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**RESEARCH ARTICLE :**

# Study on distribution and occurrence of phototropic insect pest fauna of vetiver [*Vetiveria zizanioides* (L) Nash] ecosystem

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**SUMMARY :** The present study was conducted to study of scope of light trap as IPM tool in Vetiver ecosystem in Balaghat region of Madhya Pradesh. Information on insect pest fauna of Vetiver ecosystem collected in light trap was documented. Data of trap catch during the year 2006 (*Kharif* season) was classified on taxonomic basis and economic aspect (crop pests). A total of 42 insect pest species were recorded. These insect pest species belongs to 5 orders and 22 families. Lepidoptera was the largest order with 24 species.Other orders were Hemiptera (9 species), Coleoptera (4 species) and Orthoptera (4 species) and Isopterawith single species only. Among these phototropic insect pests 16 species were recorded as major and minor pests of vetiver (*viz.*, *Chillo partulus* S., *Spodoptera litura* Fab., *Mythimna separata* C., *Sesamia inferens* Wal, *Scirpophaganivella* Fab., *Tryporyza* sp.,*Nephotettix* sp., *Leptocorisa* sp.,*Cletus punctiger* (Dallas), *Aulacophora fovecollis* L., *Holotrichia insularis* B., *Mylobris pustulata* T., *Trilophidia cristella* S., *Gastrimargus transversus* T., *Gryllus* sp., *Microtermes obesi* Hol.).The season's trap catch collection also includedthe phototropic insect pests of Medicinal crops (15), Paddy (14) Polyphagous (6), Pulses (7), Cereals (6), Oilseeds (5), Sugarcane (4), Fodder crops (8) and Forest trees and others (7). The present study reviled the valuable documented information on distribution and occurrence of phototropic insect pest species of vetiver. It also gives broader scope of using light trap as Integrated Pest Management tool against these pest species of vetiver and medicinal crops as light trap can overcome the problem linked to the use of insecticides and cementing the strength of medicinal crops as potential therapeutic mile stone.

**KEY WORDS :**
Distribution, Occurrence,Phototropic, Insect pest, Vetiver, Light trap

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## BACKGROUND AND OBJECTIVES

Vetiver (Khus), *Vetiveria zizanioides* (L.) Nash, family-Poaceae is a true miracle grass by its character of special massive long rootsthat anchoring and penetrating straight into the ground.Apart from its use as insecticidal and fungicidal value andsoil erosion management tool, vetiver grass has numerous medicinal uses such as root and leaf paste for treatment of insomnia, arthritis, rheumatism, chin, stiff muscles, rheumatism

and sprains. Commercial uses of vetiver grass mainly pertain to the extraction of vetiver oil through distillation of the roots. Vetiver oil has extensive applications in the soap and cosmetic industries and is also used as anti-microbial and anti-fungal agent in the pharmaceutical industry (Rao and Suseela, 2000 and Grimshaw, 2003). Shangwen (2001) reported that a total of 79 insect species were recorded on vetiver hedges. Among these 29 species were considered as pests of vetiver causing considerable damage to leaf, stem and root. Many of these pests are nocturnal and positively phototropic and are attracted towards light. Use of light trap is one of the oldest, traditional and Indigenous technology of pest control for sustainable agriculture, which was very common in early decade of 20$^{th}$ century mostly for the control of insect pests. The indiscriminate and consistent use of insecticides to achieve 100% control of pests for over three decades badly disturbed the stable cropping ecosystems. It also generated several problems to environment, beneficial fauna and flora, economical, human and animal health. Entomologists soon realized these problems and diverted their attention to non chemical technologies such as light trap which are based on sound ecological principles. Use of non chemical alternative methods such as light trap can occupied an important role in survey, detection and control of insect pests of vetiver particularly looking to its medicinal and aromatic uses. Although much work has been done on use of light trap against pests of pulses and paddy but no information is available on pests of vetiverparticularly in Balaghat region of M.P. Solsoloy *et al.* (2011) from Phillipins reported 25 to 100 per cent reduction chemical insecticides after using light trap in vegetable cops and Mango. So the present study is a step forward in this direction of to evaluate the scope of using light trap as IPM tool for insect pest fauna of vetiver ecosystem.

