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RESEARCH ARTICLE

STUDY OF THE BIOLOGY OF THE PEST*A GROTIS YPSILON* ROTT (LEPIDOPTERA, NOCTUIDAE): ITS INFESTATION AND DESTRUCTION ON THE CROP *CICER ARIETINUM*.A CASE STUDYAT RAMGARH (JHARKHAND, INDIA)

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ABSTRACT

Protein is one of the main building unit of the cell and ultimately the life. It is abundant in nature. The cheapest and omnipresent natural source of protein as grain is *Cicer arietinum* commonly called as gram. It is consumed by the people as a main food items as well as the food supplement, the health supplement. The people of the world like it as the protein rich food grain. At the end of September the farmers of Ramgarh start to cultivate the gram in their field. The pest*Agrotis ypsilon* Rott, destruct the cropalso hatched at the time ofappearing of seedlings of *Cicer arietinum*. The pestis found around the world. In India the infestation on rabbi crops by this pest is common in winter season. Ramgarh (Jharkhand)is a plateau region where lack of proper irrigation restricts the cultivation of gram. Only few farmers cultivate the gram at restricted and irrigated field and earn a handsome money. This important and commercial crop is infested and destructed by the pest *Agrotis ypsilon* Rott, it damages the crop as well as the financial condition of farmers significantly.The present author deals with the study of the biology of the pest *Agrotis ypsilon* Rott. (Lepidoptera, noctuidae):Its infestation and destruction on the crop *Cicer arietinum*. A case study at Ramgarh (Jharkhand, India). It was observed that the experimental pest was a cold weather pest, its activity was maximum during September to March and completed 03 to 04 over lapping generations. The Caterpillar was the only destructive stage its activity was maximum during night. Only larvae damage the standing crops at night, it cut the foliage more than it devour. During day time they hide in cracks and crevices in soil. After fertilization the female moth oviposit creamy white dome shaped eggs singly or in cluster of about 20 to45 eggs. During night on the under surface of leaves of the host plant or on the moist soil under the host plant. After incubation of 02 to15 days eggs hatched out to small caterpillars feeding on their own egg shell and move like a semilooper. After disturbance the larvae turns C shaped and motionless for few minutes. The larvae attains its maximum size in 12 to 30 days and enters into cracks or crevices and form their earthen chamber and pupate underground. The pupal period varies from 08 to 30 days and the moth emerges out at night. The life cyclegets completed in 35 to80 days. The farmers of Ramgarh cultivate vegetables and crop throughout the year, they cultivate different types of vegetables and crops asper demand of the market. The crop *Cicer arietinum* is a cash crop, whole parts of the green plant is edible as green leaves, green soft pods, mature pods all the stage of cropattracts the people and always make it in the demand, the farmers use to sale it and get handsome price. The life cycle was studied during the year 2018 -2020 at Ramgarh .During the studyit was found that the life-cycle of the pest Agrotis ypsilon Rott.(Lepidoptera, noctuidae) was very simple. In summer season the pest pupa hidesunder 25 to35 mm incracks and crevices in the soil. There was an observation that the moth migrates towards cold region of hillsduring hot climate. Destruction of host plant by pest was 50 to 80%.Prevention from the pest was very difficult. The farmers were advised to control the pest by spraying the chemical pesticides as lindane 02% etc. The field should have been often flooded moderately. Various natural enemies e.g. moles, grubs, wasps, predaceous and parasitic flies destroyed the larvae of the pest were natural control of the pest population.

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INTRODUCTION

Agrotis ypsilon Rott. is *a serious pest of rabbi crop.* Its attack starts in the month of September, when the seedlings of the host plants become visible at that time the infestation started in cold night. Ramgarh is situated on plateau, lack of proper irrigation restricts the farmers for rabbi cultivation. Limited areas are suitable for gram cultivation and only a few farmers cultivate gram as a cash crop. The pest *Agrotis ypsilon* Rott, is also called as gram cutter pest. It is a serious pest global distribution and infestation of cultivated plant causes significantly economic loss in agricultural products. The experimental host plant produces one of the most important grain consumed by the people around the globe. It is rich in essential vitamins, fibres and lack of cholesterol, fat. It is the main ingredient of most of the delicious dishes. It also offers a variety of health benefits infest and apply as a traditional medicine for digestion, infection and fever. The pest *Agrotis ypsilon Rott*, is a polyphagous in nature and cause severe damage to different host plants including vegetables, field crops, weeds and turf grasses. It infests a number of agricultural plants very fast and destroy 50 to 80 percent of crop population. Considerable works had been done by several workers on the life history of *Agrotis ypsilon Rott.* On different crops but none of the researcher studied the life cycle of *Agrotis ypsilon Rott*, on the host plant *Cicer arietinum* at Ramgarh. The present author deals with the *Study* of the biology of the pest *Agrotis ypsilon Rott*.(Lepidoptera, noctuidae) its infestation and destruction on the crop *Cicer arietinum* A case study at Ramgarh (Jharkhand, India).

