Seasonal activity and diversity of insect fauna collected through light traps in protected and unprotected conditions during *rabi* season

Abstract

The present investigation was carried out by installing two light traps with different light sources in the experimental site one is inside the polyhouse and the other is outside the poly house. Insects were collected regularly from the third week of September 2019 to the second week of March 2020. During the study, in all 8 predaceous and 6 harmful species were observed in the light trap inside the polyhouse. Seven major insect pest species and some unidentified Lepidopteran moths were identified and collected outside the polyhouse, as important positively phototropic insect pest in rabi crops. The light sources used in light trap SMV-4 models were 8+8 watt UV (10"tubes) and 15 watt UV (15" tube).

Key words: Insect Fauna, Light trap, Poly house, Protected condition, Solar trap, UV

1. Introduction

"Traps are used for general surveys of insect diversity and usually are simple interception devices that attract and capture insects moving through an area. Traps also are used for the detection of new invasions of insect pests in time and space, for delimitation of areas of infestation and for monitoring population levels of established pests. Light trap helps to minimize the pest population by mass trapping reproducing adults of both sexes from the crop ecosystem. It is absolutely an eco-friendly approach insect pest management" [1-2]. "In areas, where organic farming is a common practice and using of insecticides is prohibited (by law), it is the only available practical method of pest control to minimize crop losses due to insect pests effectively without using insecticides. Environmental conditions inside the polyhouse/ greenhouse can be modified to suit the potential growth of plants. Partial control of microclimatic conditions, which have major influence on plant growth characteristics, can be achieved in poly greenhouses" [3]. "The growing conditions within the protected environment of the greenhouse/ polyhouse are highly favorable to arthropod pests. In India, about twenty insect and mite species have been recorded to be associated with the crops under protected environment" [4-5].

"Seasonal activities of insect pest species can be monitored very effectively through trap catches. Conducted a study to collect valuable information on the seasonal activity of

four major insect pest species namely white backed plant hopper (*Sogatellafurcifera*), rice leaf folder(*Cnaphalocrismedinalis*), army worm (*Mythimnaseparate*), grass hopper(*Hieroglyphusbanian*)and other insect pest species of paddy and to find out their relationship with weather parameters".[6,7] Used Ultra-violet light traps for insect capture and found that Coleopterans dominate the catches followed by Hemipterans[8], Hymenopterans and Lepidopterans. "The low wattage of ultra violet (Black light) lamps 8 and 15 watts with low electricity consumption, maintaining high trapping efficiency, makes these lamps most convenient to operate the light traps with solar panel or a set of dry recharging batteries, even in remote areas in the farmer's field where electricity is not available" [9]. Findings suggest that highly toxic wavelengths of visible light are species-specific in insects[10], and that shorter wavelengths are not always more toxic. Blue light is more harmful than UV light for some animals, such as insects.

2. Materials and Methods

The experiments were conducted in Jawaharlal Nehru KrishiVishwaVidyalaya, campus, Jabalpur, (Madhya Pradesh) during the period between third week of October to third week of March, (2019-20).Light Trap model SMV-4 (UV 8+8w) was used inside the polyhouse and model SMV-4 (UV 15w) were used in open field for the monitoring of insect pest. Light traps were operated every night and collection was being observed next morning. Observations were recorded every day throughout the *rabi*season. Total insect fauna was observed and sorted out based on major species and order groups. Data of daily trap catch was maintained. Weekly records of day to day catches were maintained order, family and species wise. In all, two light traps were installed in the experimental area. The area was covered mainly by a gram around 5 hectors of crop area outside the polyhouse and tomatoes were grown inside the polyhouse. Spacing between two traps was approximately 300 meters. The data of every day catch of major insect pests collected in trap were converted to weekly total (corrected to seven days).

