# TAXONOMICDISTRIBUTIONOFMAJORINSECTPESTOF *RABI* SEASON AT JHANSI (U.P.) USING SOLAR POWERED LIGHT TRAPS


## ABSTRACT

The experiment was conducted at Bundelkhand University, Jhansi (UP) during the period March and April, 2021to study the taxonomic distribution of insect pest species collected in Solar powered Light Traps model SMV- 8 and SMV- 9 using low energy light source i.e. 7w UV LED. According to taxonomic analysis, 8 insect species were recorded and theybelong to four orders and eight families. Based on the number of speciescollected, the order Lepidoptera had the biggest collection (42 per cent), followed by the orderColeoptera with 3 species (40 per cent). The pyraliidae family has the most insect pests (25 percent),followed by the Scarabaeidaefamily (19 percent).



**Key words:** Light trap, taxonomic distribution, UV LED, insect fauna, Solar trap


## INTRODUCTION

Light traps are used to catch insects and survey the density of insects in ourenvironment or at a particular place. A light trap is a device that captures and killing insects.Light trap used to monitor the Insects to maintain theirpopulation level and its use is increasing rapidlyamong farmers to control Insect. Light traps are suitable for sampling only those flying insects that are attracted to the lightsource being used (Vaishampayan and Vaishampayan, 2016). Theattractionofinsecttolightfortheirpositivephotoactiveresponsehas beenunderstudyforalong-timebyecologicalentomologist. ThedataprovidedbythelighttrapcatchcouldthrowlightonperiodofmaximumactivitiesofinsectDad malandKhadakkar(2014).

Light trap for insect catches give useful faunistic data because many insects are positivelyphototrophic in nature. This information can be interpreted as a measure of the health of thebiodiversity in the area. The data produced by light trap catches could shed light on when insectsareattheirmostactive(Band *et al*.,2019).Lighttrapdatacanbeusedtoforecastandpredict insectincidenceor outbreaks. (Patidar*et al.,* 2019).Farmersmustknowthatbyattractingandkillingoneadultmothorinsecttheycontrolaround30

0-400 insect progenies through them. By monitoring the light traps, they will know better whattypesof insects arethereinthe field and whether theyare incontrollablelevelornot.Thelighttraphasundergonelotsofchangesfromitssimplebeginningasa kerosene lamp kept in front of a cloth sheet or water container to electrically operated ones tobatteryoperatednow (Vaishampayan *et al*., 2021).

For that reason, firstly a model of light trap box with iron structure was developed then asolarlightsystemincludingSolarpanelchargingunitbatteryandLEDbulb installwiththeinsectlight trap box so that this solar light trap can screen and control the insect pests' nuisances ofvariouscrops adequately (Dronachari and Nikhil kumar, 2019).It is the best IPM tools which give better defend to the nature in contrast with the othertechnique for insect pest control. There are various IPM practice that work best when applied bythewholeentirecommunityandlocalareaandinasynchronizedmode.Thisisprobablynotgoingto occur without showing advantages of gathering approach, and outer inspiration and backing tothefarmers.

## MATERIALSANDMETHODS

The trials were conductedduring March April 2021 *(Rabi*Season), at DepartmentofEntomology,InstituteofAgriculturalSciences,BundelkhandUniversity,Jhansi(Utt arPradesh).

The climatic conditions prevalent in Jhansi are essentially semi-arid and sub-tropical. It issituated at 25°26'55"N latitude, 78°34'11"E longitude and at an altitude of 285m above the meansea level. The annual rainfall varies from 830 to 930mm with an average of 850 mm, the rainyseason starts by the third week of June (although this is variable year to year), while the monsoonrains gradually weaken in September and end before the last week of September. The averagemaximumtemperaturewas42°Candminimumtemperatureis40°C.Relative humidityremains verylowduring summer(34), moderate duringwinter (59)andattainhighervalue(85)duringrainyseason.

