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Taxonomic analysis of photo tactic insect pests of medicinal crops

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Abstract
Study reported that total of 11 phototropic insect pests were recorded from August to December 2019. These species belongs to 4 orders and 8 families. Largest collection was represented by order Lepidoptera (4 species) followed by orders Hemiptera (3 species), Orthoptera (3 species) and Coleoptera (1 species). Major polyphagous pests of medicinal crops *viz. Helicoverpa armigera, Agrotis ipsilon, Spodoptera litura, Plusia orichalcea, Nephotettix virescens, Nezara viridula, Dysdercus koenigii, Trilophidia cristata and Gryllotalpa orientalis* were active during the season. The present findings will be very useful for surveillance, monitoring and incorporation of light trap as a component of IPM against phototactic pests of medicinal crops.

Keywords: Lepidoptera, Hemiptera, Orthoptera, Coleoptera, phototropic insect pests, medicinal crops

1. Introduction
In India, the use of different parts of several medicinal plants to cure specific ailments has been in vogue from ancient times. According to the World Health Organization, 80 per cent of the population of developing countries relies on traditional plant-based systems of medicine to provide them with primary health care needs [1].
In Madhya Pradesh medicinal healing herbs are being used, in various system of medicine like Ayurveda, Siddha and Unani. These plants are found in Chhattisgarh plain Satpura, Vindhyachal, Amarkantak, Pachmarhi and Patalkot areas.
In Madhya Pradesh medicinal and aromatic crops are grown in 22,900 hectare area with production of 0.137 million metric tons and productivity of 6 metric tons/ha [2]. Insect pests generally infest their hosts to a lesser extent in their natural homes. Medicinal plants now-a-days are being cultivated in the fields to meet the increasing demand for pharmaceutical industries. Thus, they are likely to be attacked by a more number of insect pests in the manmade agro ecosystems [35]. Infestation of insect pest on medicinal plants reduces yield as well as quality of the product.
The indiscriminate and non-judicious application of chemical insecticides results into deleterious problems like Biomagnification and Eutrophication etc. High residual deposition of chemical pesticide on the medicinal products which are directly consumable, can lead to more hazardous effect in place of cure of patient. Therefore non-chemical, economically viable and environmental friendly approach like use of light trap can be used. One of the most apparent behavior of insects is flying towards a light source at night known as phototaxis [24].
The present study is conducted to identify phototactic insect pests of medicinal crops and describe them on the basis of taxonomic and economic aspects for assessing the scope of light trap as IPM too against medicinal crop pests.

2. Material and Methods
The experiment was conducted at experimental field, JNKVV, Jabalpur by using the Jawahar light trap with 125 W. M.V. lamp to study the taxonomic distribution of major phototropic insect pests of medicinal crops. Light trap was operated every night but collection of single day per week was recorded from August to December during 2019. Daily collection of light trap was classified on the basis of order and families. From the light trap catches the specimen of concerned species were preserved in dry condition. The dry collection was prepared by keeping the pinned specimens in oven for 24 hours at 30 °C while the small insects, such as

leaf hoppers were directly mounted over the small pieces of card sheet with the help of fevicol or gum. Dried specimens of insects were kept in insect boxes and show case. To study the relative size of trap catches of various species collected in various taxonomic groups collection of entire season (Aug. to Dec.) was totaled species wise.

3. Results and Discussion

Observations on seasonal trap catch indicated that a total of 11 phototropic insect pest species were recorded during the period from August to December 2019. Distribution on taxonomic basis reveals that these species belongs to 4 orders and 8 families. Order Lepidoptera was represented as largest collection according to number of species collected (4 species) followed by orders Hemiptera (3 species), Orthoptera (3 species) and Coleoptera (1 species). (Table-1)

Similarly [23] also reported a record of 62 species belonging to 11 orders and 36 families through light trap catches Lepidoptera was the largest order with 31 species, followed by Hemiptera (13 species), Coleoptera (11 species) and Orthoptera (6 species).

