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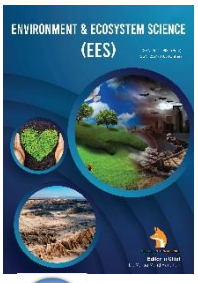

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RESEARCH ARTICLE

POPULATION DYNAMICS OF MAJOR PHOTOTATICS INSECT PESTS OF AGRICULTURE ECOSYSTEM THROUGH LIGHT TRAP

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ABSTRACT

This study was conducted to monitor the population dynamics of major insect pest of agriculture ecosystem through light trap at the agriculture farm of GAASC ,Baitadi,during the winter of 2018.The main aim of this study was to determine the status of phototatics insects pest of the farm locality.. Light trap with a 100Watt filament bulb was installed at the site at college boundary, vegetable field and wheat field for trapping purpose. The observation was done every day and data was weekly record their status and occurrences. Overall nine insect species were observed and among them click beetle*(Agriotes spp.)* population was observed maximum compared to other species.Insects occurrence in vegetable field is dominated by click beetle followed by moths(*Pieris canidia)*and cabbage semi looper*(Trichoplusia spp).*The total 289 of 6 different species were found from vegetable fields. Trap installed on Agronomy farm contributes clickbeetle *(Agriotes spp.)*The most followed by Greenleaf hopper(*Nephotettix spp).,* Pink borer*(Chilo partellus)*, wasp*(Vespa spp.)* and grasshopper(*Hieroglyphus banian),*total 152 of 5 different species were found until 15 week of monitoring. Similarly, trap installed in open field obtained total 176 out of which 68 were click beetle *(Agriotes spp.)*,47 pink borer *(Chilo partellus)*,40 moths (*Pieris canidia)* and 21 wasps *(Vespa spp.)*.

KEYWORDS

Insect population, Monitoring, Trapping, Light Trap.

1. INTRODUCTION

Light trap is used in all major crops, fruits, and orchards to assess seasonal pattern of insect pest fluctuations. It is a very effective method to track and manage insect pests of both sexes, thereby raising the pest burden on the crop (Singh and Ramaneek, 2007).There are thousands of species of insects that are nocturnal and cannot be captured by traditional insect control methods. The best sampling methods are for light traps of these insects (Dhaliwal and Arora, 2010). For example, there are 160,000 species in the largest order of Lepidoptera (butterflies / moths), 95% of which are nocturnal moths(Knutson and Muegge, 2010) So for studying diversity and population dynamics, it is important to have proper documentation. This approach is also effective in attracting species of order of insects including Coleoptera, Diptera, Hymenoptera and Neuroptera. Light traps are good for collecting insects such as Moths, beets, spiders, flies etc. Some nocturnal insects can only be attracted during special nighttime (Sabir et al., 2007) Farmers have to be aware that they can monitor about 300-400 insect progenies by attracting and killing one adult moth. Moth populations have recently been found to decline. In Great Britain , for example, the abundance of moths dropped by 28 per cent from 1968-2007 (Lewis, 1980) When the insect population is reaching a certain mark in the light traps, the farmers will agree on the method of management technique. Light traps are costly but they are very good for insect collection (Lebhold and Tobin, 2008) Various light sources are used, such as mercury vapor lamps, gas lamps and UV light tubes (Butler et al., 1999) Light trapping yields huge numbers of insect specimens with limited effort (Holloway et al ,2001) But automated light traps are more effective as farmers do not need to inspect such traps all the time. Many factors, such as trap scale, shape, type of lamp, and environmental factors influence the performance of light traps. The efficiency of light traps can be correctly calculated taking into account temperature, air humidity, rainfall, wind speed, moonlight and cloud covers (Beck and Linsenmair, 2006). Given the attempts to minimize the use of insecticides and the appropriate monitoring of insect pest species, the current study was designed to test the efficacy of light traps in agriculture ecosystem.

