started decreasing gradually till the end of season in April with a peak catch of moths were observed during November, December, January and February. These findings are in close agreement with present investigations. It was observed that the pink bollworm moth catches started to increase from September and peak activity was observed during December and January. The present findings are in agreement with Patil *et al*. (2007) and moth catches started declining from February till the end of April. These findings are in confirmation with reports of Korat and Lingappa (1996); Patel *et al*. (2010).

To monitor the activity of pink bollworm, *P. gossypiella* with sex pheromone baited sleeve traps revealed that the activity of moths was started from third week of September and continued to increase till the second week of January with the peak catches of 34.36/trap/week (Fig. 1). These findings are in agreement with Sangareddy and Patil (1997) at Raichur observed that the moth activity was started from first week of September till the end of January and the peak catches was observed during fifth week of January. Korat and Lingappa (1995); Patel *et al*. (2010) recorded the moth activity was decreased from February onwards till the last week of April and these results are in agreement with present investigations.

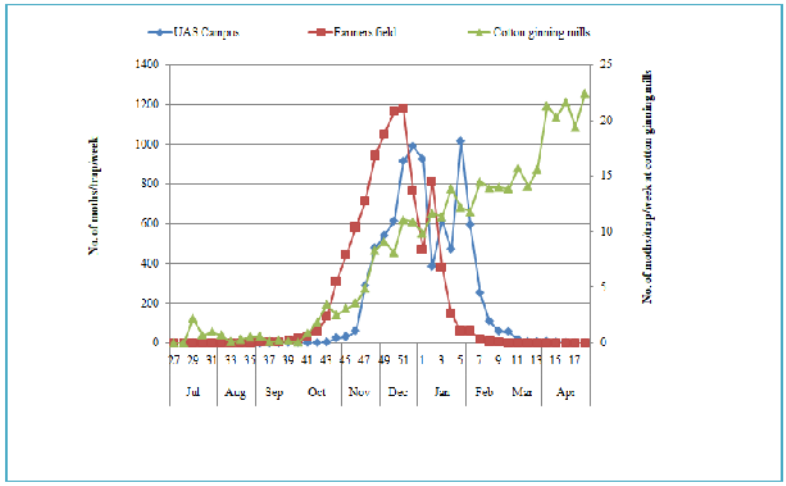

Fig. 1. Weekly sex pheromone trap catches of pink bollworm at three different locations.

The activity of male moths at MARS was started from second week of July and continued till the third week of April whereas in farmers field moth activity was noticed from fourth week of August till the first week of March. The activity of moth was extended till the April month in MARS it is mainly due to availability of host compared to farmer's field where the activity was ended in the month of March.

The monitoring study observation revealed that the activity of moths was noticed throughout the year. Activity of moths was increased from second week of October (1.20/trap/week) and continued till the last week of April. The peak catches were noticed during fourth week March (4.67/trap/week) and fourth week of April (4.79/trap/week) (Fig. 1). The activity of moth throughout the year was mainly due to storing of rejected lots of cotton in the premises of cotton ginning mills and the higher activity of moths was increased from October onwards because of arrival of freshly harvested seed cotton to the cotton ginning mills. There is no published reference regarding trap catches at cotton ginning mills.

CONCLUSION

The activity of pink bollworm moths monitored through sex pheromone traps from June 2017-April 2018 indicated that the activity of moths started from September and continued till the end March. It clearly indicates that the control measure should be initiated from September with all available suitable methods to manage pink bollworm effectively.

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Conflict of Interest. None.

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