[7] & [6] also reported the per cent distribution of light trap catches [Lepidoptera (38.8%), Coleoptera (27.7%), Hemiptera (20.0%) and Orthoptera (18.2%)].

[28]Reported all fifteen insect species belonging to four orders were observed to be associated with ten medicinal plants in different parts of Himachal Pradesh. All these insect-pests were recorded in low to medium numbers causing moderate damage. Seven insect species *viz*, *Henosepilachna vigintioctopunctata* (Fabr.), *Nezara viridula* (Linn.), *Dysdercus cingulatus* (Fabr.), *Helicoverpa armigera* (Hübner), *Drosicha mangiferae* (Green), chrysomelid, *Podagrica bowringi* Baly and one unidentified pentatomid bug were recorded feeding on *Withania somnifera*. On *Saussurea costus*, *Thysanoplusia orichalcea*, *Condica conducta* (Walker), *C. albigutta* (Wileman) and *Alcidodes crinalifer* (Marshall) were found associated at different locations in Himachal Pradesh. *Papilio* sp. was recorded damaging *Aegle marmelos* at Shimla. *Digitalis lanata*, *Rauwolfia serpentina*, *Celastrus paniculatus* and *Bacopa monerii* showed low degree of damage by a scale insect, *Drosicha*, Pyrrhocorid bug and *Spodoptera litura*.

[20] revealed that the occurrence of five insect species on ashwagandha (*Leptocentrus* sp., *Acrosternum gramineum* Fab., *Tetranychus urticae* Koch, *Helicoverpa armigera* Hub., *Deilephila nerii* Linn.), three species on Solanum (*Leptocentrus* sp., *Nezara viridula* Fab., *Aphis gossypii* Glov.) and one species on shatavari (*Lema* sp.) at Machenhalli. At Shivamogga dairy, four species on sarpagandha (*Indomia cretaceous* Fst., *Deilephila nerii* Linn., *Trilophida annulata* Thumb., *Riptortus pedestris* Fab.) and two species on Amruthaballi (*Neorthacris acuticeps* Bol., *Kolla ceylonica* Melichar.) were recorded and similarly four species were found on Ashwagandha (*Henosepilachna vigintioctopunctata* Fab., *Elasmolomus pallens* Dallas., *Spilostethus hospes* Fab., *Dolicoris indicus* Stal) at Shivamogga.

Table 1: Taxonomic distribution of insect pests of medicinal crops collected in light trap

S. No.	Name of the species	Family	Season's total trap catch*	Host crops
(A)	**Order: Lepidoptera**			
1.	*Helicoverpa armigera* (Hubner)	Noctuidae	305	Muskdana, Sarpgandha Opium popy
2.	*Agrotis ipsilon* (Hufnugel)	Noctuidae	322	Muskdana, Sarpgandha, Belladona, Opium popy
3.	*Spodoptera litura* (Fabricius)	Noctuidae	456	Brahmi, Glory lilly
4.	*Plusia orichalcea* Fab.	Noctuidae	351	Babchi, Beal
(B)	**Order: Hemiptera**			
5.	*Nephotettix virescens*(Distant)	Cicadellidae	12355	Babchi, Beal
6.	*Nezara viridula* (Linn.)	Pentatomidae	534	Sarpgandha, Pudina
7.	*Dysdercus koenigii* (Fabricius)	Pyrrhocoridae	510	Muskdana, Sarpgandha
(C)	**Order: Orthoptera**			
8.	*Trilophidia cristata* S.	Acrididae	1155	Lemon grass
9.	*Gryllotalpa orientalis* Burmeister	Gryllotalpidae	366	Safed mushli
10.	*Gryllus bimaculatus* De Geer	Gryllidae	2066	Beal
(D)	**Order: Coleoptera**			
11.	*Aulacophora foveicollis* (Lucas)	Chrysomelidae	422	Muskdana

*Light trap catches from August to December, 2019

3.1 Order Lepidoptera

Order Lepidoptera was the highest with 2 families and 4 species. Among these *Helicoverpa armigera* (Hub.) (305), *Agrotis ipsiton* (Huf.) (322), *Spodoptera litura* (Linnaeus) (456) and *Plusia orichalcea* (Fabricius) (351) belongs to family noctuidae. All these species were active from August to December. [28], [31] and [19] also reported these noctuids as major pests of medicinal crops.