3. Result and Discussion

3.1. Seasonal activity and diversity of insect fauna collected through light trap in protected condition (polyhouse)

Results of the experiment on seasonal activity and diversity of insect fauna collected through a light trap in polyhouse using UV (8+8 watt) light source 12" tube length as a light source are described in brief below: Seasonal activities of insect fauna (Table no. 1) collected in the light trap were studied by operating light trap with UV 8+8 watt light source. The experiment was conducted in apolyhouse at KrishiVigyan Kendra, JNKVV Jabalpur

(MP)during the period between the third week of September to the second week of March, (2019 -2020). The tomato was the principal crop grown inside the polyhouseand inthe light trap area installed at the centre of the polyhouse. The data in Table.No.1 and 2 showing seasonal activity of beneficial and harmful insects, respectively. "In all, 14 species of insects were observed in the crop ecosystem, having regular occurrence in light trap catches Of the 14 species recorded, 6 species were harmful and 8 were beneficial. It was found that the beneficial insects (58.99%) were more abundant than the harmful insects (41%)" [11,12]. The present study found that Coleoptera is the most diverse insect order in thepolyhouse ecosystem followed by Orthoptera.

The species of predacious Carabidae(Coleoptera) were more active compared to other groups and the Reduviid bugs were the least responsive.In accordance with the findings, [13] 21 predaceous and 8 parasitic species of insects were observed and collected in the light trap at Jabalpur. Species of predacious Carabidae and Cicindelid (Coleoptera) and Reduviid(Hemiptera) were however, the most responsive but Coccinellidae (Coleoptera) were the least responsive to light which is in contrast with the current findings Coccinellids were observed in significantly high number in the present study.

Table 1: Seasonal activity of beneficial species collected during September to March 2019-20.

Observation period weekly	*Chlaeniuscircumdatus*	*Ophioneaindica*	*Coccinellaseptumpunctata*	*Dytiscusmarginalis*	*Brachinuslongipalpis*	*Chlaeniusnigricans*	*Chlaeniusmedioguttatis*	*Sirtheneacarinata*
Sept III wk	**00 (0.71)**	**00 (0.71)**	**25 (5.05)**	**40 (6.36)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
Sept IV wk	**12 (3.54)**	**00 (0.71)**	**26 (5.15)**	**36 (6.04)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
Oct I wk	**15 (3.94)**	**00 (0.71)**	**20 (4.53)**	**23 (4.85)**	**00 (0.71)**	**01 (1.22)**	**00 (0.71)**	**00 (0.71)**
Oct II wk	**12 (3.54)**	**21 (4.64)**	**16 (4.06)**	**18 (4.30)**	**00 (0.71)**	**01 (1.22)**	**00 (0.71)**	**00 (0.71)**
Oct IIIwk	**24 (4.95)**	**13 (3.67)**	**09 (3.08)**	**21 (4.64)**	**00 (0.71)**	**00 (0.71)**	**03 (1.87)**	**02 (1.58)**
Oct IV wk	**19 (4.42)**	**04 (2.12)**	**03 (1.87)**	**16 (4.06)**	**02 (1.58)**	**02 (1.58)**	**00 (0.71)**	**00 (0.71)**
Nov I wk	**12 (3.54)**	**04 (2.12)**	**01 (1.22)**	**12 (3.54)**	**02 (1.58)**	**02 (1.58)**	**02 (1.58)**	**01 (1.22)**
Nov II wk	**07 (2.74)**	**03 (1.87)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
Nov III wk	**01 (1.22)**	**01 (1.22)**	**00 (0.71)**	**03 (1.87)**	**01 (1.22)**	**01 (1.22)**	**00 (0.71)**	**00 (0.71)**
Nov IV wk	**04 (2.12)**	**00 (0.71)**	**00 (0.71)**	**01 (1.22)**	**01 (1.22)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
Dec I wk	**04 (2.12)**	**00 (0.71)**	**00 (0.71)**	**02 (1.58)**	**01 (1.22)**	**00 (0.71)**	**01 (1.22)**	**00 (0.71)**
Dec II wk	**02 (1.58)**	**01 (1.22)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**01 (1.22)**	**01 (1.22)**	**00 (0.71)**
Dec III wk	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
Dec IV wk	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
Jan Iwk	**02 (1.58)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
Jan II wk	**01 (1.22)**	**02 (1.58)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
Jan III wk	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
Jan IV wk	**04 (2.12)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**04 (2.12)**	**00 (0.71)**	**01 (1.22)**	**00 (0.71)**
Feb Iwk	**06 (2.55)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**05 (2.35)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**

