
ORIGINAL ARTICLE

Study of Cutworm *Agrotis ipsilon* (Lepidoptera: Noctuidae) on the potato plant and its management

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ABSTRACT

Agriculture is the main source of development of human civilization. Pests of different crops are the most challenging one for crop production. A polyphagous pest, cutworms cause huge destruction in agricultural fields. The caterpillars of these pests, which affect many types of plants, feed on newly emerged seedlings, which can do most harm. Being a polyphagous and cosmopolitan pest, it attacks large number of crops worldwide including India. This study reveals that caterpillars of *Agrotis ipsilon* are the most damage causing stage generally resides in soil, which remains hidden during the day and feed mostly at night on the young plants at ground level. This cutworm belonging to the genera *Agrotis*, plays an important role in economic sector. The genus *Agrotis* consists of numerous species of cutworm that substantially harm green and cereals vegetation in India. The life cycle of *Agrotis ipsilon* is completed within 36 to 50 days which includes egg, larva, pupa, and adult. The period of incubation is completed within 3 to 7 days. As the larval stage is very destructive phase and causes much damage for which management was done by different methods. During the study of potato cutworm its destructive phase was noticed which was alarming for all the cultivating agriculture fields. To get rid of this destruction different control management was done like cultural control, mechanical control, biological control by encouraging predatory birds to visit the fields, by placing birdbaths and feeders near the planting beds and through chemical control by insecticides like Endosulfan, Chlorpyrifos, and Carbofuran was studied. Out of which Chlorpyrifos 20EC @0.5 L/ha as a foliar spray was observed the most effective against cutworms when implemented two times on plant foliage in addition to ridges. First spray at earthing and second after 21 days of the first spray. In this treatment, tuber damage was measured at 0.10% by number and 0.15% by weight, but only 0.10% by foliage.

Keywords: cutworm, pest, *Agrotis ipsilon*, life cycle, management.

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INTRODUCTION

Potato (*Solanum tuberosum*) is the most important crop in India. Another name for the potato is "Queen of vegetables" [1, 6-10]. With a gross production cost of 63.6 billion US dollars in 2017, It is cultivated extensively in 130 countries [11]. In 2009, approximately 369 million tonnes of potatoes were produced. It is an ideal crop because of its distinctive feature like huge adaptability, the flexibility of production and various variety of human tastes and choices. There are various major potato production areas out of which Bihar is also one of them. Cutworm is a most important pest in Bihar that attacks these potato plants through a variety of insect pest of potatoes. Out of the diverse insect pest of potatoes, [13-19, 8]. The most damage-causing pests for potato plants are cutworms, these are polyphagous and cosmopolitan insect pests attacking large number of crops and vegetables worldwide including India as informed by Ram *et al* [17]. There are mainly five species of cutworm in India i.e. *Agrotis ipsilon* (Hufnagel), *Agrotis interrecta* (Walker), *Agrotis flammata* (Fabricans), *Agrotis spinifera* (Thubner) and *Agrotis segetum* (Denis and schittermuller) have been reported causing 12 to 18% yield loss in potato fields in different parts of country reported by Saxena and Nusra [20]. According to Kumar & Kumar in [7] *Agrotis ipsilon* was a very serious pest of potato in Bihar. Cutworms are the member of the Order- *Lepidoptera* and Family - *Noctuidae*. Which only nourish the prone sections of plants and severely harm them by cutting seedlings. Cutworms generally eat at night while hiding during the day in the soil crevices or under clumps imposed

around the plants [21]. They severely damage and quickly lose crops when they chop down the stem of potato plants throughout the night feeding, especially at the seedling stage. The egg hatch into a caterpillar, which grows through multiple moults until it reaches its full size and pupates in the earth, and moths emerge from these pupae. *Agrotis ipsilon* may require 38 to 57 days to complete its life cycle. More than 80% of the damage happened when the larvae reach their fourth instar, which cut down numerous plants in the early seedling stage throughout the night, reducing plant development and agricultural output [23-25]. Different methods for its management and control, including cultural control, mechanical control, biological control and chemical control, were used to deal with the yield loss caused by *Agrotis ipsilon* in the agricultural field.

MATERIAL AND METHODS

For the study of cutworm *Agrotis ipsilon* on the potato plant and its management local cultivation area of Muzaffarpur was selected. Different stages of *Agrotis ipsilon* was collected from the potato cultivation site of Dholi. These samples were collected from the potato crops *Kufri sundri* variety of potato. Which was planted in the first week of October in Dholi (Muzaffarpur). Whose plot size was 4.25×4m² and the spacing 60×20cms, where observation of different damaging stages of cutworm was studied. During study from October 2022 to February 2023, it was observed that the larval stage of *Agrotis ipsilon* was most destructive. Different methods of its control and management were practiced in *Kufri sundri* variety of potato plotted in specific area as defined above.

Cultural control-

- Deep ploughing was done.
- Flooding was done.
- Decomposed organic manure was used.
- Crop rotation was done.
- Early sowing in the last week of October was done
- To reduce infestation intercropping was also done.
- In early stages insect were picked manually and destroyed.

Biological control

- Parasitoids of *Agrotis ipsilon* were introduced in the crop field like *Braconid* wasp.
- Predators of *Agrotis ipsilon* were introduced like *Gryllus bimaculatus*.
- Also encouraged predatory birds to visit the cropped field by placing birdbaths and feeders near the planting beds.

Mechanical Control-

Through mechanical control, adult insects were controlled by light traps. Larval instars were also collected and destroyed mechanically as they might be curled near the base of young plants or just few inches deep in the soil.