[9] reported *Spilarctia obliqua* (Arctiidae) as pest of Coleus, *Costus speciosus* Linn. [3] and [27] also reported these species through light trap catches [15]. reported *Helicoverpa* sp. was found feeding on leaves and also boring into buds, flowers and fruits with its head.

3.2 Order Hemiptera

Order Hemiptera was the second highest order of pest species in trap catch with 3 families and 3 species. The family Cicadellidae was represented by *Nephotettix virescens* (Distant) with highest trap catch of 12,355 hoppers with peak catches in November followed by *Nezara viridula* Linnaeus (534 bugs) and *Dysdercus koenigii*, Fabricius (510 bugs) with monthly peaks in December and March respectively.

[9] Recorded both nymphs and adults of Cicadellids on tender parts of Ashwagandha (*Withania somnifera*). [32]Recorded *Nezara viridula* as pest of *Withania somnifera*. [21]Also observed the population densities of 92 hemipterous insect species belonging to 58 genera of 16 families including Cicadellidae pyrrhocoridae and pentatomidae by using Robinson light trap at Al-Arish city, North Sinai during 1994-96. [15] Reported green plant bug, *Nezara viridula* Fab is a polyphagous pest, where nymphs and adults were observed to suck the sap from leaves, buds of Ashwagandha.

3.3 Order Orthoptera

Order Orthoptera was represented by 3 families and 3 species. Among these highest trap catch was of field cricket, *Gryllus bimaculatus* De Geer (2066 crickets) followed by short horn grass hopper, *Trilophidia cristata* S. (1155 hoppers) and Mole cricket, *Gryllotalpa orientalis* Burmeister (366 crickets).

[10] Also reported *Trilophida* sp. as pest Ashwagandha. In accordance with the present findings [22] reported that order Orthoptera was represented by 3 families in which highest trap catch was of *Gryllus* sp. (3854) (fam. Gryllidae) followed by grass hoppers, *Trilophidia cristella* S. (311) & *Gastrimargus transversus* T. (387) and *Gryllotalpa gryllotalpa* Linn. (213) through light trap at Jabalpur. Similarly [29] reported that the nocturnal Orthopteraus were represented by six families including Gryllidae, Gryllotalpidae and Acrididae in light trap catches. Gryllidae was found dominant as compared to other families.

3.4 Order Coleoptera

Order Coleoptera was represented by 1 families and 1 species. In terms of relative size of trap catch red pumpkin beetle, *Aulacophora foveicollis* (Lucas) had the trap catch of 422 beetles. [15]Reported three species of Coleopterans were found feeding on the leaves of Ashwagandha. *Henosepilachna vigintioctopunctata* (Coleoptera: Coccinellidae) was predominant at early stage of the crop both adults and grubs cause damage to the leaves and tender parts by scraping the epidermal layer in a very characteristic manner leaving a netted pattern. The incidence of Epilachna beetle resulted incomplete skeletinized leaf during heavy infestation at later stage of the crop growth. Finally the plants dried and wither up.

The present study indicated voluble information about 11 phototropic insect pests in medicinal crops at Jabalpur. This will be very useful for the future surveillance and monitoring of insects for forecasting and also in incorporating light trap as Integrated Pest Management tool against these pests of medicinal crops. Light trap can overcome the problem linked to the use of chemical insecticides on medicinal crops.