## RESOURCES AND METHODS

The experiment was conducted near the hills of Devgaon village during *Kharif* season 2006 at Balaghat. The climatic conditions prevalent in Balaghat are essentially semi-arid, sub-tropical and monsoon type. It is situated at 21.48°N latitude, 80.15° E longitude and at an altitude of 760 m above the mean sea level. The experiment was conducted by standard design of light trap (model SM-01) by using 80 watt M V lamp. The insects collected in the collection chamber of light trap are killed by the exposure of Dichlorvos 76 EC vapor (as fumigating agent) which is directly placed in collection chamber. Light trap was installed near the vetiver growing hilly area of Devgaon village. The trap was operated every night but collection of single day per week was recorded from July to December. From the light trap catches the specimen of concerned species were preserved by keeping the pinned specimens for 24 hrs. at 30$^{o}$C while the small insects, such as leaf hoppers are directly mounted over the small pieces of card sheets with the help of gum. Dried specimens were kept in insect boxes and showcase for identification. A detailed photographic presentation of these insects were also prepared.

## OBSERVATIONS AND ANALYSIS

Documentation of taxonomic analysis (Table 1) revealed that 42 species of insect pest were recorded in vetiver ecosystem. These insect species belongs to 5 insect orders and 22 families. Lepidoptera was the largest order with 24 species followed by Hemiptera (8 species), Coleoptera (4 species) Orthoptera (4 species) and Isoptera with single species only (Fig.1). The largest order Lepidoptera was represented by 7 families and 22 species. Under this order family Noctuidae included largest number of 14 species. Similarly Martien *et al.* (2000) reported collection of 44 species belonging to families Sphingidae and Noctuidae of order Lepidoptera through light trap catches in Madeira during 1998.The major polyphagous pest species of this family namely *Helicoverpa arimgera* Hub. (176*), Agrotis ipsilon* Huf. (133) and *Spodoptera litura* Fab. (336) were recorded in trap catches during the season. Sharma and Bisen (2013) and Sharma *et al*. (2006) also reported *S. litura*and *H. armigera* through light trap. Vitever stem borers, *Chillo partulus* S. (210) and *Sesamia inferens* Wal. (233), Cabbage semiloopers *Pulsia orichalcea* Fab. (221) and *Plusia acuta* Wal. (698) were among the others major Noctuids.

Comparing the relative size of trap catches of order Lepidoptera the highest catch was observed of Rice leaf folder, Cnaphalocrocis medinalis Guen. (3,682 moths) belonging to family Pyralidae. Chang and Wu (1999) from Tiwan and Harinkhare *et al.* (1998) from Waraseoni, Balaghat, Madhya Pradesh have also reported activity of Cnaphalocrocis medinalis in light trap catches.Other major species are Amsacta moorie But.(702) and

**Table 1 : Taxonomic distribution of insect pest species collected in light trap in vetiver ecosystem in *Kharif* year 2006 based on seasons total collection**

