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FIELD EFFICACY TESTING OF SEX PHEROMONE TRAPPING WITH ALTERNATIVE TRAP DESIGN-LURE OPTIONS FOR BRINJAL SHOOT AND FRUIT BORER IN SRILANKA

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ABSTRACT

Collaborative field studies were carried out to evaluate the effectiveness of improved pheromone trapping system against brinjal shoot and fruit borer *Leucinodes orbonalis* Guenee in Sri Lanka. First field study comparing five alternative trap designs in two locations for eight weeks confirmed that moth catch was more in funnel trap with two holders (3.08), with the next being funnel trap with three holders (2.09). The catches in delta trap were intermediate (1.81), while other two funnel traps caught 1.05 to 1.84 moths. The differential efficacy of moth catches may be attributed to trap colour, shape, size and other features enhancing arrivals and/or minimising moth escape. The second field study was on pheromone loadings in lures which showed non -significant differences among 3, 5, 7 and 10 mg loadings. These studies confirmed the superiority of promising trap designs for trapping of the brinjal shoot and fruit borer moth in Sri Lanka. Scope for further research to identify more efficient trap designs and optimum pheromone loadings is indicated.

Key words: Moth sex pheromones, *Leucinodes orbonalis*, trap design, colour, shape, size, trap catches, lure loading, efficacy, IPM, Sri Lanka, brinjal

The global scenario of deploying synthetic insect pheromones is mainly for sex attraction of pestiferous moths (Lepidoptera), towards more ecofriendly IPM options among agri-horticultural ecosystems, especially in the tropics. In South Asia, while the R&D in the early decades targeted more on identification, characterisation and synthesis the current focus is more on improved delivery by slow release formulations, dispenser options and more cost-effective trap designs towards their enhanced utilisation in mass trapping vis-a vis monitoring. Sithanantham (2019) pointed out the scope for developing and adopting more effective pheromone trap designs and lure dispenser options. The cultivation of brinjal is seriously affected by brinjal shoot and fruit borer (BSFB) *Leucinodes orbonalis,* Guenee (Lepidoptera: Pyralidae) being the most destructive pest (Nusra et al., 2020). The use of sex pheromone has been shown to provide a good degree of success to suppress the BFSB (Srinivasan, 2012). The sex pheromone confused the male adult for mating and thus preventing fertilized egg production by trapping significant number of male moths, which resulted in reduction of larval and adult population build up and can be included in IPM, may be beneficial in holistic manner (Mathur et al., 2012). The brinjal shoot and fruit borer problem in Sri Lanka being a major constraint to the crop cultivation and the urgent need for such control options to be availed to farmers has been well documented (Gunawardanae et al., 1989). The present paper summarises the results from recent collaborative R&D undertaken for identifying maximally effective pheromone trap design and loadings in lure dispenser on shoot and fruit borer in brinjal in Sri Lanka.

MATERIALS AND METHODS

The major objective of the two field tests was to compare the relative efficacy of alternative pheromone trap designs, while supplementary testing was also taken up on pheromone loadings in lure dispenser.

Pheromone traps design: The first field study to compare trap types was taken up in two locations in Horticulture Crop Research and Development Institute (HORDI), Gannoruwa. There were five trap types compared as listed below, each with five replications: T1. Special delta trap (delta plus) with four holes; T2. Plastic funnel trap-green-3 holders; T3. Plastic funnel trap- yellow-3 holders; T4. Plastic funnel trap- 3 holders; and T5.Plastic funnel trap- 2 holders. The traps were installed at an inter-distance of 20 m. Moths attracted were recorded in weekly interval for eight continuous weeks. The traps were interchanged

in their position within each replication after weekly moth catch recording so to ensure no interference by trap positioning. The moth catch data were analysed using chi square test in SAS (Gomez and Gomez, 1983).