4. Conclusion

The present investigations revealed that total of 11 phototropic insect pests were recorded from August to December 2019. These species belongs to 4 orders and 8 families. Largest collection was represented by order Lepidoptera (4 species) followed by orders Hemiptera (3 species), Orthoptera (3 species) and Coleoptera (1 species). Major polyphagous pests of medicinal crops *viz*. *Helicoverpa armigera*, *Agrotis ipsilon*, *Spodoptera litura*, *Plusia orichalcea*, *Nephotettix virescens*, *Nezara viridula*, *Dysdercus koenigii*, *Trilophidia cristata and Gryllotalpa orientalis* were active during the season. The present findings will be very useful for surveillance, monitoring and incorporation of light trap as a component of IPM against phototactic pests of medicinal crops.

5. References

1. Agarwal VK, Upadhyaya SD. Agrotechniques of Medicinal and Aromatic Plants. Satish Serial Publishing House, Delhi, 2006, 358.
2. Anonymus. Madhya Pradesh -An Ideal destination for Food Processing Industries, 2014; mpstateagro.nic.in.
3. Butler L, Kondo V, Strazanac J. Light trap catches of Lepidoptera in two central Appalachian forests. Proceedings of the Entomological Society of Washington. 2001; 103(4):879-902.
4. Dubey C. Studies on light trap catches of some major lepidopterous pests and their correlation with meteorological conditions. M.Sc. Thesis submitted to JNKVV, Jabalpur, 1980, 1-80.
5. El-mezayyen GA, Ragab MG. Predicting the American bollworm, *Helicoverpa armigera* (Hübner) field generations as influenced by heat unit accumulation. Egyptian Journal of Agriculture Research. 2014; 92(1):91-99.
6. Govindarajan D. Influence of climatic factors on light trap catches of some selected exoptera insects. Journal of Ecobiology. 2007b; 21(2):147-152.
7. Govindarajan D. Impact of climatic factors on light trap catches of some endoptera insects. Journal of Eco biology. 2007a; 21(3):217-222.
8. Gupta KK. Studies on the major insects trapped in different traps associated with some winter vegetable crops at Jabalpur, 2010, 1-231.
9. Hanumanthaswamy BC, Rajgopal D, Farooqui AA, Chakravarthy AK. Insect pests of *Costus speciosus* Linn. a medicinal plant. My Forester. 1993; 29(2):158-160.
10. Hanumanthaswamy BC. Survey of pests of medicinal plants with special reference to biology and management of *Polytela gloriosae* (Lepidoptera: Noctuidae) on *Gloriosa* superb. M.Sc. (Agri) Thesis, Uni. Agric. Sci., Bangalore, 1992, 1-184.
11. Holyoak M, Jarosik V, Novak I. Weather induced changes in moth activity bias measurement of long term population dynamics from light trap samples. Entomologia Experimentalis et Applicata. 1997; 83(3):329-335.
12. Konar A, Paul S, More KA, Johanson N. Monitoring of adult Lepidopteran pests with the help of light trap in potato growing season in West Bengal. Journal of Entomological Research. 2013; 37(3):249-251.
13. Lal L, Mukharji SP. Incidence of rice gundhi bug on certain medicinal plants at Varanasi. Science Cultivation. 1975; 41(11):560-561.
14. Nag Paras and Nath. Light trap catches of cutworm in Varanasi, Utter Pradesh, and India. Journal of Plant Protection in Tropics. 1994; 14(1):182-186.
15. Nirmal Akash, Yogesh Kumar Sidar, Rupesh Gajbhiye, Jaya Laxmi Gangul. A Review on Insect Pests of Medicinal Plants with Special Reference on the Pest Management of Ashwagandha, *Withania Somnifera* (Linn.). Bulletin of Environment, Pharmacology and Life Sciences. 2017; 6(1):206-208.
16. Nirmala Devi, Deshj Raj, Kashyap NP. Monitoring of *H. armigera* (Hub.) in the mid hill zone of Himachal Pradesh. Journal of insect Science. 1996; 9(2):95-97.
17. Panse VG, Sukhatme PV. Statistical methods for agricultural workers. New Delhi: Indian Council of Agricultural Research, 1968, 1-364.
18. Ramamurthy VV, Akhtar MS, Patankar NV, Menon Pratibha, Kumar Rajesh, Singh SK *et al*. Efficiency of different light sources in light traps in monitoring insect diversity. Munis Entomology & Zoology. 2010; 5(1):109-114.
19. Ramanna D. Investigations on pest complex of medicinal plants and their management with special reference to ashwagandha, *withania somnifera* (linn.). M. Sc. Thesis college of agriculture, dharwad University of agricultural