Feb II wk	**02 (1.58)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
Feb III wk	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
Feb IV wk	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
March Iwk	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
March IIwk	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
Total	**127(48.44)**	**49 (29.8)**	**100(37.03)**	**172(48.4)**	**16(23.36)**	**07(20.82)**	**08(20.6)**	**03(18.42)**

Value in parenthesis is square root transformation value (SQRT)

Table 2: Seasonal activity of insect-pests collected during September to March 2019-2020

Observation period weekly	***Forficulaauricularia***	***Riptortusstrenuus***	***Gryllusbimaculatus***	***Cofana spectra***	***Flatasps.***	***Spodopteralitura***
Sept III wk	**00 (0.71)**	**00 (0.71)**	**20 (4.53)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
Sept IV wk	**00 (0.71)**	**00 (0.71)**	**31 (5.61)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
Oct I wk	**16 (4.06)**	**00 (0.71)**	**33 (5.79)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
Oct II wk	**04 (2.12)**	**16 (4.06)**	**27 (5.24)**	**00 (0.71)**	**01 (1.22)**	**00 (0.71)**
Oct III wk	**04 (2.12)**	**17 (4.18)**	**25 (5.05)**	**02 (1.58)**	**10 (3.24)**	**00 (0.71)**
Oct IV wk	**06 (2.55)**	**14 (3.81)**	**17 (4.18)**	**01 (1.22)**	**02 (1.58)**	**00 (0.71)**
Nov I wk	**02 (1.58)**	**14 (3.81)**	**08 (2.92)**	**02 (1.58)**	**01 (1.22)**	**03 (1.87)**
Nov II wk	**01 (1.22)**	**04 (2.12)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**01 (1.22)**
Nov III wk	**03 (1.87)**	**05 (2.35)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**03 (1.87)**
Nov IV wk	**00 (0.71)**	**01 (1.22)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**02 (1.58)**
Dec I wk	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**07 (2.74)**
Dec II wk	**00 (0.71)**	**01 (1.22)**	**01 (1.22)**	**00 (0.71)**	**00 (0.71)**	**05 (2.35)**
Dec III wk	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**03 (1.87)**
Dec IV wk	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
Jan Iwk	**00 (0.71)**	**00 (0.71)**	**02 (1.58)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
Jan II wk	**00 (0.71)**	**00 (0.71)**	**04 (2.12)**	**00 (0.71)**	**00 (0.71)**	**02 (1.58)**
Jan III wk	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**02 (1.58)**
Jan IV wk	**00 (0.71)**	**00(0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**01 (1.22)**
Feb Iwk	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**01 (1.22)**
Feb II wk	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**03 (1.87)**
Feb III wk	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**01 (1.22)**
Feb IV wk	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
March Iwk	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**
March IIwk	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**00 (0.71)**	**06 (2.55)**
Total	**36 (27.55)**	**72 (34.09)**	**168 (48.15)**	**05 (19.24)**	**14 (21.41)**	**40 (31.83)**

Value in parenthesis is square root transformation value (SQRT)

Family: Carabidae (Coleoptera): The beetles are predominantly predaceous. Both in the larval and adult stage

1.*Chlaeniuscircumdatus*Brullé: It is a general predator of caterpillars with soft-bodied insects.The insect was active from the IV week of September to the II week of February.

