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# COMPARISON OF LIGHT AND SHADE TRAP DESIGN IN CONTROLLING INSECT PESTS IN THE FIELD OF CUCURBITACEAE

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## ABSTRACT

Pesticides are also responsible for environmental hazardous problem, some insect pest like Lepidoptera, Coleoptera as well as Diptera attract towards moon light as well as electrical light being might, so it is one of the most successful tactics for protection of different important plants being cropping become by this practice, we can save environment as well as money and health of producers as well as consumers. By light trapping we can also identify various migratory insect pest, which will light various hidden reserved problems. Present study highlights comparison of insect trapping in light and shade in field conditions.

## INTRODUCTION

Continuous damaging of any annual, biannual as well as perennial species of plants if continuously effected by saliva of insect pest, may also loss its specific genetic components. Regwada in it hymns, mentioned several insect pests. The bible reported at last eleven pests, continuous use of pesticides are responsible for loss of specific plant's productivity as well as various metabolic activities of herbivores and carnivores disturb if continuously any pesticide intake in their body and may cause serious problem like tumor, cancer, hepatitis problems.

It is obvious therefore that man must faced the problem of insect pest quite early in the history of his existence. The insect pests are much harmful to the crops like wheat, pulses and vegetables than rodents. Not only food plant damage by pest but also ornamental plants as well as medicinal plants damaged by various insect pest.

As confirmed by ancient observation and records ever since Aristotle, insect pests which are attracted by artificial light, for these insects light trap in an important tool in modern pest management as there is no any effect on the productivity of crops. Insects have existed on this planet (earth) for over two hundred million years ago, while men, on the scene only half a million years ago. The use of light traps as an entomological survey device has been in vague for long time than the other sampling devices like sweetness, sticky traps, pheromone trap etc. light traps are specially suited to nocturnal flying insects over a large area. The pheromone of insect attraction to artificial light was recorded by man as early as 525-456 B.C. (Heinton, 1974). However, progress was slow due to use of oil lamp, which were

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less efficient. With the introduction of electric lamps, research on this direction developed faster and the invention of mercury lamps led to a new way of investigation.

## MATERIALS AND METHODS

During experiments, investigation carried out together abiotic components which influenced the light traps with reference to trend of insect catch during experiments. Light trapping of insect population noted relative catches (RC) that is collection of different orders with relation to abiotic factors. The relative catches (RC) defined as a quotient of the number of individual caught during the sampling time (night). In this work relation between temperature, humidity as well as velocity of air studied with insect population of different orders, which compose with the non trapped field productivity. Studies were conduced is selected three crop field stations in Etah, which are crop field of Ganjdundwara village for crops of *Luffa cylindrical* (Ghia), *Luffa aegyptica* (Torai) and *Citrullus vulgaris* (Tinda).

The insect which caught by light trapping, have not get in contact with the chloroform for killing because of its strong fat dissolving action. The trapping used during the first and second crop season respectively as per crop season from October 2010 to March 2011 for *Luffa cylindrical* and *Luffa aegyptica*. March 2010 to August 2011 *Citrullus vulgaris.* Data were gathered separately for each crop when there was peak population on insects. Again a correlation was worked out between the light trap catches and the corresponding week average number of insect to know the effect of light trap catch of different insect population in the field. During trapping temperature, humidity and velocity of air as well as pH of soil also noted to find out the correlation between light trapping and abiotic factors. The log values of the total catch of each crop field in relation to physical factors have represented by respective histograms. To avoid swamping of result, the catch values for experimental orders are divided separately.

The light trap used for the purpose in the present observation has done at a height of 1.5 meter with Jermy type light trap. It is placed in a corner of the crop field of selected station. A regular operation of the light trap was conducted during night. Entire catch of the night was then shorted out with morning. Daily record of the individual of different orders attracted to light was regularly maintained the temperature recorded by centigrade thermometer, where as relative humidity was determined by the standard values of humidity meter.

## RESULTS AND DISCUSSION

The results are given in Tabel-1-6. This study was conducted in experimental field with a view to know weather the light trap attraction of adult insect resulted to reduced field incidence in and around the trapped area or trap can only function as a device for monitoring pest.

The percentage of *Luffa cylindrical* field infestation by *Raphidopalpa foveicollis* comparatively studied in light trapped and light shadow areas, minimum percentage in light trapped area recorded 12.08% while in light shadow area 10.09% while maximum percentage in light trapped area is 27.85 and in light shadow area is 24.39%. This result indicate that *Raphidolpalpa foveicollis* more active in light trapped area than in light shadow area.

