

## **Comparative efficacy of the different power sources in light trap during *rabi* season.**

### **ABSTRACT: -**

The present investigation entitled, "Comparative efficacy of different power sources in light trap against major phototactic insect pest of *rabi* season" was carried out at the BSP Farm, Adhartal, JNKVV, Jabalpur (MP) during *rabi* season 2022-2023. Four light traps design were used in study via. T1 – Solar light trap (with 40 cm funnel diameter), T2 – Solar light trap (50 cm funnel diameter), T3 – Electrical light trap (with 40 cm funnel diameter), T4 – Electrical (with 50 cm funnel diameter). All four light traps were operated at every evening and collection was collected every morning during the investigation was carried out and for the analysis purpose every day data converted into weekly total, this data was subjected to analysis in paired and two sample t-test. In conclusion that electrical light traps were superior in terms of trapping efficacy compared to solar light traps for most of the species tested. The advantage of electrical light traps lies in their ability to provide continuous and long-term light illumination in the trap, which ensures a higher attraction and capture rate of insects. On the other hand, solar light traps may have limitations in providing consistent and sustained light throughout the night, potentially leading to reduced trapping efficiency.

### **INTRODUCTION**

Light traps are mainly targeted towards attracting moths; given their strong phototactic behavior [1] and for understanding their important role in ecosystem functioning [2,3,4]. Light trapping has proven to be a highly effective method for studying moths, enabling the reliable sampling of a diverse range of clades and individual specimens for various research purposes [5,6,4]. There are significant variations among traps, encompassing differences in the types of lamps used, structural designs, trap placement, and

trapping mechanisms. While light traps may be relatively costly, they are remarkably efficient for collecting insects [7,8]. Light traps can be used as an effective IPM tool for monitoring and management of phototactic pests. Many of the insects mostly nocturnal and few diurnal species are positively phototropic (phototactic) and are attracted towards light [9].

Studies comparing trap catches have indicated that the use of a 15-watt Ultraviolet (UV) light source yields superior results compared to a 125-watt Mercury Vapor (MV) light source [10]. The solar light trap may be considered as the alternate solution that has several advantages over the electrical light trap [11].

[12,13,14,15,16,17,18,19,20,21,22,23,24,25] have used electrical light traps whereas [26,27,28,11] have studied on use of solar light trap. In the domains of applied and fundamental entomology, a variety of electric and solar-powered light trap designs are in use for moth capture, but there is a notable absence of comparative assessments that examine the structural designs and power sources utilized in these traps. Our study “**Comparative efficacy of the different power sources in light trap during *rabi* season.**”

#### **MATERIAL AND METHOD**

The research was conducted at the BSP farm in Adhartal, JNKVV, Jabalpur (MP) from mid-November 2022 to mid-April 2023. Four distinct light traps were employed for the study and positioned within the BSP Unit Adhartal, JNKVV Jabalpur. These traps were set up at the center of the cultivated field, on a raised board bund near an electric pole. Each day, the traps were activated by turning on the 15 W ultraviolet light, running from 6:00 PM to 11:30 PM (a duration of 5.5 hours) [29]. In the morning, the insects captured in the collection chamber were collected by removing the collection tray. The distance between each trap was approximately 100 meters [10]. All four traps were positioned in different directions and arranged to prevent light from spilling along them [30]. To euthanize the trapped insects in the collection chamber, 70% Formalin was placed in the collection tray [4].

The observations were recorded in all four traps with same light source (15-watt UV tube). The pooled data of solar powered (40 cm and 50 cm funnel

diameter) and electrical powered (40 cm and 50 cm funnel diameter) were subjected to statistical analysis. For analysis purpose, the trap catches were adjusted to weekly total of 7 days computed in experiment [30]. For comparison of efficiency of both the light trap design the observed data were analyzed by paired and two sample t-test for testing the significant difference between two treatments as per the requirement [30].

**T<sub>1</sub> = Solar powered**

**T<sub>2</sub> = Electrical powered**

## **RESULTS**

Comparison of efficiency of both the funnel diameters, the observed data were analyzed by paired and two sample t-test for testing the significant difference between two treatments. Mainly 12 species data were analyzed that were regular occurrence in light trap minimum 12 weeks. Results are presented below

Treatments - **T<sub>1</sub> = Solar powered light trap**

**T<sub>2</sub> = Electricity powered light trap**

*Agrotis ipsilon*(66.69%), *Spodoptera litura*(112.38%),  
*Cretonotus gengis*(57.33%), *Gryllus bamaculatus*(106.30%), *Gryllotalpa orientalis*(191.38%),  
*Nezaraviridula*(62.34%), *Asotaficus*(73.00%),  
*Thysanoplusia orichalcea*(93.38%), *Theretra oldenlandiae*(81.04%) species has given statistically higher response in electrical powered light traps as compared to solar powered light traps.