| Sr. No. | Insect species collected | Total collection (July to Dec.)* | Economic status as crop pest |
|---|---|---|---|
| | **Order-Lepidoptra** | Year | |
| | Fam.-Noctuidae | 2006 | |
| 1. | *Helicoverpa arimgera* Hub. (Gram pod borer) | 176 | Major polyphagous, pest of potato, tomato, okra, chili, pulses and cotton |
| 2. | *Agrotis ipsilon* Huf. (Black cut worm) | 133 | Major pest of pulses, pest of cabbage, cucurbits, potato. |
| 3. | *Spodoptera litura* Fab. (Tobacco caterpillar) | 336 | Pest of vitever, Major polyphagous, pest of cabbage, cabbage, potato, chili, soybean, peas. |
| 4. | *Pulsia orichalcea* Fab. (Green semilooper) | 221 | Pest of cabbage and cauliflower |
| 5. | Plusia acuta *Wal.* (Cabbage semilooper) | 698 | Pest of cabbage and cauliflower |
| 6. | *Mythimna separata* C. (Army worm) | 476 | Pest of vitever, Major pest of Paddy |
| 7. | *Hyblaea puera* Cram. (Teak defoliator) | 212 | Major pest of Teak |
| 8. | Earias vittella Linn. (Shoot and fruit borer) | 255 | Major pest of okra, cotton |
| 9. | *Chillo partulus* S. (Vitever stem borer ) | 210 | Pest of vitever, Major pest of Sorghum |
| 10. | *Sesamia inferens* Wal (Jowar stem borer) | 253 | Pest of vitever, Major pest of Sorghum |
| 11. | *Achaea janata* Linn. (Cabbage semilooper) | 102 | Major pest of cabbage |
| | Fam.- Arctiidae | | |
| 12. | *Spilosoma obliqua* Wal. (Bihar hairy caterpillar) | 164 | Major polyphogous pest, particularly- Sesamam, linseed and minor pest of cabbage, sweet potato |
| 13. | *Amsacta moorie* But. (Red hairy caterpillar) | 702 | Major pest of sunnhemp, maize and jowar |
| 14. | Utetheisa pulchella Linn.. (Sunnhemp hairy caterpillar) | 85 | Major pest of sunnhemp |
| 15. | *Creatonotus ganogis* (Hairy caterpillar) | 704 | Forest trees and fodder pest |
| | Fam.-Pyralidae | | |
| 16. | *Cnaphalocrocis medinalis* G.(Rice Leaf folder) | 3682 | Major pest of paddy |
| 17 | Scirpophaga nivella Fab. (Sugarcane top shoot borer) | 156 | Pest of vitever, Major pest of sugarcane |
| 18. | *Tryporyza* sp. (Rice stem borer) | 188 | Pest of vitever,Major pest of paddy |
| | Fam.- Hypsidae | | |
| 19 | *Argna cribraria* | 124 | Pest of sunnhemp |
| 20 | *Hypsa ficus* | 90 | Pest of sunnhemp |
| | Fam.-Sphingidae | | |
| 21 | *Acherontia styx* West.(Til howk moth) | 152 | Major pest of sesamum and minor pest of potato, bringal etc. |
| 22. | *Daphinis nerii* Linn. | 302 | Forest trees and fodder pest |
| | Fam.-Nymphalidae | | |
| 23. | *Melanitis ismene* Cram. (Rice butterfly) | 99 | Pest of paddy |
| | Fam.-Hesperiidae | | |
| 24. | *Pelopidas mathias* Fab. (Rice skipper ) | 118 | Pest of paddy |
| | **Order-Hemiptera** | | |
| | Fam.-Delphacidae | | |
| 25. | *Nilaparvata lugens* Stal.( Brown plant hopper) | 15,366 | Major pest of paddy |
| 26. | *Sogatella furcifera* Harv. (White baked plant hopper) | 9,922 | Major pest of paddy |
| | Fam.- Cecadeliadae | | |
| 27. | *Nephotettix* sp. (Green leaf hopper) | 11,375 | Pest of vetiver, Major pest of paddy |
| | Fam.- Fulgoridae | | |
| 28 | *Pyrilla* sp. (Sugarcane leaf hopper) | 677 | Major pest of sugarcane |
| | Fam.-Pyrrhocoridae | | |