The insects contained in the collecting bag were killed by exposure to Dichlorvos 76 ECvapors (as a fumigating agent) released in a dispenser with scrubber and deposited in a collectiontrayfor quick killing. Every morning, insects werecollectedfrom thecollectionbag.Everynight, light traps were set, and the collection was monitored thenext morning.Observations were made every day.The entire insectfauna wasobserved

andclassifiedintomajorspeciesandordergroups.Dailytrap catchdatawasrecorded for analysis.Intheexperimentalarea,twolighttrapswereinstalled.Agram crop was sowninroughly5hectorsofarea. The distance between two traps was about 100meters.

Investigatethetaxonomicdistributionactivityofinsectpestspeciesgatheredinlighttraps. The total number of insects trapped each week(adjusted to sevendaystotal) in two traps(i.e.,Solarlighttrap models SMV-8UVLED7-wattwithoutelectricgridandSMV-9 UVLED7-wattwithelectricgrid) isusedtostudytaxonomicdistributionactivity.

***RESULTS AND DISCUSSION***

Duringthemain*Rabi*2020-21activityseasons (March- 2021 to April-2021),theincidenceofinsectsgatheredinlighttrapswasanalyzedbyoperatinglighttrapswithsolarmodelSMV-8andsolarmodelSMV- 9,everynight. Total trap catches were observed on a day-by-day basis. Light trap catches included in significant 8 species of insect pests that were evaluated fortheir relevance during *Rabi s*eason.According to an analysis of trap catches,these speciesshown in Table1 and Fig. 1.

**Table 1Taxonomicdistributionofmajorinsectpestcollected insolarlighttraps**

| S.NO. | Insectspeciescollected | March | April | Total |
|---|---|---|---|---|
| | **A).Coleoptera** | | | |
| **1.** | *Hetwronychusarator* | 107 | 53 | 160 |
| **2.** | *Anolplhora glabripennis* | 48 | 37 | 85 |
| **3.** | *OcypusOlens* | 33 | 42 | 75 |
| | **B).Lepidoptra** | | | |
| **4.** | *Hyblaeapurea* | 35 | 17 | 52 |
| **5.** | *Eutectonamachaeralis* | 136 | 75 | 211 |
| **6.** | *Phthorimaeaoperculella* | 32 | 46 | 78 |
| | **C).Orthoptera** | | | |
| **7.** | *Gryllusaesimillis* | 35 | 31 | 66 |
| | **D).Hemiptera** | | | |
| **8.** | *Nezara viridula* | 43 | 44 | 87 |

According to taxonomic analysis, these 8 insect species were recorded during theseason (*Rabi* 2021) andbelonged to four orders andeight families. Basedon the numberofspeciescollected,theorderLepidopterahadthebiggestcollection(42percent),followed by the order Coleoptera with 3 species (39 per cent) (Fig. 2). The pyraliidae family hasthemost insectpests (25percent), followedbytheScarabaeidaefamily (19 percent).

Data of weekly collection of all the species, classified order wise and family wiserespectivelyare presented in Table 1

