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Evaluation of Pheromone Traps for the Management of Pod Borer, *Helicoverpa armigera* (Hubner) in Redgram [*Cajanus cajan* (L.) Millsp.] Ecosystem

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Abstract

The present study entitled "Evaluation of pheromone traps for the management of pod borer, *Helicoverpa armigera* (Hubner) in Redgram [*Cajanus cajan* (L.) Millsp.] ecosystem" was carried out to study the influence of trap height on catches of *H. armigera* in redgram ecosystem during *kharif* 2017 at experimental farm of NPRC, Vamban and farmer's field at Vadakaddu.Funnel traps were more effective compared to delta traps and green funnel traps placed at the level of crop canopy (96.0 moths / 5 traps) and one foot below the crop canopy (94.8 moths / 5 traps) performed well compared to traps placed at two feet below the crop canopy (77.1 moths / 5 traps), one foot above the crop canopy (66.6 moths / 5 traps) and two feet above the crop canopy (58.9 moths / 5 traps).

1. Introduction

Pulses are very important in balanced diet because of their high nutritional value in recognition of which the year 2016 has been declared as "The International year of pulses" by FAO (Anonymous, 2017) indicating the importance of pulses . India is known as a major pulse growing country in the world. The insect pest spectra that infest pulse crops include more than 40 species out of which, gram pod borer, *Helicoverpa armigera* (Hubner) is a serious pest of pulses (Sharma *et al.,* 2005).

High polyphagy, mobility, reproduction rate, and diapause are major factors contributing to its serious pest status (Fitt, 1989). This pest begins infestation at the seedling stage and later feeds on the flower and developing seeds in pods until crop maturity (Mandal and Roy, 2012). Farmers rely heavily on the use of chemical pesticides to control this pest on pulses (Phokela *et al.,* 1990). Intensive and indiscriminate use of chemical pesticides leads to adverse effects in the ecosystem like development of resistance to insecticides, environmental degradation, harmful effect on beneficial flora and fauna and secondary pest resurgence. Chemical insecticide-based management of pod borers is also challenging because of the cryptic behaviour of larvae. Hence, there is urgent need to manage the pest by and eco - friendly methods. Behavioural control using pheromone traps is a recent advancement in pest management and reckoned as handy tool for monitoring and forecasting in addition to management.

2. Materials and Methods

2.1. Trap erection methods

Green funnel trap was selected to study the influence of trap height on trap catches. The treatments were fixed at different heights in an erect stick. Polythene cover was tied at the bottom by folding and fastened with stick to prevent the escape of insects. Count was taken by removing the thread at the bottom. Lure was placed in the provision provided for it in the lid of the trap at the centre. Lures were replaced once in 15 days. The traps were placed 20 m away from each other. The following five treatments were replicated five times.

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Treatment details	
T_1	Two feet above the crop canopy
T_2	Two feet below the crop canopy
T_3	One feet below the crop canopy
T_4	One feet above the crop canopy
T_5	At the level of crop canopy four feet

2.2. Statistical methods

The experiment was conducted using RBD design. The number of insects was converted to Square root transformation and analysis was done using AGRES software. The standard error SE (d) and critical difference CD (0.05) at 5 per cent was found for accuracy. The best treatment was found by grouping and differentiation by Least Significant Difference (LSD).

3. Results and Discussion

3.1. Experimental results

Green funnel traps placed at the level of crop canopy recorded the maximum moth catches (96.0 moths / 5 traps) which was statistically on par with one foot below the crop canopy (94.8 moths / 5 traps). The lowest catch was recorded at two feet above the crop canopy (58.9 moths / 5 traps) (Table 1). The order of efficacy of different trap heights was at the level of crop canopy > one foot below the crop canopy > two feet below the crop canopy > one foot above the crop canopy > two feet above the crop canopy (Figure 1).

