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FACTORS AFFECTING MALE PINK BOLLWORM MOTH CATCHES IN GOSSYPLURE BAITED TRAPS

S. LAL TANEJA* AND A.P. JAYASWAL**
Department of Entomology Haryana Agricultural University, Hissar - 125 004 (India).

ABSTRACT

In an experiment conducted in cotton fields at Hissar, Haryana (India) during the year 1978-79, it was observed that the most effective trap for the capture of male pink bolworm moths using sex pheromone "gossyplure" was metal trap in which either rubber stopper or plastic tube was used as pheromone dispenser and either liquid paraffin or cotton seed oil was used as moth sticking material. Maximum moths were captured when the traps were kept at the plant canopy level and at a distance of 60 or 40 metres.

INTRODUCTION

Pink bollworm, *Pectinophora gassypiella* (Saunders) is a serious pest of cotton in India and in many other countries. Female moth of this pest releases a pheromone which attracts male moths for mating (Ouye and Butt, 1962). This pheromone has been identified as 1 : 1 mixture of Z, Z and Z, E isomer of 7, 11-hexadecadienyle acetate (Hummel *et al.*, 1973, Bierl *et al.*, 1974) to which the name gossyplure has been given.

Gossyplure can be used in pink bollworm control in three major ways : (1) in sampling or monitoring the pest population to know the optimum time for insecticidal application, (2) in mass collection and killing of male moths in traps, and (3) in confusing males to disrupt premating communication. All these types of experiments particularly (1) and (2) require an economical and effective trap, an optimum pheromone releasing substrate (dispenser) and optimum distance and height of trap to catch maximum moths. The present study was, therefore, undertaken to evaluate effective trap for the maximum catch of male pink bollworm moths under Haryana conditions.

MATERIALS AND METHODS

The study was carried out at Haryana Agricultural University Research Farm on a *hirsutum* cotton variety H 655 during 1978-79 crop season. All the recommended agronomic practices were followed and the crop was sprayed with insecticides according to the fixed spray schedule (at an interval of 10-12 days starting from middle of August). The sex pheromone of pink bollworm, which is a 1 : 1 mixture of Z, Z and Z, E isomer of 7, 11 hexadecadienyl acetate (commonly called gossyplure) was purchased from Farcan Division, Chemical Samples Co. Ohio, U.S.A. Two sets of experiments were conducted for trap evaluation.

1. Trap type, pheromone dispensers and moth sticking material :

Two types of traps (Delta and metal trap), two types of pheromone dispensers (rubber stopper and plastic tube) and two types of moth sticking materials (liquid paraffin and cotton seed oil) were evaluated from 5th August to 5th October, 1978. Delta traps were received from Arizona, U.S.A. through Dr. Hollis M. Flint. When

Present Address : * Sorghum Entomologist. ICRISAT. Patancheru P.O. A.P. - 502 324.
** Scientist S-3 Entomology Division Central. Institute for Cotton Research. Nagpur - 440 010.

assembled, they form a base and two sides (17.5 × 10 cm each) with two holes across (Plate 11a and b). The inner side of the trap was coated with an adhesive 'stickem'. Metal traps with eight holes (trap diameter 30 cm, height 7 cm and hole diameter 2 cm) were made from galvanised iron sheet (Plate 1a and b). The sticky material uniformly covered the bottom of the trap. The dispenser rubber stopper was 1.5 cm in height and 1.0 cm in diameter while the plastic tube was 6 cm long with 1 mm internal diameter. In the rubber stopper 1 μl of gossyplure mixed with 50 μl of methylene chloride was added and kept for five minutes before use in the traps. In the plastic tube, gossyplure get filled through capillary action when the tube was dipped in the pheromone solution and recharged when the whole solution got evaporated.

Traps were installed at the plant conopy level at a distance of 60 × 60 metres and arranged in a randomised block design with five replications. Male pink bollworm moths captured in these traps were counted and removed at 3-4 days interval.