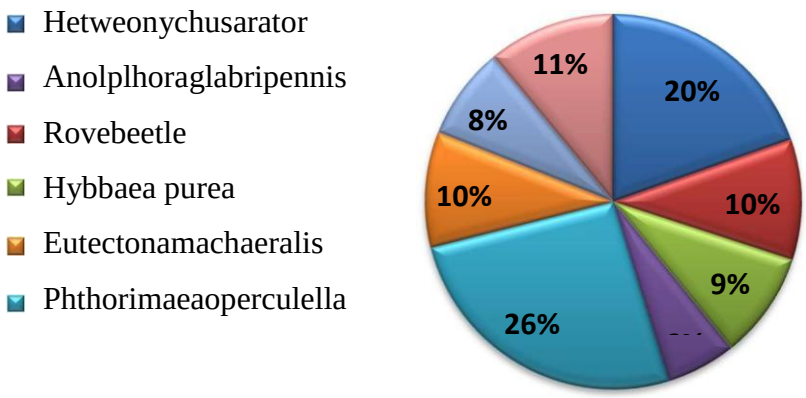


**Fig.1:Species wisepercentage distribution**

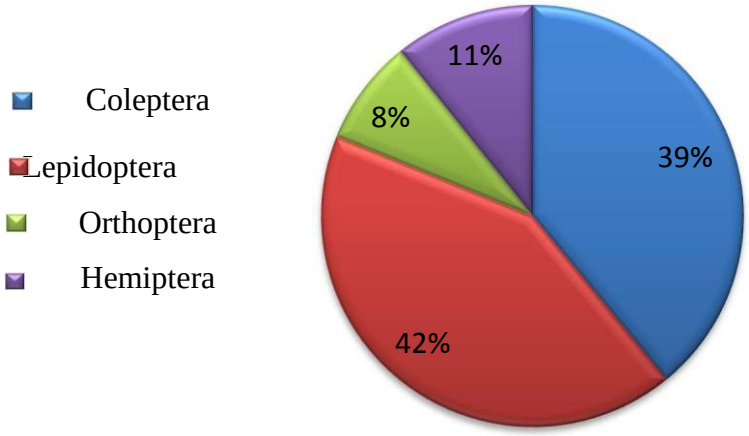


**Fig.2: Orderwise percentagedistribution**

**Discussion:**

The usage of a light trap has become a standard tool in entomological research for avariety of topics. Many insect species, generally nocturnal, are positively phototrophicand flock to light in great numbers. Light traps are one of the safest methods forreducing hazardous insect pests and can play a significant role in the monitoring andmanagementofinsectpestpopulations inagro-ecosystems.

In addition, throughout the study period of the second week of March 2021 to thethird week of April 2021, observations were made on the utility of UV light source in lighttrap operation for studying theseasonalactivityofthemajor insectpest species.

Accordingtotaxonomicanalysis,these8insectspeciesbelongedtofourordersandeight families and were recorded throughout the season (Rabi 2020-21). Based on thenumberofspeciescollected,theorderLepidoptera

hasthebiggestcollection(42percent),followedbytheordercoleopterawith3species(40percent).The pyraliidaefamilyhasthemostinsectpests(25 percent),followed by thescarabaeoidaefamily (19percent).

Sharma and Bisen (2013) also observed that light trap catches during the kharifseason of 2006 at Jabalpur yielded 23 species of 7 families belonging to the orderLepidoptera. The Noctuidae family had the greatest number of species among these (13species),

Inasimilarway,Sharma*et.al., (2013)*duringthepaddycroppingseasoninJabalpur(2002-03), light trap catches revealed a total of 62 species belonging to 8 orders and 33 families. Thelargestorder, Lepidoptera, has27species,followedbyHemiptera (14 species), Coleoptera (12 species), and Orthoptera (12 species) (4 species).TheotherordersofminorimportancewereOdonata,Hymenoptera,Isoptera,andDictyoptera .

The collection of the entire season (November to April) was recorded species byspecies to analyses the relative amount of trap catches of diverse species gathered indifferent taxonomic groupings. These species were divided into two categories based ontheir economic importance: Lepidoptera was the largest order with 24 species, with thelargest collection represented by the family Noctuidae (8 species), followed by Arctiidae(4species),Spingidae(2species),andErebidae(2species),whilefamiliesGeomeridae,Pyra lidae,Lymentridae,Lasiocampidae,Nymphalidae,andCrambidaeweregroupedtogether.

Bernardi et.al., (2011) used light traps to gather a total of 2,220 individuals from 14families, 106 taxa, and 220 species. Noctuidae (59), Geometridae (30), Arctiidae (28) andSaturniidae(28) werethe familieswiththe most species obtained(14).