Chemical control

As the reported data by Srivastava and Khan in 1962 it is clear that the better control of cutworms with soil and foliar application of Endrin, Heptachlor and DDT.

Aldrin and Heptachlor were also identified by Nirula and Kumar [15] to be extremely effective at the time of planting.

According to Kumar [9, 10] it was reported that Nimbicide and Lymnoid found most effective against the foliage damage to potato by *Agrotis ipsilon*. Kumar (2005) reported that Chlorpyrifos as a foliar application was most effective.

In this study six treatments including untreated check in the farmer's field of Dholi block, Muzaffarpur (Bihar) during October 2022 to February 2023.

The treatments were, T1- Endosulfan 35EC @0.5L/ha sprays once at earthing, T2- Endosulfan 35EC @ 0.5L/ha spray twice, once at earthing and second after 21days of first spray, T3- Chlorpyrifos 20EC @ 0.5L/ha spray once at earthing. T4-Chlorpyrifos 20EC @ 0.5L/ha sprays twice, once during earthing and once after 21 days of the first spray. T5-Carbofuran 3G @ 1.5kg/ha sprays once at earthing T6- Control (Untreated).

RESULT AND DISCUSSION

From the cultural control

Deep ploughing of fields between crops turned up larvae and pupae on the soil surface making them susceptible to predators and the sun. This process was helpful to catch the larvae and pupae from the soil, which can be destroyed easily.

Depending on the crop, flooding of the infested field might be a possible control method in some cases. But this method has some disadvantages also. For example- By flooding, roots were unable to respire easily which can affect the growth and development of plants.

Early sowing was also helpful to some extent. Intercropping was also introduced to reduce infestation. In the early stage, destructive larval instars were picked manually and destroyed but all the methods of cultural control were not promising as hoped.

From the biological control;

Parasitoids like *Braconid* wasps were introduced which attacked mostly on the third larval stage to the fifth larval stage. The third to fifth instars of *Agrotis* were most destructive, *Braconid* wasps was helpful in the control and management of cutworms.

Predators like *Gryllus bimaculatus* were introduced as well as predatory birds were encouraged to visit the cropped field by placing birdbaths and feeders near the planting beds. Which were helpful to some extent.

From the Mechanical control;

By light traps, adult insects were controlled mechanically and destroyed. The different stages of larvae were also collected from time to time and destroyed mechanically. These were resided in the crevices of soil as curved "C" shaped. Which were trapped easily by light and destroyed easily.

From the Chemical control;

These all three methods of control and management of cutworms were helpful to some extent. The most effective results were found from the chemical methods and also promising in better control and management of cutworms, which are described as follows-

Finding is summarized in Table-1.

Table 1: Effectiveness of different insecticides against cutworm, *Agrotis ipsilon* on the potato crop as a foliar spray & soil application

Treatment	Shoot Damage caused in %	Tuber Damage by %							
		By weight				By number			
		Large	Medium	Small	Total	Large	Medium	Small	Total
T1 Endosulfan 35 EC @ 0.5L/ha 2 sprays once at earthing	3.25	1.80	1.30	1.25	4.35	1.30	1.25	2.25	4.80
T2-Endosulfan 35 EC @ 0.5L/ha 2 sprays 1 st at earthing & 2 nd at 21 days after 1 st spray	2.50	0.75	0.25	0.60	1.60	0.75	0.75	0.50	2.00
T3-Chloropyrifos 20 EC @ 0.5L/ha once at earthing	0.40	0.10	0.05	0.15	0.30	0.05	0.15	0.20	0.40
T4-Chloropyrifos 20 EC @ 0.5L/ha two spray 1 st at earthing & 2 nd 21 days after 1 st spray.	0.10	0.00	0.14	0.05	0.15	0.05	0.00	0.05	0.10
T5-Carbofuran 3G @ 1.5kg/ha at planting	2.50	1.25	1.50	2.15	4.90	1.50	1.55	2.25	5.60
T6- Control (Untreated)	7.00	4.50	4.20	8.30	17.00	5.00	4.75	4.50	17.25

It is clear from the findings in the table that the size of the tuber also affects the percentage of infestation. When T4 was added twice to plant leaves and ridges, once at earthing and once after 21 days of the first spray, which proved most effective against cutworm. Only 0.10% foliar damage was reported, compared to 0.15% by weight and 0.10% by number of tuber damage.

T2 (Endosulfan 35 EC @ 0.5 L/ha 2spray) was most effective than T1 (Endosulfan 35 EC@0.5L/ha once at earthing). Less effective than all foliar sprays used in the trial, T5(Carbofuran 3G@1.5kg/ha at planting) was noticed. In Untreated plots (T6) the foliage damage was recorded at 7.00% and tuber damage by 17.00% by weight and 17.25% by number. Only two insecticides Endrin and Dursban 18 tested as direct contact poisonous against third and fourth-instar larvae of *Agrotis ipsilon* were reported by Harris et al [6]. According to Kumar & Kumar [7], *Agrotis ipsilon* was a serious pest of potatoes in Bihar. More than 100 Arthropod pests damaged potato crops in various parts of the country reported by Simpson [22].

CONCLUSION

Cutworms are voracious eater and extremely polyphagous and target wide variety of crops around world including India, in this research work different management methods were applied to control the

destruction caused by *Agrotis ipsilon*. From this study it is concluded that in near future through different management techniques these destructive pests could be controlled and sustainable solution about this problem will be concluded.

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