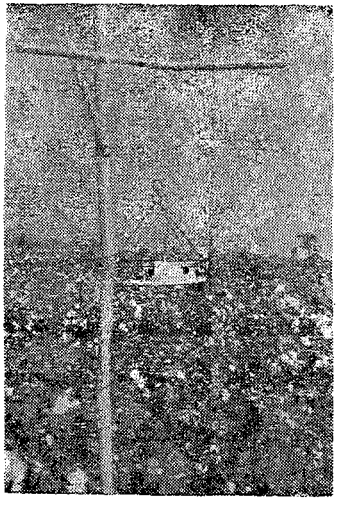

Plate Ia – Metal Trap

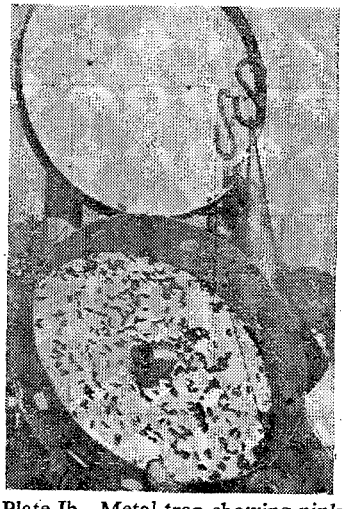

Plate Ib – Metal trap showing pink bollworm moths trapped

Plate IIa – Paper trap

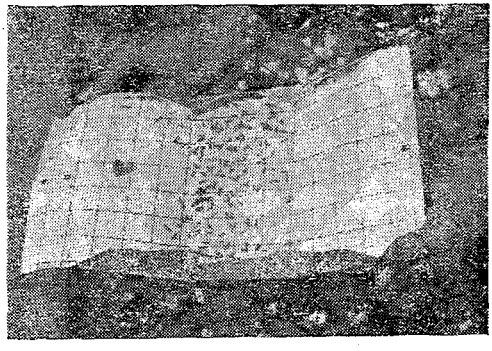

Plate IIb – Paper trap showing pink bollworm moths trapped

2. Trap distance and height :

This experiment was conducted from 6th October to 5th December, 1978. Three distances (60, 40 and 20 metres) and three heights (at canopy level, 30 cm below and 30 cm above canopy level) were tested for capturing male pink bollworm moths. Nine traps (3 heights with 3 replications) of the same distance were installed in one block and randomised. Similarly the traps for other distances were also randomised independantly and installed in the adjacent blocks. Metal traps were used with plastic tube as pheromone dispenser and liquid paraffin as moth stticking material. Gossyplure was refilled in the plastic tube when whole of the material got evaporated. The male pink bollworm moths captured in the traps were counted and removed at 3-4 days interval.

RESULTS AND DISCUSSION

1. Trap type, pheromone dispenser and moth sticking material :

Mean number of male pink bollworm moths captured in different traps is presented in Table 1. The number of moths captured in metal traps with all combinations of pheromone dispensers and moth sticking materials were significantly higher than the Delta traps. Among the metal traps, the maximum number of moths (10.7 moths / trap / night) were captured in traps having rubber stopper as pheromone dispenser and cotton seed oil as moth sticking material and the minimum (9.2 moths / trap / night) in traps having plastic tube and liquid paraffin, but these differences were not found to be significant. There were no significant differences in moth capture in traps having either rubber stopper or plastic tube as pheromone dispenser and either liquid paraffin or cotton seed oil as moth sticking material. Traps having cotton seed oil also attracted other cotton insects particularly red cotton bugs and jassids.

The greater efficiancy of moth capture in metal traps baited with gossyplure may be attributed to (1) large surface area of the trap as indicated in the studies of Marks (1976) and Foster *et al.*, (1977) and (2) more number of holes all around the trap for better dispersion of pheromone and moth entry as demonstrated by Sharma *et al.*, (1973 b).

2. Trap distance and height :

Mean number of moths captured (Table 2) in traps fixed at 60 metre distance was significantly higher (6.2 moths / trap / night). There was no significant difference in moth capture in traps placed either at 40 or 60 metres. Moth catch per trap was reduced at the closer spacing, probably because of small area of crop was covered by the trap array. Similar results were also observed by Reed *et al.*, (1975) in South India.

Moths captured in traps placed at plant canopy level was found to be significantly higher (8.1 moths / trap / night) than in traps kept either 30 cm below canopy level (4.3 moths / trap / night) or 30 cm above canopy level (3.5 moths / trap / height) indicating that maximum moth acitivity took place at top of the plant foliage and the pheromone stimulated males flow to the traps more directly without hindrance from any vegetation and also the pheromone dispersed over a larger area. Traps placed below canopy level captured less moths because either the pheromone dispersed over a smaller area or the pheromone stimulated males encountered hindrance from the plant vegetation. Traps placed well above the canopy level, although disperesed pheromone to a larger area, but attracted very few moths,

TABLE 1. Effect of trap type, pheromone dispenser and moth sticking material on the capture of male pink bollworm moths in gossyplure traps.