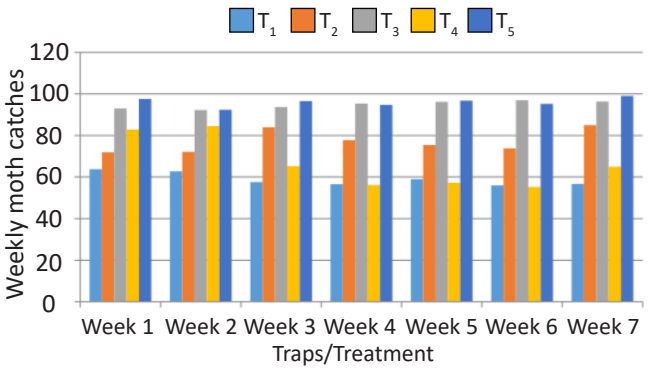

Figure 1: Trap design optimization on weekly moth catch pattern among five treatments

Table 1: Influence of pheromone trap height on moth catches of *H. armigera* in Vamban and Vadakaddu during *kharif*, 2017

Treatment	Moth catches / 5 traps							
	1st SMW	2nd SMW	3rd SMW	4th SMW	5th SMW	6th SMW	7th SMW	Mean
T_1	63.8 (7.98)^{e}	62.8 (7.92)^{d}	57.6 (7.58)^{d}	56.6 (7.51)^{c}	59.0 (7.67)^{c}	56.0 (7.47)^{c}	56.8 (7.53)^{d}	58.9 (7.66)^{d}
T_2	72.0 (8.48)^{d}	72.2 (8.49)^{c}	84.0 (9.15)^{b}	77.8 (8.81)^{b}	75.4 (8.67)^{b}	73.8 (8.58)^{b}	85.0 (9.21)^{b}	77.1 (8.77)^{b}
T_3	93.0 (9.63)^{b}	92.2 (9.59)^{a}	93.8 (9.67)^{a}	95.4 (9.76)^{a}	96.2 (9.80)^{a}	97.0 (9.84)^{a}	96.4 (9.81)^{a}	94.8 (9.72)^{a}
T_4	82.8 (9.09)^{c}	84.6 (9.19)^{b}	65.2 (8.06)^{c}	56.2 (7.49)^{c}	57.2 (7.55)^{c}	55.2 (7.42)^{c}	65.0 (8.05)^{c}	66.6 (8.12)^{c}
T_5	97.6 (9.87)^{a}	92.4 (9.60)^{a}	96.6 (9.82)^{a}	94.8 (9.73)^{a}	96.8 (9.83)^{a}	95.2 (9.75)^{a}	99.0 (9.94)^{a}	96.0 (9.79)^{a}
Mean	81.84 (9.01)	80.84 (8.95)	79.44 (8.85)	76.16 (8.66)	76.92 (8.70)	75.44 (8.61)	80.44 (8.90)	-
SE(d)	0.0894	0.0783	0.1083	0.0874	0.0825	0.1191	0.0787	0.2041
CD(0.05)	0.1895	0.1660	0.2296	0.1854	0.1749	0.2524	0.1667	0.4213

The values are mean of five replications. Figures in the parenthesis indicate square root transformed values; The means followed by different alphabets differ significantly at (p=0.05); Means were differentiated by LSD.

The current findings indicate that at and Vadakaddu, the trap catches were ranging from 96.05 moths / 5 traps to 58.94 moths / 5 traps. The highest catch was recorded when the green funnel traps were placed at the level of crop canopy followed by one foot below the crop canopy. The second highest catch was observed at two feet below the crop canopy followed by one foot above the crop canopy. The lowest count was recorded at one foot above the crop canopy. It is line with the findings of Witzgall *et al*. (2016) who revealed the traps placed at a height of three feet above ground level captured highest number of moths compared to the traps placed at other heights. The pests attracted to the pods might have fallen into the trap.

These findings are in contrast to the findings of Hashemi (2015) who evaluated that green colour traps placed at 0.6 m had higher moth catches. Witzgall *et al*. (2016) who revealed that higher number of male moths was attracted when placed at 1.5 m above the ground level compared to two m above the

ground level. Raman (1988) who suggested that the moth catches was not influenced by difference in heights.

4. Conclusion

Green funnel traps placed at the level of crop canopy and one foot below the crop canopy attracted more moths which suggest that traps placed almost at the height of crop canopy attracts more moths.

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