*Table 1 contd…*

*Table 1 contd…*

| | | | |
|---|---|---|---|
| 29. | *Dysdercus cingulatus* Fab. (Red cotton bug) | 142 | Pest of paddy |
| | Fam.-Pentatomidae | | |
| 30. | *Nezara viridula* Linn. (Green stink bug) | 239 | Major pest of paddy |
| | Fam.- Coreidae | | |
| 31 | *Leptocorisa* sp. (Rice gandhi bug ) | 301 | Pest of vetiver, Major pest of paddy |
| 32 | *Cletus punctiger* (Dallas) | 244 | Pest of vetiver |
| | Fam.-Belostomatidae | | |
| 33 | *Belostoma indica* | 91 | -- |
| | **Order-Coleoptera** | | |
| | Fam.- Chrysomelidae | | |
| 34. | *Aulacophora fovecollis* Linn. (Red pumpkin beetle) | 487 | Pest of vetiver, Major pest of cucurbitaceous vegetables (pumpkin, tinda, melon etc.) |
| | Fam.-Rutelinae | | |
| 35. | *Anomala viridis* Fab. (Cockchafer beetle) | 111 | Pest of paddy |
| | **Fam.-Melalonthidae** | | |
| 36. | *Holotrichia insularis* Bren. (White grub) | 477 | Pest of vetiver,Polyhagous pest, particularly of sugarcane, sorghum, maize and minor pest of potato and tomato |
| | Fam.-Meloidae | | |
| 37. | *Mylobris pustulata* (Blister beetle) | 175 | Pest of vetiver, Pest of sorghum |
| | **Order-Orthoptera** | | |
| | Fam.- Acridiidae | | |
| 38. | *Trilophidia cristella S.* (Grass hopper) | 342 | Pest of vetiver, Major pest of paddy |
| 39. | *Gastrimargus transversus T.* (Grass hopper) | 463 | Major pest of paddy |
| | Fam.-Gryllidae | | |
| 40. | *Gryllus* sp. (Field cricket) | 4,521 | Pest of vetiver, Pest of paddy |
| | Fam.- Gryllotalpidae | | |
| 41. | *Gryllotalpa gryllotalpa* Linn. (Mole cricket) | 213 | Pest of paddy |
| | **Order-Isoptera** | | |
| | Fam.-Temitidae | | |
| 42. | *Microtermes obesi* Hol. (Termite) | 681 | Pest of vetiver, Major pest of wheat, sugarcane and cereals |

*Number of insects collected in light trap/total of 4 days collection per month (Single day's per week)

Spilosoma obliqua Wal.(164) of family Arctiidae and Acherontia styx West. (152) offamily Sphingidae. After Lepidoptera, Hemiptera was the next highest order of pest species in trap catch with 7 families and 9 species. The family Delphacidae was represented by highest trap catch of Nilaparvata lugens Stal. 15,366 hoppers. Sogatella furcifera Harv. (9,922),Nephotettix sp. (11,375) are the other major species of this order. Family Coreidae was represented bytwovetiver bugs namely Leptocorisa sp. (236) andCletus punctiger (Dallas)(244).

Order Coleoptera was represented by 4 families and 4 species *Aulacophora fovecollis* Linn. has the highest trap catch size (487 beetles). The other major species of this order included, *Holotrichia insularis* Bren. (477), *Anomala viridis* Fab. (111) and *Mylobris pustuleta*

**Table 2 : Classification of number of insect pest species collected in light trap according to different crop groups (year 2006)**

| Sr. No. | Crop pest group | Number of species captured |
|---|---|---|
| 1. | Pest of vetiver | 16 |
| 2. | Pest of medicinal crops | 15 |
| 3. | Pest of paddy | 14 |
| 4. | Pest of vegetable crops | 13 |
| 5. | Polyphagous pest species | 6 |
| 6. | Pest of oilseeds | 7 |
| 7. | Pest of other cereals | 6 |
| 8. | Pest of pulses | 5 |
| 9. | Pest of sugarcane | 4 |
| 10. | Pest of fodder crop | 8 |
| 11. | Pest of forest and others | 7 |