Date of Observation		Mean number of male pink bollworm moths captured / trap / night					
		Delta trap	Metal trap				Mean
			Rubber stopper Liquid paraffin	Rubber stopper cotton seed oil	Plastic tube Liquid paraffin	Plastic tube cotton seed oil	
Aug.	8	12.0	18.1	18.8	20.7	14.8	16.9
	11	5.1	8.4	11.0	24.4	14.6	12.7
	14	5.8	7.9	11.6	22.7	15.6	12.6
	17	5.4	8.8	12.1	22.5	13.8	12.5
	21	4.0	5.8	7.1	11.9	8.4	7.4
	25	0.8	13.0	16.0	1.3	6.3	7.4
	28	2.2	10.6	38.8	3.7	4.0	11.8
	31	0.8	2.0	5.8	2.2	3.0	2.7
Sept.	3	1.1	1.4	4.3	2.1	3.7	2.5
	6	2.9	1.9	5.6	2.4	5.2	3.6
	10	4.0	3.0	7.1	1.6	3.8	3.9
	14	3.3	3.4	3.9	1.8	5.8	3.6
	18	5.1	7.3	3.2	2.3	7.2	5.0
	22	4.9	7.2	5.8	2.4	9.7	6.0
	26	11.1	17.5	8.6	6.0	16.9	12.0
Oct.	2	4.7	17.4	8.8	13.0	13.6	11.5
	5	11.6	20.6	19.1	23.6	26.9	20.4
Mean		4.9 (2.4)*	9.4 (3.2)	10.7 (3.4)	9.2 (3.2)	10.1 (3.3)	
F test :			Significant		C.D. at 5% = (0.62)		

* Figures in parentheses are $\sqrt{n + 1}$ transformations of mean number of moths.

TABLE 2. Effect of trap distance and trap height on the capture of male pink bollworm moths in gossyplure traps.

Date of observation			Mean number of male pink bollworm moths captured / trap / night									Mean
			D1 (60 metres)			D2 (40 meters)			D3 (20 metres)			
			H1	H2	H3	H1	H2	H3	H1	H2	H3	
Oct.	7	..	42.6	15.1	7.6	33.8	10.0	8.5	18.8	5.8	7.6	16.6
	10	..	19.6	8.7	6.0	22.7	4.4	6.1	13.6	8.4	3.5	10.3
	14	..	9.3	3.6	2.9	7.4	5.4	5.0	5.7	4.3	2.6	5.1
	18	..	9.0	3.9	3.7	8.2	4.4	3.2	3.6	3.9	3.4	4.8
	22	..	3.5	3.0	1.5	5.7	3.0	2.2	5.5	3.4	2.9	3.4
	25	..	15.6	9.7	7.7	18.3	6.7	8.5	4.7	6.8	6.7	9.4
	29	..	9.3	4.0	4.5	12.6	4.3	5.0	7.7	4.3	2.4	6.0
Nov.	2	..	9.8	5.0	3.6	4.2	3.4	3.2	6.4	3.0	2.9	4.6
	6	..	7.0	5.7	3.0	3.4	3.0	3.5	2.5	2.8	1.5	3.6
	10	..	13.9	5.1	7.2	4.8	5.8	6.1	5.8	4.6	2.9	6.3
	14	..	15.4	6.7	4.7	5.3	5.2	4.8	5.7	5.0	4.5	6.4
	18	..	7.5	6.0	2.0	10.5	4.5	3.5	6.3	2.5	2.7	5.1
	22	..	5.5	2.9	2.2	7.9	2.2	2.1	3.4	2.3	1.3	3.3
	26	..	6.1	4.7	3.5	4.0	4.9	3.4	5.5	1.3	2.3	4.0
	30	..	4.1	4.3	2.0	3.7	2.4	1.7	4.5	1.5	1.1	2.8
Dec.	5	..	3.0	1.2	0.8	2.8	1.0	1.4	2.6	1.3	0.6	1.6
Mean		..	10.0	5.1	3.7	8.4	4.1	4.0	5.8	3.6	2.8	

Mean table

	H1 (Canopy level)	H2 (30 cm below canopy level)	H3 (30 cm above canopy level)	Mean
D1 (60m)	10.0 (3.1)*	5.1 (2.6)	3.7 (1.8)	6.2 (2.4)
D2 (40m)	8.4 (2.9)	4.1 (2.0)	4.0 (2.0)	5.5 (2.3)
D3 (20m)	5.8 (2.4)	3.6 (1.9)	2.8 (1.6)	4.1 (2.0)
Mean	8.1 (2.8)	4.3 (2.0)	3.5 (1.8)	

F test : Distance : Significant C.D. at 5% (Distance) = (0.20)
Height : Significant C.D. at 5% (Height) = (0.61)
Distance × Height : Not Significant

*Figures in parentheses are $\sqrt{n+1}$ transformations of mean number of moths.

probably because the moths could not perceive the pheromone. These results are in confirmity with those of Sharma *et al.*, (1971 and 1973 a), Kaae and Shoey (1973) and Marks (1976), who reported greater number of moth catches in traps placed at canopy level of the cotton plant. Kaae and Shorey (1973), however, recorded more number of months in traps placed below the plant canopy level on windy nights.

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