However, case of *Helicoverpa armigera*, *Amata cyssea*, *Perina nuda*, and *Theretra oldenlandiae* species statistically non-significant difference were found between solar and electrical powered light traps although numerically trap catches were higher in electrical light traps. (Table: - 4.2.1 and Figure: - 4.2.1).

## DISCUSSION

### Comparative efficacy of different power sources in light traps.

Comparing the efficacy of both the power sources (electrical and solar) *Agrotisipsilon*, *Spodoptera litura*, *Cretonotusgengis*, *Gryllusbamaculatus*, *Gryllotalpa orientalis*, *Nezaraviridula*, *Asotaficus*, *Thysanoplusiaorichalcea*, *Theretraoldenlandia* species has given statistically higher response in electrical light traps as compare to solar light trap.

However, in case of *Helicoverpaarmigera*, *Amata cyssea*, *Perina nuda*, and *Theretraoldenlandiae* species statistically non- significant difference were found between solar and electrical powered but numerically trap catches were higher in electrical light trap.

[11] also reported that comparative studies of trap catches revealed that UV 15 watt (model SMV-4 electrical powered) has given better response than UV LED 7 watt solar trap (model Rakshak). Solar light source (07watt UV) seems to be very good alternative source to 15watt for operation of light trap as pest control device. But cost wise compared the both models the solar powered light trap is much costlier.

However, [30] studied on comparison is based on the relative response of the phototactic insect pest species (total trap catches in a week) in Jawahar light trap (electrical) and solar light trap. The result indicated that statistically, there is no significant difference in terms of trapping efficiency of Jawahar light trap and solar light trap for trapping the major phototactic insect pest species of vegetable crops.

In the contrast with present finding [31] reported that solar light trap was the most effective Integrated pest management tool for the monitoring of insect pests and their mechanical control in the field of agriculture, provide no harm to the nature and also have low-cost involvement so that it can be utilized by most of the farmers.

[27] also reported that automated solar powered solar power trap for monitoring and mass trapping of major pest of date palm. The designed trap could provide a potential component for future integrated pest management. Similarly, [28] proposed solar light trap was the most effective IPM tool for the monitoring of insect pests and their mechanical control in the field of agriculture, provide no harm to the

nature and also have low-cost involvement so that it can be utilized by most of the farmers [30]. It is the most effective IPM tool which provide better safeguard to the nature in comparison to the other method of pest control. [26] also reported the better efficiency solar light trap [30].

Based on statistical analysis, it can be concluded that the designs with electrical powered light traps were superior in terms of trapping efficacy in most of the species as compared to solar powered light traps due to continuous and better light illumination in electrical powered as compared to solar powered light traps. Similarly, [17,14] reported the capture of eight phototactic pest species in paddy fields using light traps equipped with electrical light traps.

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**Table 4.2.1: Comparative efficacy of different power sources in light traps.**

S.No.	Name of Insects	T <sub>1</sub> (Solar) Weekly (pooled) mean per trap	T <sub>2</sub> (Electricity) Weekly (pooled) mean per trap	Statistically difference	Increase in trapping efficiency over T1 (%)
1.	<i>Helicoverpaarmigera</i>	6.04 (2.46)	8.50 (2.86)	NS*	–
2.	<i>Agrotisipsilon</i>	4.44 (2.11)	7.41 (2.71)	S	66.69
3.	<i>Cretonotosgangis</i>	8.52 (2.99)	13.41 (3.72)	S	57.33
4.	<i>Spodoptera litura</i>	7.34 (2.78)	15.59 (3.96)	S	112.38
5.	<i>Gryllusbimaculatus</i>	5.41 (2.39)	11.16 (3.36)	S	106.30
6.	<i>Gryllotalpa oreintalis</i>	2.64 (1.66)	7.68 (2.79)	S	191.38
7.	<i>Nezaraviridula</i>	7.70 (2.74)	12.50 (3.51)	S*	62.34
8.	<i>Amata cyssea</i>	8.50 (2.87)	11.14 (3.31)	NS*	–
9.	<i>Asotaficus</i>	6.39 (2.51)	11.05 (3.31)	S*	73.00
10.	<i>Perina nuda</i>	7.47 (2.73)	12.03 (3.37)	NS*	–
11.	<i>Thysanoplusiaorichlcea</i>	5.46 (2.35)	10.57 (3.23)	S*	93.38
12.	<i>Theretraoldenlandiae</i>	4.46 (2.14)	8.07 (2.81)	NS*	–