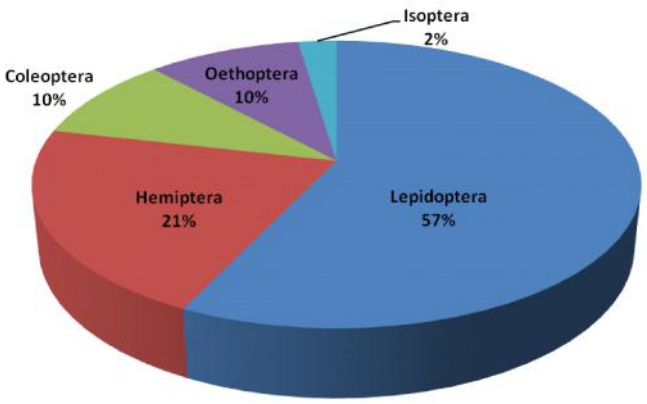


**Fig. 1 : Percentage shared by different insect pest orders season's total trap catch (2006)**

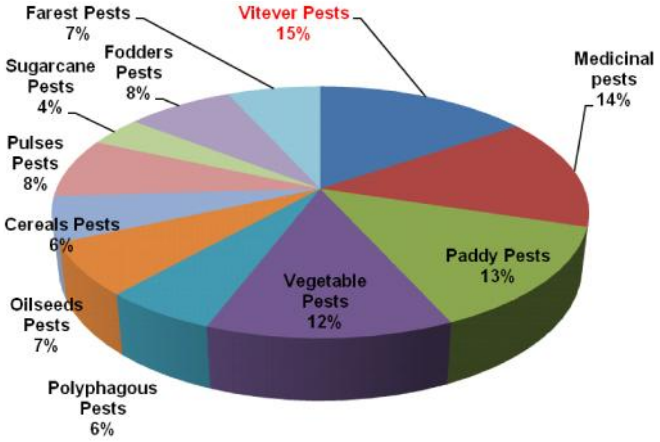


**Fig. 2 : Percentage shared by different phototropic crop pest groups in vetiver ecosystem (2006)**

(175). Nath et al. (1978) observed that adults of white grubs. *Holotrichia consenguinea* were attracted toward light between 8.30 to 10.30 p.m. with peak period at 9.30 p.m. Nabli *et al.* (1999) reported collection of blister beetle *Epicacuta* sp. (Coleoptera : Meloidae) among the various species attracted to light trap. Order Orthoptera was represented by 3 families in which highest trap catch was of *Gryllus* sp. (4,521) (fam. Gryllidae) followed by Grass hoppers *Trilophidia cristella* S. (311) and *Gastrimargus transversus* T. (387) and mole cricket *Gryllotalpa gryllotalpa* Linn. (213). Vaishampayan (2002) reported 5 year data of annual collection of grass hoppers, *Trilophidia cristella* S. (342) and *Gryllotalpa gryllotalpa* Linn. (463) collected in light trap catches at Jabalpur (M.P.). Soni (1998) reported peak catches of grass hoppers during 2nd week of November. Order Isoptera was the smallest one with single family (Termitidae) and single species *Microtermes obesi* Hol., (681). *Mederios et al.* (1999) also recorded the seasonal activity of termite swarming through light trap catches.

Seasons trap catch provided valuable information on occurrence and distribution of 16 major and minor pest species of vetiver including *Chillo partulus* S., *Spodoptera litura* Fab., *Mythimna separata* C., *Sesamia inferens* Wal, *Scirpophaganivella* Fab., *Tryporyza* sp.,*Nephotettix* sp., *Leptocorisa* sp.,*Cletus punctiger* (Dallas), *Aulacophora fovecollis* L., *Holotrichia insularis* B., *Mylobris pustulata* T., *Trilophidia cristella* S., *Gastrimargus transversus* T., *Gryllus* sp., *Microtermes obesi* Hol.). Many researchers from various parts of world also reported these species as pest of vetiver crop [*viz.*, Zisong (1991), Grimshaw and Helfer (1995), Shangwen (1999) Van den Berg (1997) Xinbao (1992) Nation Research Council (1993)].

Present study also revealed that light trap collection in vetiver ecosystem of this region also includes number of other crop pest species other then vetiver pests (16 species). Among these highest number of crop pest species (14) in trap catch belongs to Paddy because Balaghat district has predominantly dominated by paddy cultivation in *Kharif* and summer season. Number of pest species belongs to other groups are Medicinal plants (15), Polyphagous (6), Pulses (5), Cereals (6), Oilseeds (7), Sugarcane (4), Fodder crops (8) and Forest trees and others (7).

## Conclusion :

The present investigation has provided valuable information on presence, occurrence, distribution and population dynamics of 42 phototropic insect species in vetiver ecosystem at Balaghat .Among these 16 crop pest species belongs to vetiver crop and remaining 27 species of different agricultural crops and forest trees. This will serve as base line data, useful at present and in future for surveillance and monitoring of insects for forecasting. Outcome of present study also gives broader scope of using light trap as Integrated Pest Management tool against these pest species of vetiver and medicinal crops as light trap can overcome the problem linked to the use of insecticides and cementing the strength of medicinal crops as potential therapeutic mile stone.

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