Comparative evaluation of different baffle plates in light traps to lureagainst major phototactic insect pests of *rabi* season

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 of 2023-2024. Two light traps designs were used in study viza. T2 —Electrical light trap with acrylic transparent sheet baffle plates (T2) and T3 —Electrical light trap with galvanized iron sheet baffle plates (T3). Light traps were operated every evening and insect pest collection was observed every morning for the duration of the investigation for 12 species *viz.*, *Helicoverpa armigera, Agrotis ipsilon, Creatonotus gengis, Spodoptera litura, Gryllus bamaculatus, Gryllotalpa orientalis, Nezara viridula, Amata cyssea, Asota carica Perina nuda, Thysanoplusia orichalcea* and *Theretra oldenlandiae.* Analysis of data revealed that electrical light trap with acrylic transparent baffle sheet plates outperformed the galvanized iron baffle sheet plates in terms of trapping efficacy for most of the pest species tested. The acrylic transparent plates with larger illumination area resulted in a higher capture rate, making them a superior design of light trap for insect collection.

Keywords: Light trap, Phototactic Insect – Pest and Integrated Pest Management, rabi season

1. INTRODUCTION

Light traps offer an effective, safe and environmental friendly method of controlling flying insect pests in a wide range of settings. In the field of applied and basic entomology, light trapping has a history that extends back over 130 years [1]. One of the most apparent behaviors of insects is flying towards a light source at night, known as Phototaxis. It is traditional in Integrated Pest Management (IPM) to control insect pests by exploiting their phototactic responses. The use of light trap was a common practice and indigenous technology during the early 20th century, mostly for the control of insect pests. The detailed effects of light trapping on agro-ecosystems and biodiversity is not fully understoodare unknown. In recent years, as a non-chemical method for insect pest control, light trap has been widely used to control agricultural pests in developing countries such as India [2]. Light trap is a very important tool to reduce the insect pest populations,injury with non-toxic to beneficial insects, ecofriendly and has very low health hazards [3], light trap has been accustomed to contribute the data about the pest fauna of a specific area, geographical distribution and their seasonal activity etc. [4]. Light trap has come into widespread use in the recent years as an entomological survey device and have been extremely helpful in the insect monitoring program and survey [5]. Similarly, some other researchers *viz.* [6,7,8,9,10,11,12,13,14,15,16,17,18,19] have also studied on the various aspects of light traps.

In general, the light illumination in most of the light trap models is obstructed up to some extent by galvanized iron or plastic baffle plates. In order to resolve this problem acrylic transparent baffle plates can be used to increase the light illumination of light trap, the present comparative evaluation was put forth to study the luring efficiency of light traps with different baffle plates towards phototactic insect pests of rabi season.

MATERIALS AND METHODS

The study~~research~~ was conducted at the BSP farm in Adhartal, JNKVV, Jabalpur (MP) from 15th November 2023 to 15th April 2024. Two separate light traps were used for the study and traps were 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 traps were operated by switching on the power to illuminate the 15 W Ultra violet light source, 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 [20]. Two traps were installed in different direction and placed in such way to avoid light illumination along them [21 and 22] (Fig-1-Add figures of the traps-one figure of the traps and other on traps installed in the field). To kill the trapped insects in the collecting chamber, Formalin 70% (as a fumigating agent) was placed in the collection tray [23].

To assess the effectiveness of different baffle plates in light traps for observing major phototactic insect pest species, two treatments were compared to test the relative efficacy of different baffle plates in light traps. on the basis of major phototactic insect pest species observed. The observation was recorded in two traps with the same diameter and light source. For analysis purpose, the trap catches were adjusted to weekly total of 7 day computed in experiment [21 and 22].

The observed data was analyzed by paired and two sample t- test for testing the significant different between two treatments as per the requirement [22].