sciences, 2010. dharwad-580005.
20. Rehaman Syed Khadeeru, Pradeep S, Dhanapal R and Chandrashekara GV. Survey studies on insect-pests associated with important medicinal plants in Shivamogga, Karnataka. Journal of Entomology and Zoology Studies. 2018; 6(1):848-857.
21. Salem MM, Al-Gamal MM, El-Sebaey IIA, Negm FH. Survey and population studies on catches of Hemiptera by a light trap at Al-Arish city (North Sinai). Egyptian Journal of Agricultural Research. 1999; 77(1):187-193.
22. Sharma AK, Bisen UK. Taxonomic documentation of insect pest fauna of vegetable ecosystem collected in light trap. International Journal of Environmental Science: Development and Monitoring. 2013; 4(3):4-10.
23. Sharma AK, Barche S and Mishra PK. Pest and predatory insect species inhabiting paddy ecosystem in Jabalpur, Madhya Pradesh collected with the help of light traps. Pest Management and Economic Zoology. 2010; 18(1/2):125-133.
24. Sharma Amit Kumar, Bisen Sharad, Bisen UK. Comparative analysis on activity of major predatory and insect pest species of paddy in two distinct (forming-ecological) locations through light trap. The Ecoscan. 2015a; 9(1-2): 81-82.
25. Sharma, Amit Kumar, Mandloi Rishikesh, Pachori R. Study on distribution and occurrence of phototropic insect pest fauna of vetiver [*Vetiveria zizanioides* (L) Nash] ecosystem. Agriculture Update. 2017; 12(7):1762-1767.
26. Sharma Amit Kumar, Pachori R, Thakur AS, Mandloi Rishikesh. Population dynamics of major phototropic insect pests of medicinal crops with special reference to effect of ecological factors on *Helicoverpa armigera* hub. and *Agrotis ipsilon* huf. The Ecoscan. 2015b; 8:921-927.
27. Sharma AK, Vaishampayan S, Vaishampayan SM. Distribution of insect pests fauna of rice ecosystem collected through light trap at Jabalpur. JNKVV Research Journal. 2006; 40(1-2):50-60.
28. Sharma PC, Kumar A, Mehta1 PK, Singh R. Survey studies on insect-pests associated with important medicinal plants in Himachal Pradesh. Indian Journal of Science Research and Technology. 2014; 2(4):2-7.
29. Singh Devinder, Ramaneek HB. Population dynamics of Orthoptera (Insecta) collected from light trap. Journal of Entomological Research. 2007; 31(1):63-71.
30. Sivaprakasam N. Influence of weather factors on the attraction of *H. armigera* (Hubner) on tomato. Pest Management in Horticultural Ecosystems. 1996; 2(2):87-88.
31. Srilaxmi Paul K, Ravindra, Ambreen, Syeda Humeera. Seasonal abundance of *Helicoverpa armigera* (Hubner) under dry land farming system in Gulbarga, Karnataka. The Bioscan. 2008; 3(3):289-292.
32. Tripathi AK, Gupta AK, Khanuja SPS. Differential responses of ladybird, 2005.
33. Vaishampayan SM. Light trap studies on black cutworm *Agrotis ipsilon* (Hufnagel). In: Veeresh GK (eds). In Soil Biology and Ecology in India. Technical Series editions, 1981, 192-200.
34. Verma R, Vaishampayan SM and Rawat RR. Influence of weather factors on light trap catches of gram pod borer, *Helicoverpa armigera* (Hub.) moths. Indian Journal of Entomology. 1982; 44(3):213-218.
35. Verma JS. Insect pest problem in medicinal plants - a review. Agriculture Review. 2006; 27(2):130-136.