Spodoptera litura Fabricius (638 moths), Chrysodeixis chalcites (Esper) (25 moths),*Helicoverpaarmigera*(Hubber)(538moths),Eariasinsulana(70moths),andAgrotisipsilon( Hufnagel)(366 moths)werealso found in trapcatchesduring theseason.

SpodopteralituraFabricius,*Helicoverpaarmigera*(Hubner),Agrotisipsilon(Hufnagel), and *Plusia orichalcea* (Febricius) were identified as polyphagous pests of theNoctuidaefamily inlighttrap catchesin Jabalpurby Dangi(2004).

ThroughtrapcatchesinthepaddyenvironmentatJabalpur,Sharma&Vaishampayan(2009)andS harma*et.al.*,(2004)revealedthat*Helicoverpaarmigera*,Agrotisipsilon,andSpodopteraliturawereth

eprimarypolyphagous pestsofthe familyNoctuidae.

Cotton bollworm (H. armigera) individuals were often found in light trap catches,according toNowinszky and Puskas (2006). Cutworm seasonalactivitywasstudied using lighttrapcatches byBishtet.al.,(2005).

## CONCLUSION

According to taxonomic analysis, these 8 insect species were recorded during the season(*Rabi* 2020 -21) and belonged to four orders and eight families. Based on the number of speciescollected, the order Lepidoptera had the biggest collection (42 per cent), followed by the ordercoleoptera with 3 species (40 per cent). The pyraliidae family has the most insect pests (25 percent),followed by the scarabaeoidaefamily (19 percent).

## REFERENCE


Abbas, M., Ramzan, M., Hussain, N., Ghaffar, A., Hussain, K., Abbas, S., & Raza, A. (2019). Role of Light Traps in Attracting, Killing and Biodiversity Studies of Insect Pests in Thal. *Pakistan Journal of Agricultural Research*, 32(4).

Alheeti, A. (2021). Innovative Sustainable Solar Photovoltaic Insect Trap of Double Catching Mechanisms for Insect Monitoring. *Zenodo (CERN European Organization for Nuclear Research)*.

BandSS,VaisampayanaSanjayShrikantPatidarandNavyaMatcha(2019).Seasonalactivityofmajorinsectpestspeciesofcropcollectedinlighttraps.*JournalPharmacognosyand phytochemistry*8(1):1112-1117

Bernardi O, Garcia MS, Ely Silva EJ, Zazycki LCF, Bernardi D and Finkenauer E. (2011). Survey population and fauna analysis of Lepidoptera in *Eucalyptus* spp. in the municipality of Pinheiro Machado, RS.[Portuguese]. Ciencia Florestal, Santa maria, 21(4): 735-744.

Bhandari, G., Jha, S. K., Giri, Y. P., Manandhar, H. K., Jha, P. K., Devkota, N., Thapa, P., & Thapa, R. B. (2018). Performance evaluation of locally developed black light trap for maize insects monitoring in Chitwan, Nepal. *Journal of Maize Research and Development*, *3*(1), 98–107.

Bjerge, K., Nielsen, J. B., Sepstrup, M. V., Helsing-Nielsen, F., & Høye, T. T. (2021). An Automated Light Trap to Monitor Moths (Lepidoptera) Using Computer Vision-Based Tracking and Deep Learning. *Sensors*, 21(2), 343.

Dangi H.S. (2004). Evaluation of light traps with different light sources on Insect trapping in Medicinal crops. M.Sc. (Ag.) Thesis JNKVV, Jabalpur. 1-118p.

Erler, F., & Hilal Sule Tosun. (2023). Mass-trapping the codling moth, Cydia pomonella (L.) (Lepidoptera: Tortricidae), using newly designed light trap reduces fruit damage in apple orchards. *Journal of Plant Diseases and Protection*, 130(4), 795–807

Kabir, M., Md. Panna Ali, Datta, J., Topy, S. N., A. Debonath, Saifullah Omar Nasif, Tapon Kumar Roy, & Uddin, A. (2023). Period of effective catching of insect pests and natural enemies in light traps. *International Journal of Agricultural and Applied Sciences (IJAAS)*, 4(1), 12–16.