T2 - Electrical light trap with acrylic transparent sheet baffle plates. (add figure)
T3 - Electrical light trap with galvanized iron sheet baffle plates. (add figure)

RESULTS AND DISCUSSION

Comparison of efficiency of different baffle plates, ~~the observed data were analyzed by paired and two sample t test for testing the~~ revealed significant difference between two treatments (Fig. 2). Mainly 12 species data were analyzed that were regular occurrence in light trap minimum 12 weeks. Results are presented below –

~~**Treatments – T2 - Electrical light trap with acrylic transparent sheet baffle plates.**~~
~~**T3 - Electrical light trap with galvanized iron sheet baffle plates.**~~

~~**Higher**~~ **R~~r~~esponse of different insect pests towards~~in~~ electrical light trap with acrylic transparent sheet baffle plates ~~as compared to electrical light trap~~ and with galvanized iron sheet baffle plates~~:~~**

Add a line on overall response towards both traps irrespective of different insect pests. In case of *Helicoverpa armigera* (11.55%), *Agrotis ipsilon* (15.85%) *Spodoptera litura* (14.57%), *Creatonotus gengis* (13.48%), *Gryllus bamaculatus* (12.04), *Nezara viridula* (12.98%), *Asota carica* (8.48%), *Gryllotalpa orientalis* (11.36%), *Theretra oldenlandiae* (10.76%) and *Amata cyssea* (12.59%) species has given statistically higher response in electrical light trap with acrylic transparent sheet baffle plates (increase in trapping efficiency given in parenthesis) as compared to electrical light trap with galvanized iron sheet baffle plates (Table 1). Add few lines on total number of insects and species wise numbers of insects trapped in both trap types. The same numbers can be inserted in Table 1 as additional columns.

However, in case of *Perina nuda* and *Thysanoplusia orichlcea* species statistically non-significant difference was observed between electrical light trap with acrylic transparent sheet baffle plates and electrical light trap with galvanized iron sheet baffle plates.

Table 1: Comparative efficacy of different baffle plates in light traps

S. No.	Name of Insects	T2 (Electrical with AT) Weekly mean per trap	T3 (Electrical with GI) Weekly mean per trap	Significant difference	Increase in trapping efficiency over T3 (%)
1.	*Helicoverpa armigera*	10.72 (3.35)	9.61 (3.18)	S	11.55
2.	*Agrotis ipsilon*	9.06 (3.09)	7.82 (2.89)	S	15.85
3.	*Creatonotos gangis*	15.32 (3.98)	13.5 (3.74)	S	13.48
4.	*Spodoptera litura*	16.82 (4.16)	14.68 (3.90)	S	14.57
5.	*Amata cyssea*	13.77 (3.78)	12.23 (3.57)	S	12.59
6.	*Asota carica*	12.14 (3.56)	11.19 (3.42)	S	8.48
7.	*Perina nuda*	12.7 (3.63)	12.11 (3.55)	NS*	–
8.	*Thysanoplusia orichlcea*	12.4 (3.59)	11.53 (3.47)	NS	–
9.	*Theretra oldenlandiae*	9.67 (3.19)	8.73 (3.04)	S	10.76
10.	*Gryllus bimaculatus*	13.95 (3.80)	12.45 (3.60)	S	12.04
11.	*Gryllotalpa oreintalis*	9.41 (3.15)	8.45 (2.99)	S	11.36
12.	*Nezara viridula*	12.27 (3.57)	10.86 (3.37)	S	12.98

(_) – Figures in parentheses are (X+0.5) square root transform value. * - Analysis by two sample t-test.

Treatments T2 - Electrical light trap with acrylic transparent sheet baffle plates.
T3 - Electrical light trap with galvanized iron sheet baffle plates.

