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

ABSTRACT: -

The present investigation entitled,"Comparative efficacy ofdifferent power sources in light trap against major phototactic insect pest of rabi season"was carried out at the BSPFarm,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~~ for the duration ofthe investigation. For ~~was carried out and for the~~ analysis ~~purpose every day data converted~~daily data were combined into weekly totals, 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~~collected. The advantage of electrical light traps ~~lies~~ arein their ability to provide continuous ~~and long term light~~ illumination while the power is on~~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~~ even somediurnal species are

Comment [A1]: Title is not specific enough. Change to title as reflected in the abstract

Comment [A2]: What is the BSP farm? - write out abbreviations the first time it is used.

Comment [A3]: Clarify what the rabi season is.

Comment [A4]: Add that the 12 most abundant species were analyzed.

Comment [A5]: This is incorrect. Many other insects are also collected with light traps such as mosquitoes and other Diptera.
Add a sentence or more to reflect this.

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].

Various authors [12,13,14,15,16,17,18,19,20,21,22,23,24,25] havestudies used electrical light traps whereasothers [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.**~~In the current study different light sources are compared.

MATERIALS AND METHODS

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 farm ~~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~~turned ~~on the 15 W ultraviolet light~~ on and operated ~~, 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 the solar ~~powered~~ (40 cm and 50 cm funnel diameter) and electrical ~~powered~~ (40 cm and 50 cm funnel diameter) traps were subjected to statistical analysis. For analysis purpose, the trap catches were ~~adjusted~~ combinedinto weekly totals ~~of 7 days computed in experiment~~ [30]. For comparison of efficiency of both the light trap designs the observed data were analyzed by paired

Comment [A6]: Do not start a sentence with only a reference number

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Comment [A7]: Add images of these traps to show what they looked like.

Comment [A8]: Where each of these 4 traps operated for the duration of the study in exactly the same position? If so why were these traps not rotated as in a Latin square design to eliminate bias is trap postion, trap design etc.?

Comment [A9]: What is a bund?

Comment [A10]: Were the formalin added in the morning or were it already in the collection tray? If it was already in the tray and the insects were collected into it change the paragraph to reflect that these insects were collected into 70% formalin.

Comment [A11]: This sentence indicate that other light source were used (other watt light tubes) - but the results do not show this.

Comment [A12]: What was the current used? i.e 220 volt?

and two sample t-test for testing the significant difference between two treatments as per the requirement [30].

T_1 = Solar powered

T_2 = 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~~ Data for the 12 species ~~data were analyzed that were~~ regularly~~occurrence~~ collectedin ~~light~~ thetraps, for a minimum of 12 weeks, were analyzed. Results are presented below

Treatments - **T_1 = Solar powered light trap**

T_2 = Electricity powered light trap

Statistically higher numbers of *Agrotisipsilon*(66.69%), *Spodoptera litura*(112.38%), *Creatonotusgengis*(57.33%), *Gryllusbamaculatus*(106.30%), *Gryllotalpa orientalis*(191.38%), *Nezaraviridula*(62.34%), *Asotaficus*(73.00%), *Thysanoplusiaorichalcea*(93.38%),*Theretraoldenlandiae*(81.04%)~~species has given statistically higher response~~were collected in electrical powered light traps ~~as~~ compared to solar powered light traps.

However, ~~case of~~for*Helicoverpaarmigera*, *Amata cyssea*, *Perina nuda*, and *Theretraoldenlandiae*~~species~~ statistically non-significant differences were found between solar and electrical powered light traps although numerically trap catches were higher in electrical light traps. (Table: - 1 and Figure: -.1).

Comment [A13]: Add a paragraph to indicate any on the insects collected in these traps example any mosquito species, flies, midges etc. Then state that the study focused on moths and only the 12 most commonly collected moths, etc were analyzed.

Comment [A14]: Already stated in the materials and methods section

DISCUSSION

Comparative efficacy of different power sources in light traps.

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

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

Ahirwar and Vaishampayan [11] ~~also~~ reported that comparative studies of trap catches revealed that UV 15 watt (model SMV-4 electrical powered) ~~has given~~gave a better response than the UV LED 7 watt solar trap (model Rakshak). Solar light source (0.7watt 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.

Comment [A15]: ? This sentence contradicted the sentence just before. Clarify and correct.

However,the study by [30] ~~studied~~ on electrical and solar light traps ~~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 results indicated that statistically, there ~~is~~ wasno significant differences 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~~study[31] reported that solar light trapswas~~the~~ more~~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.

Maged *et. al.,* [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~~ forinsect pests and their mechanical control in the field of agriculture, ~~provide no harm to the nature and also have~~

Comment [A16]: What did they report? Complete the sentence.

~~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 safeguards to the nature in comparison ~~to the~~with other methods of pest control.Bomale*et. al.*, [26] also reported thatthe ~~better efficiency~~ solar light trapwere more efficient [30].

Based on statistical analysis, it can be concluded that ~~the designs with~~ electrical powered light traps were superior in terms of trapping efficacyfor ~~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~~traps. Similarly, [17,14] reported the capture of eight phototactic pest species in paddy fields using electrical light traps ~~equipped with electrical light traps~~.

Move conclusion to here

Comment [A17]: Repetition already stated previously

Comment [A18]: It is not the design but the light source.

Comment [A19]: ? How is a trap equipped with a trap?

Table 1: Comparative efficacy of different power sources in light traps.