2.*Ophioneaindica*Thunberg: It is an essential predator of nymphs and adults of brown plant hopper (*Nilaparvata lugens*). Both the grubs and adults of the carabid beetle are

reported as predators. The insect was active from II week of October to IV week of November.

3.*Brachinuslongipalpis*Wiedemann:The insect (general predator) was active from the last week of October. The Population declined from Nov II week to Jan III week then population reached at peak at Jan IV week and Feb I week.

4. *Chlaeniusnigricans*Wiedemann:Predaceous upon *Laphgmapyraustanubilalis* and *Pinusinsiguos sp.* The larvae feed exclusively on amphibians. The adult beetles are generalizing predators. The insect was active from the first week of October to Nov II week.

5. *Chlaeniusmedioguttatis*Chaudoir:It is a general predator of lepidopterous larvae. The activity of this insect started in I week of October and slightly increases till October IV week with a peak in III week of October. The population started declining from Nov I week onwards and no activity was observed then.

Family: Coccinellidae(Coleoptera)

6. *Coccinellaseptumpunctata*Linn:Coccinellids are best known as predators of aphids and scale insects. Species are significant predators of the eggs and larvae of moths, such as species of *Spodoptera* (Lepidoptera: Noctuidae) and the *Plutella*(Lepidoptera:Lepidoptera:Plutellidae). The insect activity started from Sept III week till Nov I week. and then no activity was observed.

Family: Dytisadae(Coleoptera)

7. *Dytiscusmarginalis*Linnaeus:They are the predaceous diving beetles. Scavenger beetles will feed on decomposing organic material that has been deposited. The insects" activity started from Sept III week till December I week.

Family: Reduviidae (Hemiptera: Heteroptera): The nymphs and adults of Reduviidae are almost general predators and predatory upon other insects.

8. *Sirtheneacarinata*Fabricius:*Sirthenea* is one of the genera included and is exceptional in subterranean. *Sirtheneacarinata* is a generalist predator of mole crickets. The insect was active during the season from October III week to November I week.

Family Coriedae (Hemiptera): Most hemipterans are phytophagous, using their sucking and piercing mouthparts to feed on plant sap. These include leafhoppers, plant hoppers, aphids, whiteflies, scale insects, and some other groups. Some are monophagous, being host specific and only found on one plant taxon, Others are oligophagous, feeding on a few plant groups, while others again are less discriminating polyphagous and feed on many species of plant.

9. *Riptortusstrenuus*Fabricius:Pest was active during the season from October II week to December II week. The activity started in October II week. Initially no activity was seen from September III week to October I week. The population reached its peak in October III week with catch of 17 insects. Then the population started declining from November IV week onwards and becomes zero.

Family Cicadellidae (Hemiptera)

10. *Cofana spectra* (Distant): The white leafhopper (WLH) *Cofanaspectra* is a pest, which sucking sap from the leaves and results drying of leaf tips leading the leaf tip to orange and curl. Pest was active during the season from October III week to November I week.

Family Flatidea (Hemiptera)

11. Flata sp. Fabricius: Pest of various crops. Pest was active during the season from October II wk to November I wk.

Family Forficulidae (Dermaptera)

12. *Forficulaauricularia*Linnaeus:The European earwig (*Forficulaauricularia*) can be quite common in greenhouses. Earwigs are nocturnal and feed on a variety of things, including plants and other insects. Earwigs have occasionally become a problem in greenhouse crops by moving into the crop canopy and damaging fruit. Pest was active during October I wk to November III wk.

Family Gryllidae (Orthoptera)

13. *Gryllusbimaculatus,* (De Geer): Field cricket is an opportunistic scavenger and will feed on a variety of organic materials. In greenhouses, it is known to damage young plants. Pest was active during the season from September III week to January II week.