2. MATERIALS AND METHODS

The field experiment was conducted at the research field of Gokuleshwor Agriculture and Animal Science College (GAASC) in the 2018. It is located at an elevation of 700 meters above mean sea level and lies between (27^{0}30' North latitude and 83^{0}27' East longitude). Light traps was installed in three different places i.e. first one at college boundary, second one at vegetable field (tomato, cabbage, onion, chilli) which had been grown at the time of monitoring and third one at cereals (wheat). Light trap with a100W filament bulb was installed at the site for trapping purpose. It was installed in about middle of field, standing alone without any provision for shade. Light trap was operated from dusk (5pm) of previous day to dawn (6am) of next day. When power failure occurred in the day of light trap operation, light trap in such situation was run immediately for the next day as compensation. The attraction of light traps decreases with distance

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and is low at distances below 20m. Thus, the trap was placed at a distance of 50m to one another to minimize the trap interference.

Observation was done at every day from 5pm to 6am at weekly interval to record their status and occurrences. The light attract the moths and hence slide down through a funnel underside the trap where the specimen were killed using few drop of poison(formalin) in cotton piece which was kept inside the collection chamber and rest until identification. Insect attracted to the light traps were trapped into a nylon net fitted just beneath the filament bulb. Insects were then exposed to sunlight to remove odour of formalin and pinned properly to store in insect collection box. Collected insects were then brought to entomology lab for identification based on the reference insect maintained there. Then data were analyzed by calculating the percentage of each insect species in the total trap catch over the season and during each month of trapping.

3. Result and Discussion

3.1 Observation in open field

As shown in figure, vertical axis represents no of insect species where horizontal axis shows weekly observations. Among various insects collected in sample-1, the major contributors were click beetle, followed by pink borer, moth, and wasp. At 1st week the total no of insect species was found to be 7. Among them the no of click beetle, wasp, pink borer and moth was found to be 3, 1, 2 and 1 respectively. Similarly, 2nd week of observation shows maximum no of click beetle population comparatively than other weeks which was found to be 9. While wasp couldn't be observed and pink borer and moth was found to be in no 1 and 2 respectively in same week. Also, at 3rd week wasp couldn't be observed and the no of click beetle, pink borer and moth was found to be 4, 1 and 2 respectively. During 4th week of observation the no of click beetle and pink borer was found to be same i.e. 3, while wasp and moth was observed in no 2 and 1 respectively. At 5thweek the no of pink borer was found to be higher i.e. 4 than other insect species i.e. click beetle 3 and moth 1 while wasp couldn't be observed. Similarly, at 6th week click beetle insect was found in higher amount i.e. 6 than other insect species while wasp, pink borer, and moth was observed to be in no 1, 4 and 2 respectively. During 7th week the no of pink borer and moth was observed in same amount i.e. 3, while no of click beetle and wasp was found to be 5 and 2 respectively. At 8th week the no of pink borer and moth decreased in same amount and was found to be 2 while 5 click beetle and 1 wasp was observed. At 9th week wasp and moth found to be in same no i.e. 2 while click beetle and pink borer was observed in no 3 and 4. During 10th week of observation the no of click beetle was found minimum than other weeks i.e. 1 while wasp, pink borer and moth was found to be in no of 4, 5 and 3 respectively. Similarly, click beetle and moth was observed same in no i.e. 4 while wasp and pink borer was found to be 1 and 5 in no at 11th week of observation. At 12th week of observation the no of insect species of click beetle, wasp, pink borer and moth was found to be in no 6, 2, 1 and 3 respectively. Similarly, click beetle, pink borer and moth was observed in no 2, 2 and 5 respectively while wasp couldn't be found during 13th week of observation. At 14th week of observation 2 wasp and moth was found while 7 click beetle and 5 pink borer was observed too. Finally, last (15th) week of observation shows 7, 3, 5 and 6 no of click beetle, wasp, pink borer and moth.

Thus, involvement of Click Beetle, Wasp, Pink borer and Moth made to observed total (176) no of species by being trapped in Sample-1.Among them total no of click beetle was found to be 68 while total no of pink borer, moth and wasp was observed to be 47, 40 and 21 respectively as shown in Figure.