S.No.	Name of Insects	T_1 (Solar) Weekly (pooled) mean per trap	T_2 (Electricity) Weekly (pooled) mean per trap	Statistically difference	Increase in trapping efficiency over T1 (%)
1.	*Helicoverpaarmigera*	6.04 (2.46)	8.50 (2.86)	NS*	–
2.	*Agrotisipsilon*	4.44 (2.11)	7.41 (2.71)	S	66.69
3.	*Creatonotosgangis*	8.52 (2.99)	13.41 (3.72)	S	57.33
4.	*Spodoptera litura*	7.34 (2.78)	15.59 (3.96)	S	112.38
5.	*Gryllusbimaculatus*	5.41 (2.39)	11.16 (3.36)	S	106.30
6.	*Gryllotalpa oreintalis*	2.64 (1.66)	7.68 (2.79)	S	191.38
7.	*Nezaraviridula*	7.70 (2.74)	12.50 (3.51)	S*	62.34
8.	*Amata cyssea*	8.50 (2.87)	11.14 (3.31)	NS*	–
9.	*Asotaficus*	6.39 (2.51)	11.05 (3.31)	S*	73.00
10.	*Perina nuda*	7.47 (2.73)	12.03 (3.37)	NS*	–
11.	*Thysanoplusiaorichlcea*	5.46 (2.35)	10.57 (3.23)	S*	93.38
12.	*Theretraoldenlandiae*	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.

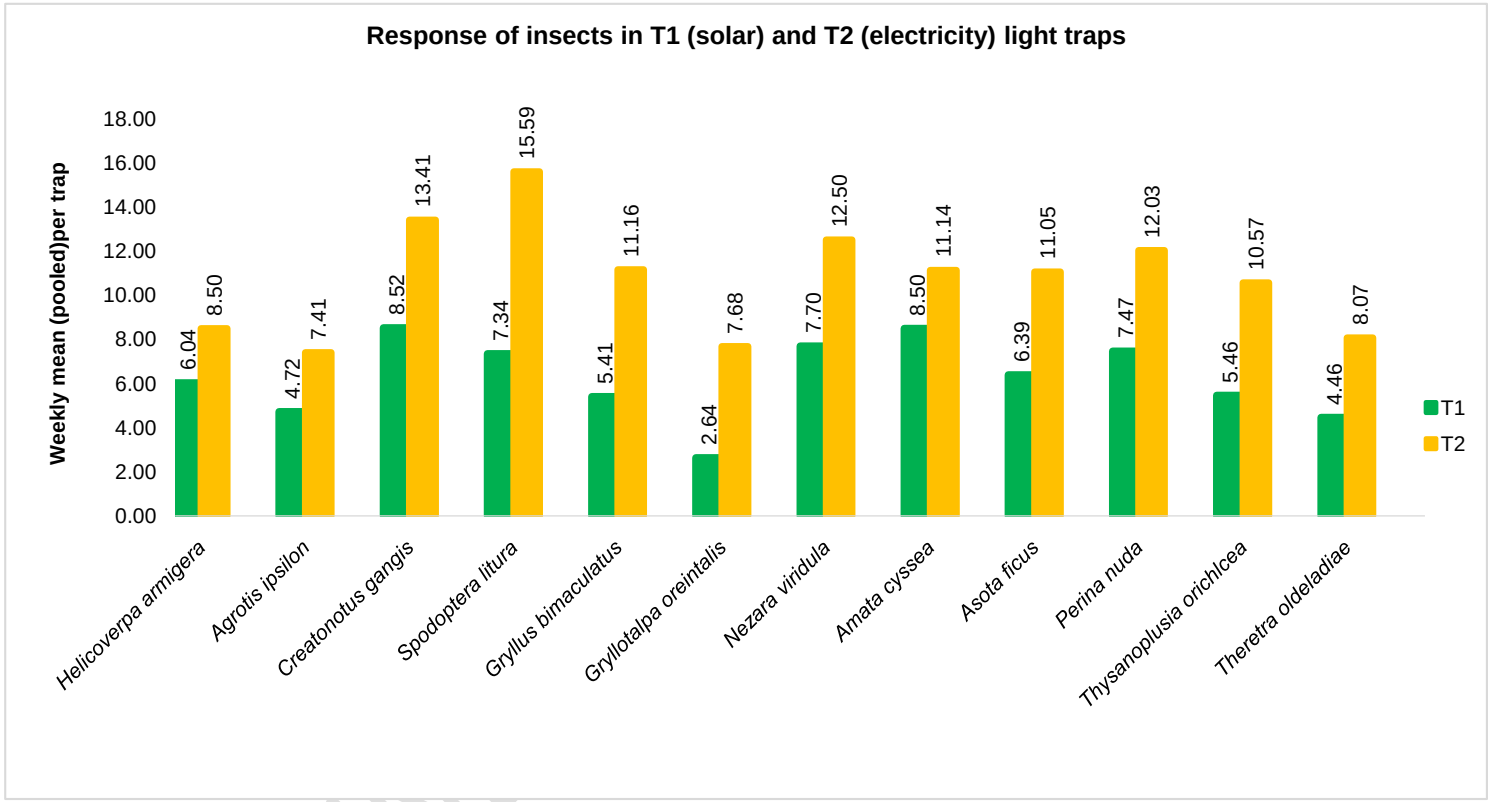

Fig1: Comparative efficacy of different power sources in light traps.

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~~collected. The advantage of electrical light traps ~~lies in~~ are 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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