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**Table-1: Comparison of field Infestation of *Raphidoptera foveicollis* (Coleoptera) in light trapped and light shadow regions in the field of *Luffa cylindrica***

| Standard Week No. | % Infestation in the light | % Infestation in the light |
|---|---|---|
| 52 | 14.27 | 12.31 |
| 1 | 21.27 | 18.21 |
| 2 | 27.85 | 26.50 |
| 3 | 27.34 | 22.80 |
| 4 | 19.44 | 24.39 |
| 5 | 11.67 | 9.74 |
| 6 | 13.67 | 11.40 |
| 7 | 24.16 | 20.18 |
| 8 | 9.49 | 8.12 |
| 9 | 25.50 | 19.02 |
| 10 | 12.08 | 10.09 |
| Total | 206.74 | 182.76 |
| Mean | (31.77) | (29.05) |
| % Catch | 52.23 | 47.77 |

**Table-2: Comparison of field Infestation of *Raphidoptera foveicollis* (Coleoptera) in light trapped and light shadow regions in the field of *Luffa aegyptica***

| Standard Week No. | % Infestation in the light | % Infestation in the light |
|---|---|---|
| 52 | 12.08 | 10.09 |
| 1 | 13.67 | 11.4 |
| 2 | 14.26 | 12.32 |
| 3 | 21.28 | 18.2 |
| 4 | 27.74 | 24.98 |
| 5 | 27.92 | 26.42 |
| 6 | 27.84 | 26.51 |
| 7 | 27.46 | 26.4 |
| 8 | 8.5 | 6.34 |
| 9 | 9.48 | 8.13 |
| 10 | 11.68 | 9.73 |
| Total | 201.91 | 180.52 |
| Mean | (19.11) | (23.28) |
| % Catch | 45.08 | 54.92 |

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**Table-3: Comparison of field Infestation of *Bactsocera strumeta* in light trapped and light shadow regions in the field of *Luffa aegyptica***

| Standard Week No. | % Infestation in the light | % Infestation in the light |
|---|---|---|
| 52 | 54.46 | 37.34 |
| 1 | 42.26 | 36.32 |
| 2 | 71.92 | 78.42 |
| 3 | 71.84 | 78.51 |
| 4 | 71.46 | 78.51 |
| 5 | 24.56 | 18.34 |
| 6 | 27.48 | 24.13 |
| 7 | 33.68 | 27.73 |
| 8 | 27.46 | 26.40 |
| 9 | - | - |
| 10 | - | - |
| Total | 425.12 | 405.59 |
| Mean | 54.79 | 48.17 |
| % Catch | 53.22 | 46.78 |

**Table-4: Comparison of field Infestation of *Raphidoptera foveicollis* (Coleoptera) in light trapped and light shadow regions in the field of *Citrullus vulgaris***

| Standard Week No. | % Infestation in the light | % Infestation in the light |
|---|---|---|
| 52 | 48.08 | 40.09 |
| 1 | 52.67 | 44.40 |
| 2 | 56.26 | 48.32 |
| 3 | 63.28 | 54.20 |
| 4 | 32.50 | 24.34 |
| 5 | 36.48 | 32.13 |
| 6 | 44.68 | 36.73 |
| 7 | 27.46 | 26.40 |
| 8 | 14.26 | 12.32 |
| 9 | 27.84 | 26.51 |
| 10 | 14.25 | 12.33 |
| Total | 418.48 | 357.77 |
| Mean | (59.69) | (52.89) |
| % Catch | 53.04 | 46.96 |

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**Table-5: Comparison of field Infestation of *Pieris brassica* (Lepidoptera) in light trapped and light shadow regions in the field of *Citrullus vulgaris***

| Standard Week No. | % Infestation in the light | % Infestation in the light |
|---|---|---|
| 52 | 36.08 | 30.09 |
| 1 | 26.67 | 22.40 |
| 2 | 27.74 | 24.98 |
| 3 | 36.07 | 30.10 |
| 4 | 27.40 | 26.55 |
| 5 | 21.26 | 18.32 |
| 6 | 14.26 | 12.32 |
| 7 | 11.70 | 10.13 |
| 8 | 11.68 | 9.73 |
| 9 | 8.59 | 6.38 |
| 10 | 9.18 | 8.10 |
| Total | 230.63 | 199.1 |
| Mean | (32.43) | (29.92) |
| % Catch | 52.02 | 47.98 |

**Table-6: Comparison of field Infestation of *Dacus cucurbitae* (Diptera) in light trapped and light shadow regions in the field of *Citrullus vulgaris***

| Standard Week No. | % Infestation in the light | % Infestation in the light |
|---|---|---|
| 52 | 19.08 | 16.09 |
| 1 | 20.66 | 17.40 |
| 2 | 22.26 | 19.32 |
| 3 | 31.28 | 27.20 |
| 4 | 41.74 | 36.98 |
| 5 | 41.92 | 36.42 |
| 6 | 41.84 | 36.51 |
| 7 | 16.50 | 12.34 |
| 8 | 18.48 | 16.13 |
| 9 | 16.68 | 14.73 |
| 10 | 11.65 | 9.70 |
| Total | 282.05 | 243.63 |
| Mean | (35.91) | (33.58) |
| % Catch | 51.68 | 48.32 |

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The percentage field infestation of *Raphidopalpa foveicollis* between the light trap area and in light shadow area over different period of time did not significantly varied in the field of *Luffa aegyptica*. The percentage of infestation varied from 8.50 to 27.92 in an around trapped area and from 6.34 to 26.51% in the light shadow area. Another study was made to find out whether any relation existed between the peak catch and subsequently field incidence of the insect pest.