Kammar, V., Rani, A. T., Kumar, K. P., & Chakravarthy, A. K. (2020). Light Trap: A Dynamic Tool for Data Analysis, Documenting, and Monitoring Insect Populations and Diversity. *Innovative Pest Management Approaches for the 21st Century*, 137–163.

Larsson, M., Göthberg, A., & Milberg, P. (2019). Night, light and flight: light attraction in Trichoptera. *Insect Conservation and Diversity*, 13(3), 296–302.

Lencioni, V., & Gobbi, M. (2021). Monitoring and conservation of cryophilous biodiversity: concerns when working with insect populations in vanishing glacial habitats. *Insect Conservation and Diversity*.

Lo, P. L., Wallis, R., & Bellamy, D. E. (2019). The effectiveness of two types of adhesive for catching insects in traps. *New Zealand Plant Protection*, 72, 230–236.

NowinszkyLandPuskasJ.(2006).Thespreadofcottonbollworm(*Helicoverpaarmigera* Hbn.) in Hungary between 1993 and 2004 based on light trap catches.*Novenyvedelem*,42(11):615-619.

Patidar Shrikant, Sanjay Vaishampayan, Band SS and Bhojeshwarisahu (2019). To studytheseasonalactivitiesofmajorinsectpestspeciesofpaddycollectedinlighttraps.*JournalPharmacognosyand phytochemistry* 8(3): 4278- 4282

Sanjay, V. (2021). Study of the taxonomic distribution of insect fauna collected in light trap with different light sources during Rabi season at Jabalpur (M.P.). *International Journal of Chemical Studies*, 9(1), 1911–1916.

Schofield, J., Hogsden, K., Greenwood, M. J., Smith, B. J., & Harding, J. S. (2023). The colour temperature and placement of LED lighting near rivers can reduce attraction of flying adult caddisflies. *Freshwater Biology (Print)*, 68(12), 2095–2108.

Sharma AK and Vaishampayan SM. (2009).Evaluation of light trap as ecofriendly control tool in the management of insect pest species of paddy ecosystem. *JNKVV Research Journal*, 187p.

SharmaAK,BarcheSandMishraPK.(2013).Seasonalactivityof*Sogatellafurcifera*H.,*Cnaphalocrocismedinalis*G.and *Mythimnaseparata*W.inrelationtoweatherparameters in CentralIndia.*Technofame*,19-29p.

SharmaMK,PandeyV,SinghRSandSingh RA. (2004). A study on lighttrapcatchesofsomericepestsinrelationtometeorologicalfactors.*SinetEthiopianJournalof Science*, 27(2):165-170.

Sharma, A.K. and Bisen, U.K. 2013. Taxonomic documentation of insect pest fauna of vegetable ecosystem collected through light trap. *International J. of Environmental Science*, 4 (3) : 4-10.

Szanyi, K., Nagy, A., Varga, Z., Potish, L., & Szanyi, S. (2022). Attractivity of various artificial light sources to caddisfly (Trichoptera) species and its importance in their sampling and conservation. *Journal of Insect Conservation*, 26(5), 839–849.

Vaishampayan S.M. (2007). Utility of light trap in integrated pest management.In:Entomology:Novelapproaches.Eds:P.C.JainandM.C.Bhargava. NewIndia Publishing Agency, New Delhi, pp.193-210.

Vaishampayan SM andVaishampayan S.(2016). Light trap: an eco-friendly IPM tool. Book published by Daya publishingHouse/NewDelhipp.162,AstralInternationalPvt.Ltd.

Vaishampayan SM. 2002. Use of light trap as a component of adult oriented strategyofpestmanagement.Resourcesmanagementinplantprotection,*IndianHydrabadpublication*, 139-144p