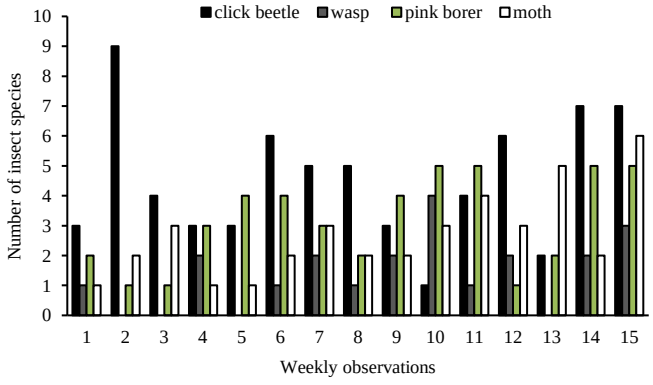

Figure 1: Number of insects populations observed in open field through light trap

3.2 Insect-pests observed in vegetables field

As shown in figure 3, vertical axis represents number of insects species while horizontal axis shows weekly observations. Among various insects collected in the traps, the major contributors were click beetle, followed by moth (white and brown), pink borer, stem borer, cabbage semi-looper and whitefly. At 1st week of observation 4 different insect species i.e. moth, click beetle, pink borer and stem borer with their respective population no of 1, 17, 2 and 2 was found to be observed. During 2nd week of observation 6 different species was recorded which includes 11 click beetle, 4 moth, 3 stem borer,2 whitefly,1 pink borer. At 3rd week of observation total insect was 11 of 5 different species which includes 3 pink borer and stem borer, 2 click beetle and moth and 1 cabbage semilooper. Similarly, 12 insects with 4 different species was observed at 4th week of observation. It includes 7 moths, 2 click beetle and pink borer with 1 stem borer. At 5th week of observation 4 click beetle and pink borer, 3cabbage semi-looper, 1 moth and stem borer was found to be trapped. During 6th week of observation 4 click beetle, 3 insects each of species moth, pink borer, stemborer and cabbage semi-looper was found to be observed. At 7th week of observation total 12 insects of 6 different species was recorded. It includes 5 moth and click beetle, 4 pink borer and 3 each of species stem borer, cabbage semi-looper and whitefly. Similarly, 22 insects of 6 species were found at 8th week of observation which includes moth, click beetle, pink borer, stem borer, cabbage semi-looper and whitefly with their respective population no of 4, 10, 3, 2, 1 and 2. At 9th week of observation 5 species were recorded which includes 5 moth and pink borer, 4 click beetle, 2 whitefly and 1 stem borer. During 10th week of observation total 16 insects of 6 different species was recorded. It includes moth, click beetle, pink borer, stem borer, cabbage semi-looper and white fly with their respective population no of 3, 3, 4, 3, 2, and 1. At 11th week of observation 3 insects each of species moth, cabbage semi-looper and whitefly, 4 clickbeetle, 5 pink borers and 1 stem borer was found to be observed. Similarly, 2 insects each of species stem borer, cabbage semi-looper and whitefly with 4 moths, 5 click beetle and 6 pink borer was found at 12th week of observation. During 13th week of observation total 30 insects of 6 different species was recorded. It includes moth, click beetle, pink borer, stem borer, cabbage semi-looper and whitefly with their respective population no of 6, 11, 6, 3, 1 and 3. At 14th week of observation 6 moth, 9 click beetle, 8 pink borer, 1 stem borer, 3 cabbage semi-looper and 2 whitefly was found to be observed. Finally, at last (15th) week of observation total 27 insects were recorded. It includes 6 moths, 7 click beetle, 5 pink borer, 4 stem borer, 2 cabbage semi-looper and 3 white fly.

The result shows that total 289 insects of 6 different species were found in sample-2 i.e. at vegetable field in which maximum (30) insects was trapped at 13th week and minimum (10) insects was trapped at 6th week.