Family Noctuidae (Lepidoptera)

14. *Spodopteralitura,* (Fabricius):*S.litura* also causes considerable damage in some poly houses. It is a polyphagous pest and has been reported to do severe damage as a foliage feeder in crops like groundnut, tomatoes, cabbage, cauliflower and many Kharif pluses like moong, urd and soybean. Leaf defoliator and also damages fruits. Pest was active during the season from November I wk to March II wk. The activity started from November I week. Population showed a peak of 7 in December I week and 6 in March II week. Initially, no activity was seen from September III week to October IV week.

3.2. Seasonal Activity and Diversity of Insect Fauna Collected through Light Trap in Unprotected Condition (Outside Polyhouse)

Major insect pest species of Rabi crops (Table no.3) collected in light trap were studied by operating light trap with SMV-4 15watt UV light sources. The trap was installed

behind the biotechnology center, JNKVV campus. Seven insect pest species namely Gram pod borer *Helicoverpaarmigera,* Black cutworm *Agrotisipsilon,* Tiger moth *Creatonotosgangis,*Field cricket *Gryllusbimaculatus,*Mole cricket *Gryllotalpaorientalis,*Cabbage semilooper*Plusiaorichalcea,*Unidentified Lepidoptera moth were identified as important positively phototropic insect pest in rabi crops. Chickpea was the principal crop grown on the farm in the light trap area. Record of daily collection of insect species of rabi crops based on our experience occurring regularly throughout the season was maintained. The data of every day catchs of major insect pest collected in trap were converted to weekly total (corrected to seven days)[14-15]. Species wise description of the trap catches is given in Table No.3, and the seasonal activity is given in Table No.4

Table No. 3: Important positively phototropic insect pest collected in the light trap

S. N	Common name	Scientific name	Order	Family
1.	Gram pod borer	*Helicoverpaarmigera*	Lepidoptera	Noctuidae
2.	Black cutworm	*Agrotisipsilon*	Lepidoptera	Noctuidae
3.	Tiger moth	*Creatonotosgangis*	Lepidoptera	Noctuidae
4	Cabbage semilooper	*Plusiaorichalcea*	Lepidoptera	Noctuidae
5	Feild cricket	*Gryllusbimaculatus*	Orthoptera	Gryllidae
6	Mole cricket	*Gryllotalpaoreintalis*	Orthoptera	Gryllotalpidae
7	Unidentified Lepidoptera moth	Miscellaneous species	Lepidoptera	-----

Table No. 4: Seasonal activityof insect pest species collected in light trap (Model SMV-4 UV 15 watt)

S. No.	Observation period weekly	Species wise mean per day per trap						
		Helicoverpaarmigera	*Agrotisipsilon*	*Creatonotosgangis*	*Plusiaorichalcea*	*Gryllusbimaculatus*	*Gryllotalpaoreintalis*	Unidentified Lepidoptera moth
1	Oct III wk	0	0	19	0	12.8	0.5	5.94
2	Oct IV wk	0	0	16.05	0	7.46	0.11	6.10
3	Nov I wk	0	0	6.5	0	3.14	0.79	2.28
4	Nov I wk	0	0	4.43	0	2.07	1.93	1.14
5	Nov III wk	0	0	7.69	0	1.57	3.64	3.14

6	Nov IV wk	0	0	6.67	0	1.0	3.20	5.25
7	Dec I wk	0	0	6.78	0	0.86	2.22	7.22
8	Dec II wk	0	0	4.10	0	0.65	2.28	4.72
9	Dec III wk	0	0	2.94	0	0	1.57	4.5
10	Dec IV wk	0.20	0.30	1.42	0	0.36	0.74	3.66
11	Jan I wk	0.14	0.20	1.36	0.79	0.72	0.57	2.72
12	Jan II wk	0.12	0.10	1.36	0.64	0.72	0.36	1.29
13	Jan III wk	0.14	0.11	1.69	1.36	0.43	0.59	1.77
14	Jan IV wk	0.14	0.57	1.06	0.81	1.18	0.94	5.45
15	Feb I wk	0.14	0.29	1.36	0.64	0.43	0.57	3.71
16	Feb II wk	0.22	0.79	1.29	0.43	0.86	0.14	2.86
17	Feb III wk	0.29	0.7	0.85	1.15	0.43	0.41	3.43
18	Feb IV wk	0.65	1.10	2.93	2.96	0.29	0.64	6.83
19	Mar I wk	0.71	1.93	6.71	2.65	1.14	1.07	9.0
20	Mar II wk	0.86	1.50	6.93	2.07	1.43	1.64	7.86
21	Mar III wk	1.5	1.42	7.14	1.29	1.86	1.0	8.92

