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Comparative Efficacy of Electrical and Solar Light Trap with Pheromone Septa and without Pheromone Septa for *Helicoverpa armigera*

Pravin[1], Amit Kumar Sharma[1*], Shraddha Tare[1] and Sandeep Patidar[2]
[1]Department of Entomology, College of Agriculture,
Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (Madhya Pradesh), India.
[2]Department of Entomology, Rajasthan College of Agriculture,
Maharana Pratap University of Agriculture and Technology, Udaipur (Rajasthan), India.

(Corresponding author: Amit Kumar Sharma)*
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ABSTRACT: The present investigation was carried out at the BSP (Breeder Seed Production) Farm, Adhartal, JNKVV, Jabalpur (MP) during *rabi* (15th November 2023 to 15th April 2024) season 2023-2024. Four light traps design were used in study via. T4 - Electrical light trap with Acrylic transparent sheet baffle plates + pheromone septa, T2- Electrical light trap with Acrylic transparent sheet baffle plates without pheromone septa, T5 - Solar light trap with Acrylic transparent sheet baffle plates + pheromone septa and T1 - Solar light trap with Acrylic transparent sheet baffle plates without pheromone septa. These four light traps were operated every evening and collection was collected every morning for the duration of the investigation for *Helicoverpa armigera* species, the data was subjected to analysis in paired and two sample t-test. Results indicated that pheromone septa with both electrical and solar light traps, featuring acrylic transparent sheet baffle plates, substantially enhances their efficacy in attracting *Helicoverpa armigera*, making this combined approach a more effective method for trapping this species.

Keywords: *Helicoverpa armigera*, Light trap efficacy, Solar traps, Electrical traps, Pheromone septa, Integrated pest management, Acrylic baffle plates.

INTRODUCTION

Utilizing a light trap as a monitoring tool, one may ascertain the economic standing of the area, the kind and quantity of pests, and their natural enemies in order to get a head start on reducing the density of pest populations. The quantity of pests captured establishes the economic threshold in Integrated Pest Management (IPM), and the pests captured on the light trap may be utilized in the early warning system (Baehaki, 2018). Light trap data is needed to be used as data on dispersal, distribution of pests, and anticipation of pest outbreaks either within or beyond countries (Baehaki *et al.*, 2016). Comparative efficiency of different trapping methods for *Zeuzera pyrina* Fab. (Leopard moth) in walnut orchard. The result found indicated that the combined treatment of pheromone trap and light trap yielded the highest number of males captured on all sampling dates. On the other hand, treatment with the light trap alone showed the lowest number of captured males (Saeidi, 2021).

It provided information respective to insect distribution, abundance, flight pattern and exact time for insect management (Singh and Bambawale 2012; Abbas *et al*., 2019; Dubey, 2021). Many researchers *viz*., Singh *et al*. (2018); Singh and Sharma (2018); Kurmi *et al*. (2019); Mishra *et al.* (2019); Meena *et al.* (2018); Sharma *et al.* (2023); Sharma *et al*. (2020); Bhargava *et al.* (2019); Sharma *et al.* (2019); Kakade *et al*. (2018); Sharma *et al*. (2017); Sharma *et al*. (2015); Patil *et al.* (2024) also conducted studies on the various aspects of light traps uses. Farmers should understand that by attracting and eliminating a single adult moth, they have the potential to effectively manage around 300 to 400 offspring of insects (Abbas *et al.*, 2019). Pheromone septa have been useful in timing, calibration and eventually reducing the application of insecticides. Pheromone traps are very effective monitoring devices and are relatively cheap (Prajapati, 2010). Use of pheromone septa with light trap may increase the trap catches of certain insect species.

MATERIALS AND METHODS

The research was conducted at the BSP farm in Adhartal, JNKVV, Jabalpur (MP) from 15th November 2023 to 15th April 2024. Four separate light traps were used for the study and placed in the Breeder seed production (BSP) Unit Adhartal, JNKVV Jabalpur (MP). The traps were installed at the center of the cropped field on a board bund near the electrical pole. The trap was operated by switching on the power to illuminate the 15 W Ultra violet, every day from sun set to sunrise. Insects trapped in the collection chamber were collected by removing the collection tray at the

end of each quarter of night. The distance between each trap is 100 m approximately (Patidar *et al.*, 2019). Four traps were installed in different direction and placed in such way to avoid light illumination along them (Ambulkar, 2022; Patil, 2023). To kill the trapped insects in the collecting chamber, Formalin 70% (as a fumigating agent) was placed in the collection tray (Singh *et al.*, 2022). The rubber septum containing the lure was changed after every 15 to 17 days (Pal *et al.*, 2014).

Four treatments were compared to test the relative efficacy of electrical and solar light trap with pheromone septa and without pheromone septa in light traps. on the basis of major phototactic insect pest species to be observed. The observation was recorded in two traps with the same funnel diameter and baffle plates. For analysis purpose, the trap catches were adjusted to weekly total of 7 day computed in experiment (Ambulkar, 2022; Patil, 2023). For comparison of efficiency of four light trap designs the observed data were analyzed by paired and two sample t- test for testing the significant different between two treatments as per the requirement (Patil, 2023).

T4 - Electrical light trap with Acrylic transparent sheet baffle plates + pheromone septa.

T2- Electrical light trap with Acrylic transparent sheet baffle plates without pheromone septa.