Pheromone loadings: Rubber septa lures impregnated with four concentrations of 3,5,7 and 10 mg of pheromone were evaluated in two locations. The lures were suspended inside the traps described in Sithanantham (2019) which were installed at an inter-distance of 20 m between treatments. Moths attracted were recorded in weekly interval for seven continuous weeks. The traps were interchanged in their position within each replication after weekly moth catch recording so to ensure no interference by trap positioning. The moth catch data were analysed using chi square test in SAS (Gomez and Gomez,1983).

RESULTS AND DISCUSSION

Pheromone trap design: The pooled data analysis results over the two locations showed significant differences between the treatments (Table 1). The funnel type trap designs were found to be generally more effective. The funnel trap with two holders (3.08) followed the one with three holders (2.09). The other two types of funnel traps caught in the range of 1.05 to 1.84. The moth catches in delta traps was intermediate (1.81).

Pheromone loadings: The ANOVA results indicated that the four loadings did not differ significantly in moth catches in both individual locations as well as in pooled analysis. Among the four loadings tested, the relative ranking based on numbers of moths trapped in location 1 was- 7 mg>10 mg>3 mg>5 mg,while for location 2 it was- 7 mg>10 mg>5 mg>3 mg, the combined ranking for both locations being 7 mg>10 mg>3 mg>5 mg. The present results are in conformity with those of ongoing team R&D clarifying the potential for selecting more efficacious trap types (Preethi et al., 2014; Ranjeeth et al., 2019). It is also in line with the findings of Arvinda et al. (2017) who compared alternative trap types and confirmed the superiority of trap designs which may be attributed to trap characteristics like colour, shape, size and any other features which enhance moth arrivals and/or minimise moth escape after they reach the trap vicinity. Increased number of moths caught in these traps confirmed their efficacy being outstanding and promising as IPM component. Present results on loadings are also comparable to the findings of Rahman et al. (2009) on trap catches in brinjal. The present results have also shown that any locally effective loading could be adopted between 3 and 10 mg. These studies have helped towards maximising the impact of either of the two superior trap designs, by optimising with the best bet loading for each trap design.

Table 1. Moth catches among five trap types compared over 8 weeks (2019-20)

Treatment/ week	T1	T2	T3	T4	T5	Mean
Week 1	2.30	0.60	3.10	3.60	6.70	3.26
Week 2	1.50	1.10	2.60	3.00	3.20	2.28
Week 3	2.60	1.70	2.60	3.20	4.00	2.82
Week 4	2.40	1.60	2.20	2.00	3.10	2.26
Week 5	1.90	1.20	1.50	1.70	2.30	1.72
Week 6	2.69	2.00	2.20	2.40	5.00	2.86
Week 7	0.90	0.10	0.40	0.40	0.10	0.38
Week 8	0.20	0.10	0.10	0.40	0.20	0.20
Mean	1.81c	1.05d	1.84c	2.08b	3.07a	1.97

T1. Special delta trap (delta plus) with four holes; T2. Plastic funnel trap-green-3 holders;T3. Plastic funnel trap- yellow-3 holders; T4. Plastic Funnel trap- 3 holders; T5. Plastic funnel trap- 2 holders
CD (p-0.05) for treatments-overall (trap types)**=0.746
CD (p-0.05) for weeks-overall (over trap types)**=0.943
CD (p-0.05) for treatments-within each week=2.109

The present study seeks to combine the advantages of improved trap design and optimum pheromone loading towards maximising pheromone trapping technology impact in IPM for Sri Lankan situation. Among the pheromone trap types compared two were identified as superior and could be recommended for improved efficiency in moth catches. Further, among pheromone loadings compared in the lure dispensers, it was found that all are on par and all can be used as per local performance preferences. The scope for further R&D towards incorporating these improvements for IPM strategy in Sri Lanka is indicated.

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AUTHOR CONTRIBUTION STATEMENT

The relative contribution of all authors fully estimated and the descending order of relative inputs agreed upon by all authors already.

CONFLICT OF INTEREST

There was no conflict of interest of any authors involved in this paper.

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