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

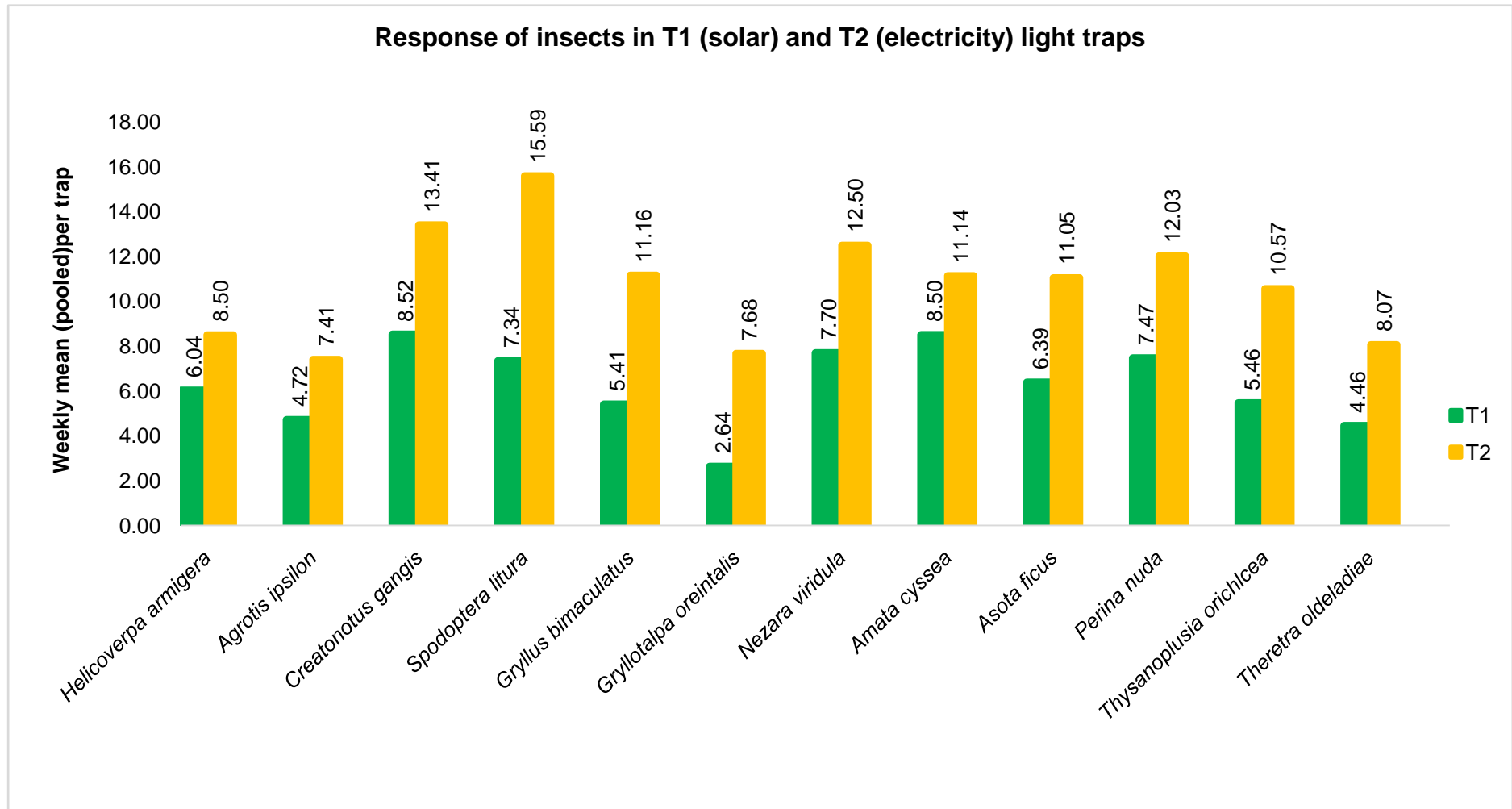


Fig. 4.2.1: Comparative efficacy of different power sources in light traps.

## CONCLUSION

In summary, it can be concluded that electrical light traps were superior in terms of trapping efficacy compared to solar light traps for most of the species tested. The advantage of electrical light traps lies in their ability to provide continuous and long-term light illumination in the trap, which ensures a higher attraction and capture rate of insects. On the other hand, solar light traps may have limitations in providing consistent and sustained light throughout the night, potentially leading to reduced trapping efficiency.

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