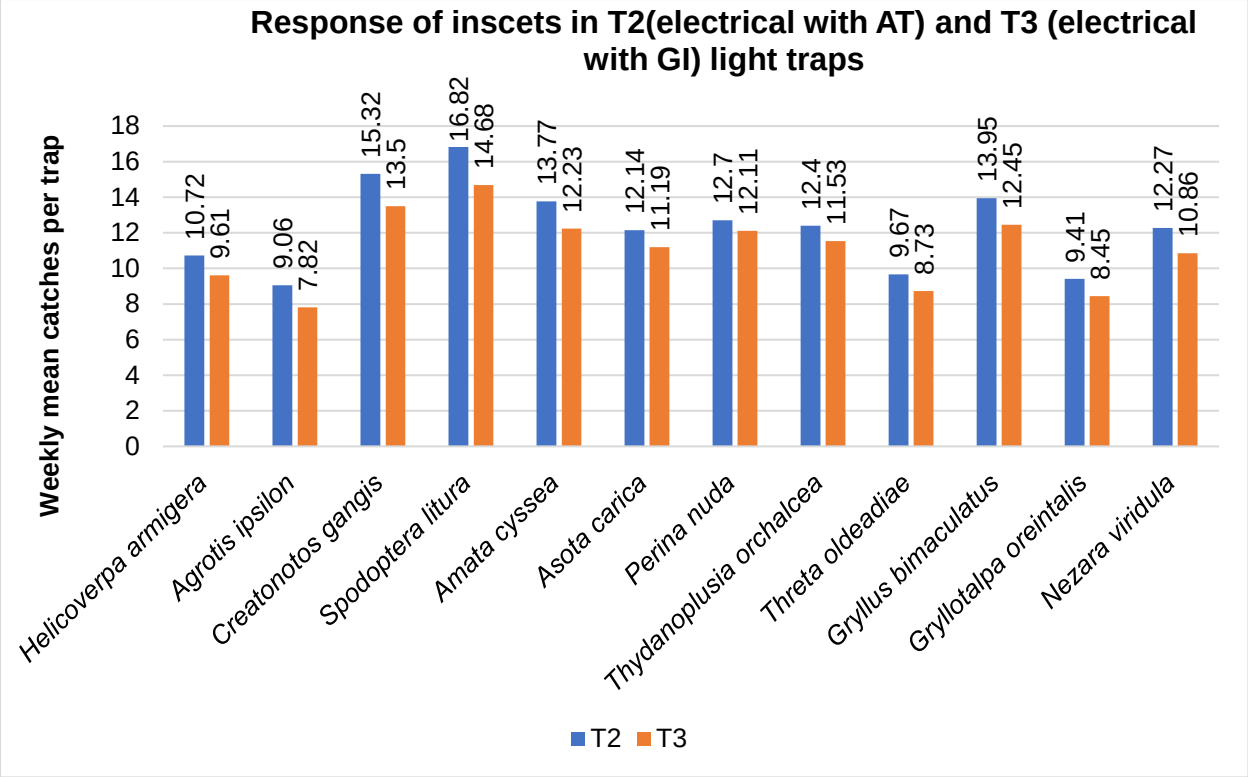

Fig.2~~1~~: Comparative efficacy of different baffle plates in light traps

Fig.3: Add photos of both trap types filled with insects which can display the comparative efficacy of both trap types and can be visually appreciated

Based on statistical analysis, it can be concluded that electrical light trap design with acrylic transparent sheet baffle plates was superior in terms of trapping efficacy in most of the species as compared to electrical light trap with galvanized iron sheet baffle plates due to the increase light illumination in acrylic transparent baffle plates as compared to galvanized iron baffle plates which some or other way obstruct the light illumination which further reduces the light illumination area around trap. However, there is no information available in the literature regarding comparing between acrylic transparent and galvanized iron sheet baffle plates in light traps. Add a line that this seems to be the first report if no similar studies were done earlier.

[21] compared solar light trap designs and Jawahar light traps with three baffle plates (24-gauge GI sheet, 45 x 12 cm each) for insect collection. Similarly, [20] also compared the effectiveness of electrical light traps with different funnel diameters (40cm and 50cm) using three baffle plates (24-gauge GI sheet, 45 x 12 cm each) for insect collection. What was the finding and how it relates to present findings?

CONCLUSION

~~In conclusion, the statistical analysis showed that~~ Eelectrical light trap with acrylic transparent baffle sheet plates were found superior to ~~outperformed the~~ galvanized iron baffle sheet plates light trap in terms of trapping efficacy for most of the insect pest species tested. The acrylic transparent plates with larger illumination area resulted in a higher capture rate, making them a superior design for insect collection studies. Therefore, it may be recommended that using electrical light traps with acrylic transparent baffle sheet plates will improve trapping efficiency.

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