The percentage field infestation of *Bactsocera strumata* between the light trap area and the light shadow area over different period of time significantly varied from 24.56 to 71.84% in an around trapped areas and from 24.13 to 78.51% in the light shadow area. The percentage field infestation of *Raphidopalpa foveicalib* between the light trap area and in light shadow area over different period of time did not significantly varied the percentage of infestation, varied from 14.25 to 63.28% in an around trapped area and 12.32 to 54.20 in the light shadow area.

In the field of *Citrullus vulgaris* the percentage field infestation of *Pieris brassicae* between the light trapped and in light shadows area over different period of time did not significantly varied. The percentage of infestation varied from 9.18 to 36.08% in an around trapped area and 8.10 to 30.09% in the light shadow area. In the field of *Citrullus vulgaris* the percentage field infestation of *Dacus cucurbitae* between the light trapped area and in light shadow area over different period of time significantly varied. The percentage of infestation varied from 11.65 to 41.92% in an around the trapped area and 9.70 to 96.98% in the light shadow area.

This study was conducted with reference to insects in field of *Luffa cylindrical*, *Luffa aegyptica* and *Citrulus vulgaris*, when attraction of insects to light trap was heavy. Most of the major *Luffa aegyptica* insect pest like *Raphidopalpa foveicollis*, *Bactsocera strumeta* on and insect pest of *Citrullus vulgaris* like *Raphidopalpa foveicollis*, *Dacus cucurbitae* and *Pieris brassicae* as well as *Raphidopalpa foveicollis* on the field of *Luffa cylindrical* were caught in greater number between 8.00PM to 10.00PM before midnight, most of the trapping were completed. This light trapping before midnight may be due to the fact that dispersing population of these insects mainly in the early night hours but in the case of *Raphidopalpa foveicolis* and *Dacus cucurbitae* more actively light trapping was noticed between 10.00PM to 12.00 midnight followed by 8.00PM to 10PM with actively continuing almost up to early morning. The present study result shows that the *Raphidopolpa foveicollis* and *Dacus cucurbitae* are active throughout the night, indicating the need to operate light trap throughout night.

The sex ratio and the reproductive ratio of the insects in experimented crops have studied for a period of 5 standard weeks, when the insect attraction was in its peak. The sex ratio of *Raphidopalpa foveicollis* as male: female during light trapping in crop field of *Luffa cylindrical*, recorded as 1:2.8 out of the percentage of female on the basis of phenotype was recorded 73.77. The proportion of male and female beetles among the light trap catches varied widely. More female were attracted than males and the ratio between male and female was 1:26 out of the total female trapped 96.30% of beetles were spent females.

The proportion of male and female *Bactsocera strumeta* of order Diptera varied slightly and male: female was 1:2.68. Among the females trapped 72.79% was recorded. Male and female of trapped insect was observed to be more or less equal and the ratio was 1:24.14. Among the female trapped 96.17% were spent insects. Male and female of trapped insects, was observed to be more or less equal

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and the ratio was 1:1.09. Among them female trapped 72.79% was recorded. Male: female trapped insect of *Dacus curcubitae* was observed 1:2.69. Among them female trapped 72.88% was recorded.

In *Luffa cylindrical* correlation was worked out between the population caught in trap during experimented time and the percentage infestation of 20$^{th}$ standard week after the catch. The correlation coefficient of +0.99 was non significant. Correlation between the light trap catches of *Raphidopalpa foveicollis* and the percentage infestation (3$^{rd}$ standard week after the catch) over different periods was worked out. The correlation coefficient was 0.53 and it was non significant. Percentage infestation of *Luffa aegyptica* on 3$^{rd}$ standard weeks after the catch in the light trap during 8$^{th}$ standard week was taken for correlation.

In *Bactsocera strumeta* a correlation was worked out between the population caught in traps during 7$^{th}$ standard week and the percentage infestation of three standard weeks after the catch. The correlation coefficient +0.74 was non significant. The light traps catches of *Raphidopalpa foveicollis* obtained during 12$^{th}$ standard week and field incidences during the corresponding period were correlated. A significant positive correlation coefficient of +0.95 was observed between the trap catches and field pest population level. The light trap catches of *Pieris brassicae* obtained during 12$^{th}$ standard week and field incidence during the period eggs shown.

A significant positive correlation coefficient of +0.3329 between the traps catches and field population level. The light trap catches of *Dacus cucurbitae* obtained during 12$^{th}$ standard week and field incidence during the corresponding period were correlated. A significant positive correlation coefficient of +0.9463 was observed between the trap catches and field pest population level.

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