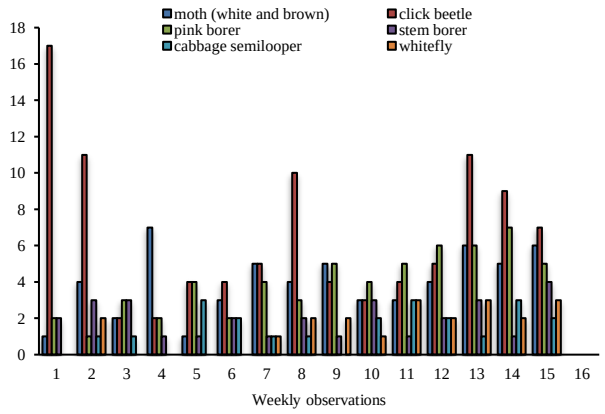

Figure 2: Insect-pests observed in vegetables field

3.3 Insect population observed in cereals (wheat) field through light trap

Among various insects collected in the traps, the major contributors were click beetle followed by Greenleaf hopper, pink borer, wasp and grasshopper. At 1st week of observation different insect species i.e. greenleaf hopper, click beetle and wasp with their respective population no of 5, 2 and 2 was found to be recorded. During 2nd week of observation higher no of insect species are found to be trapped comparatively than 1st week .Here, observed insect species were pink borer, click beetle, Greenleaf hopper, wasp and grasshopper with their respective population no of 5, 4, 2, 2 and 1. Similarly, 3 different species are recorded at 3rd week of observation. It includes 4 greenleaf hopper, 3 click beetle and 2 pink borers. During 4th week of observation 3 insects of 3 different species i.e. click beetle, wasp and Greenleaf hopper was found to be trapped or

observed. At 5th week of observation total 13 insects are found to be observed. Among them 8 click beetle, 3 greenleaf hopper and 2 pink borers was recorded. Only 2 insects were found to be observed during 6thweek. It includes click beetle and Greenleaf hopper. At 7th week of observation total 7 insects of different species i.e. click beetle, pink borer, Greenleaf hopper and grasshopper with their respective population no of 2, 2, 2 and 1 was found to be observed.

Similarly, 10 insects of 4 different species were found to be trapped in 8th week of observation. It includes 4 click beetle, 3 pink borer, 2 grasshoppers and 1 greenleaf hopper. At 9th week of observation total 9 insects of 5 different species was found to be observed. It includes 3 click beetle, 2 Greenleaf hopper and pink borer with 1 wasp and grasshopper. Maximum no of insects with 5 different species was found to be observed at 10th week of observation. i.e. 5 click beetle, 4 wasps, 3 greenleaf hopper, 2 grasshoppers and 1 pink borer. At 11th week of observation 10 insects of 5 species are found to be observed. It includes 2 click beetle, pink borer, wasp, Greenleaf hopper and grasshopper. At 12th week of observation 14 insects of 5 different species was observed. It includes 4 click beetle, 3 greenleaf hopper and wasp with 3 pink borer and 1 grasshopper. At 13th week of observation total 11 insects of 4 species was found to be observed i.e. 4 click beetle and pink borer followed by 2 wasp and Greenleaf hopper. During 14th week of observation total 13 insects of 4 different species was recorded which was higher than 13th week of observation i.e. 5 click beetle ,3 pink borer and Greenleaf hopper with 2 wasp. Finally, at last (15th) week of observation we found total 13 insect of 5 different species which includes 4 green leaf hopper followed by 3 click beetle, pink borer with 2 wasp and 1 grasshopper.

Thus, involvement of Click Beetle, Greenleaf hopper, wasp, grasshopper, pink borer was observed total (152) no which has been trapped in Sample-3. Among all three sample it is lesser than sample-1 and sample-2 shown in Figure 2 and 3.

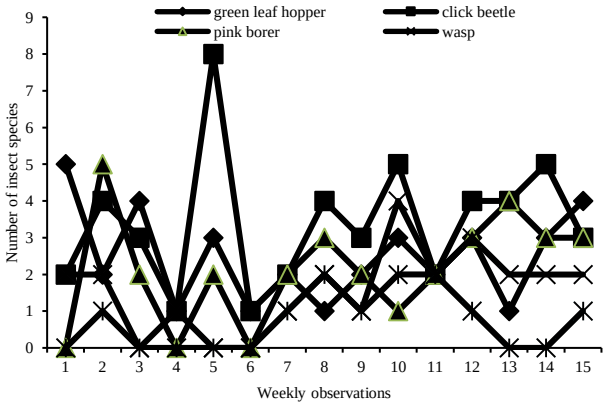

Figure 3: Insect population observed in cereals (wheat) field through light trap

4. Conclusion

Altogether, 9 different species of insect pest found in light trap. In all sample the maximum population of click beetle was observed. The monitoring of insect pest has provided some basic information of their abundance and pest dynamics in winter months.

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