1. *Helicoverpaarmigera*: It is a major polyphagous pest of pulses, potato, tomato, chili, and okra crops in Jabalpur. December to March was the active period with two peaks in population.

2. *Gryllusbimaculatus*: Field crickets are known to damage many cultivated crops as soil pests. Pest was active throughout the rabi season from the standard week 43 to Standard Week 11.

3. *Gryllotalpaorientalis*: Very little is known about the status of these species as a pest of agricultural crops. Mole cricket is known to damage many cultivated crops as a soil pest. The pest was active from Standard Week 43 to Standard Week 11.

4. *Creatonotosgangis*: The pest was active throughout the rabi season from October (2019) to March 2020. The population started at its peak in standard week 43 and declined sharply in 2 standard week.

5. ***Plusiaorichalcea*:** It is a significant pest of vegetable crops in Jabalpur. Activity during January was slightly started. It is seen that after the appearance of adult moths in trap catches during standard week I, a slight increase and decrease trends were observed from standard week II to standard week X. Population trend in seasonal activity, showed peak appearing in SW 8,

6. *Agrotisipsilon*(Hufnagel): It is a major polyphagous pest of pulses and vegetable crops such as cabbage, cucurbits, potato in Jabalpur as per the earlier records, but this year, the activity of this pest was very low. Cutworms first appeared during standard week IV in the thelight trap. It is seen that after the appearance of moths in trap catches during standard week Ⅳ, with a slight drop in catches during standard week II, it further increased and reached its highest peak during standard week 9 (17 moths). Population trend in seasonal activity, showed only one peak appearing in standard week 9.

7. Unidentified Lepidoptera Moth: These moths was active throughout the rabi season from standard week 43 to 11. The activity started in standard week 43. The population reached its first peak in standard week 44 and declined sharply in standard week Ⅱ. In the SMV-4 light source, peak was distinctly higher (78 moths).

The activity of the noctuids*Helicoverpaarmigera* (Hubner), *Agrotisipsilon* (Hufnagel) and *Thysanoplusiaorichalcea* (Fabricius), populations remained low during December, January and February [16]. March and April was a period of very high activity for all species. Observed that *H. armigera* were most abundant in late summer [17]. Similar trends were apparent for catches of both male and female *H. armigera* in light traps. He also recorded correlations between autumn and winter rainfall in central Australia. Recorded the same pattern with MV light source [18].

Observed the light trap catches of cabbage semilooper*Plusiaorichalcea*during 1991-92 and 1992-93 Rabi seasons at Varanasi, and analyzed for various characters [19]. The activity of pests was low to medium in January and February (monthly catch-34 and 277 moths). Population suddenly raised to a very high level in March (64,566 moths).

4. Conclusion

In conclusion the data collected and observed shows that since the percentage of beneficial species is more compared to harmful species, If light traps are operated selectively, avoiding the period from September to February the fauna of the beneficial species group will not be affected much. Seasonal activity of 7 species of insect pest, which were observed in trap catches operated in the field (rabi crop) regularly in considerable numbers was studied in the rabi season during the period 3rd week of October (2019) to 3rd week of March (2020). Two to three peaks were generally observed, showing periods of highest and lowest activity in both.

Conference disclaimer:

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