T5 - Solar light trap with Acrylic transparent sheet baffle plates + pheromone septa

T1 - Solar light trap with Acrylic transparent sheet baffle plates without pheromone septa

RESULTS AND DISCUSSION

Comparing the efficiency of electrical and solar light traps with and without pheromone septa in trapping *Helicoverpa armigera*, the observed data were analyzed by paired and two sample t test for testing the significant difference between two treatments. Results are presented below-

Treatment plates

T4 - Electrical light trap with Acrylic transparent sheet baffle plates +pheromone septa.

T2- Electrical light trap with Acrylic transparent sheet baffle plates without pheromone septa.

T5 - Solar light trap with Acrylic transparent sheet baffle plates + pheromone septa

T1 - Solar light trap with Acrylic transparent sheet baffle plates without pheromone septa

Higher response of *H. armigera* (54.66%) was observed in electrical light trap with acrylic transparent sheet baffle plates + pheromone septa as compared to electrical light trap with acrylic transparent sheet baffle plates without pheromone septa.

Similarly, Higher response of *H. armigera* (39.86%) was recorded in solar light trap with acrylic transparent sheet baffle plates+ pheromone septa as compared to solar light trap with acrylic transparent sheet baffle plates without pheromone septa.

Table 1: Comparative efficacy of electrical light trap with pheromone septa and without pheromone septa for *Helicoverpa armigera.*

Sr. No.	Name of Insects	T4 (Electrical with AT+ pheromone septa) Weekly mean per trap	T2 (Electrical with AT without pheromone septa) Weekly mean per trap	Statistically difference	Increase in trapping efficiency over T2(%)
1.	*Helicoverpa armigera*	16.58 (4.13)	10.72 (3.35)	S*	54.66

Table 2: Comparative efficacy of Solar light trap with pheromone septa and without pheromone septa for *Helicoverpa armigera.*

Sr. No.	Name of Insects	T5 (Solar with AT+ pheromone septa) Weekly mean per trap	T1 (Solar with AT without pheromone septa Weekly mean per trap	Statistically difference	Increase in trapping efficiency over T1(%)
1.	*Helicoverpa armigera*	15.05 (3.94)	10.76 (3.36)	S*	39.86

Figures in parentheses are square root transform value. *Analysis by two sample t-test.

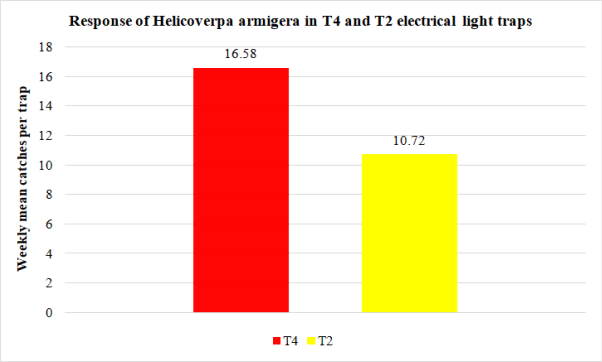

Fig. 1. Comparative efficacy of electrical light traps with pheromone septa and without pheromone septa for *Helicoverpa armigera*.

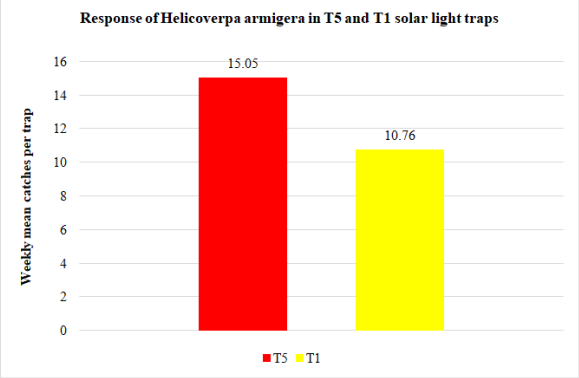

Fig. 2. Comparative efficacy of solar light traps with pheromone septa and without pheromone septa for *Helicoverpa armigera*.

Comparative efficacy electrical light trap with pheromone septa and without pheromone septa for *H. armigera.* Statistical analysis reveals that the combination of electrical light trap with acrylic transparent sheet baffle plates + pheromone septa was more effective in capturing *H. armigera* than electrical light trap with acrylic transparent sheet baffle plates without pheromone septa alone, indicating that the addition of pheromone septa enhances the trapping efficacy for this species.

Comparative efficacy solar light trap with pheromone septa and without pheromone septa. Similarly, in case solar light trap with acrylic transparent sheet baffle plates + pheromone septa outperformed solar light trap with acrylic transparent sheet baffle plates without pheromone septa alone in capturing *H. armigera*, indicating that the addition of pheromone septa significantly enhances the trapping efficacy of solar light traps for this species.

Similar kind of finding was expressed by Saeidi (2021), who reported that combining of light trap with pheromone trap significantly increase the efficiency of *Z. pyrina* mass trapping compare to light trap without pheromone trap in the walnut orchards.

CONCLUSIONS

The integration of pheromone septa with both electrical and solar light traps, featuring acrylic transparent sheet baffle plates, substantially enhances their efficacy in attracting *Helicoverpa armigera*, making this combined approach a more effective method for trapping this species.

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Conflict of Interest. None.

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