Ramgarh is a district town located at latitude: 23.38^{o}N and longitude: 85.34^{o}E, situated at 40 km South-East from Ranchi. The temperature is moderate with more humidity. This good climate is favourable for the growth and development of animal and plant population. The forest of Ramgarh plays a considerable role for the study of diversity in animal and plant. The experimental pest successfully completed 03 to 04 overlapping generation from September to April. After fertilization the female moth lays 20 to 45 eggs per day in cluster or in-single and it continues for 05 to 10 days and up to 400 eggs. They lay eggs in night on various suitable places like under surface of leaves of host plant, grasses, other plants, the moist soil near the host plant. The tiny cater pillars emerges out after the incubation of 02 to 15 days. Neonates started to feed their egg shell and move like a semilooper, during disturbance they turn C shaped and motion less. The cater pillars are very active at night and they cut down much more foliage than they can devours. The young cater pillar feed on vegetation near the ground, after 03 to 04 instar the larvae avoid day light and become nocturnal feeder and remain in the soil in day time. In 12 to 30 days the larvae develop completely, then it enters 25 to 35 mm deep in cracks or crevices in the soil and pupate there. Pupal period last in 08 to 30 days, then moth emerges out during night. Three to four over lapping generations were observed in a year. It had been observed that the moth is migratory in nature and can move a long distance with the help of flow of wind. These peculiar characters of pest makes it life cycle difficult. Prevention from pest was very difficult. Farmers were advised to apply chemical pesticides as 2% lindane after the sowing of crop. Field should be often flooded moderately. Some natural enemies were observe to control the pest population.

MATERIALS AND METHODS

Standard methodology was applied for the study of biology of *Agrotis ypsilon Rott, (Lepidoptera*, noctuidae), the infestation and destruction of the crop *Cicer arietinum*. The life cycle and biology of the experimental pest and the nature of damaging the host plant were studied in the crop field as well as in laboratory. The life cycle was studied during the year 2018—2020. Five healthy selected plants of *Cicer arietinum* were completely and carefully covered by a small mesh mosquito net separately. One pair (one male and one female) of experimental pest were introduced on the plant covered by mosquito net and observation was taken daily. One pair (one male and one female) of the experimental pest were kept in the cage of 20 cm X 20 cm X 30 cm. Space and fresh, soft leaves of host plant were provided for egg laying and hatching. This was food for caterpillar as well. In a separate cage some leaves of other plant were also provided to larvae to observe their feeding interest and survival rate. The data were recorded for further study. Methods of prevention of crop and control of pests by chemical and biological methods were applied, observed and recorded.

OBSERVATION

Ramgarh is a beautiful industrial town surrounded by hills and covered with green and dense forest. It is one of the best places to study the ecological biodiversity, a niche of variety of plants and animals. The climatic condition of Ramgarh is suitable for the vegetable and crop cultivation. Therefore, it provides to increase pest population comfortably, infests the vegetables and crops. The pest *Agrotis ypsilon* rott, is also observed here, it is a polyphagous pest which generally infest vegetables as well as the rabbi crops. The experimental crop *Cicer arietinum* is an important cash crop, very limited farmers, having irrigated and suitable land to cultivate it. The experimental pest *Agrotis ypsilon* Rott is a serious pest and damages 50 to 80 percent of the crop production. The present author expresses and deals with “the study of the biology of the pest *Agrotis ypsilon* Rott, its infestation and destruction on the crop *Cicer arietinum*. A case study at Ramgarh (Jharkhand, India)”. The crop Cicer arietinum is a cash crop cultivated by a limited farmer, were infested by pest cease the financial progress of the farmers.

Morphology of the adult pest: The experimental adult moth was large in size, 20 to 25mm long. It was 40 to 50 mm long with wingspan. The colour of fore wings especially the proximal, was dark brown. The distal area of fore wings were marked with a lighter irregular bands and a black bean shaped spot. Hind wings were white grey and vein marked with darker scales present. Females were darker than males.

Morphology of eggs: The freshly laid eggs were white in colour, later the colour turns to brown. The eggs were 0.43 to 0.50mm high and 0.50 to 0.55mm wide, spherical in shape, generally laid on the lower part of the foliage or on the moist soil in singly or in cluster of 20 to 45.

Morphology of the larva: The newly hatched larvae fed on their own egg-shell and moved like a semilooper. It were uniformly light grey or grey brown. Generally had two spotted yellow stripes running down to back. The larvae attain its maximum size after 12 to 30 days.

Table 1. Tabular representation of life-cycle of pest*Agrotis ypsilon* Rott. on host plant *Cicer arietinum*

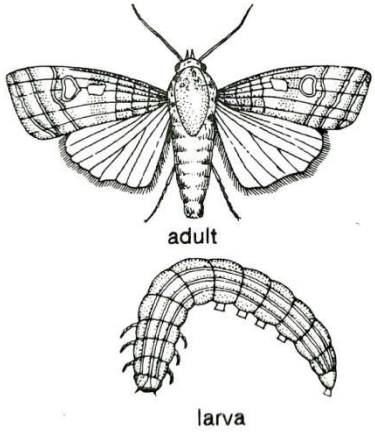
Name of the month	No. of eggs laid/day	Incubation period of eggs in days	Larva mature in days	Pupa mature in days	Life-cycle completed in day
September-October	30—40	05-08	15—18	10—15	60—80
November-December	25—30	10—12	15—20	15—20	40—50
January-February	20-25	12-15	22-30	22-30	35-40
March- April	35-45	2-3	12—15	08—10	60—80

Morphology of the pupa: The full grown larva enters in the soil up to 25 to 35 mm below and form an earthen chamber and get in pupation stage. It was barrel shaped and yellowish-.brown in colour later it become dark- brown.

Life cycle of pest: The moth *Agrotis ypsilon Rott, (Lepidoptera, noctuidae) was a serious polyphagous pest*. It damaged the commercial plants globally and caused severe damage to different host plants including vegetables, field crops, weeds etc. It was a nocturnal pest; adult moths became active during night. Copulation of adults took place since late night to the early morning. After copulation the female laid eggs on the lower surface of leaf of the experimental host plant *Cicer arietinum* or on moist ground around the host plant singly or in a mass of 25 to 45 eggs. The process of oviposition was continued for 05 to 10 days depended on climate and availability of food. The total number of egg laid by a female was 350 to 400, sometimes up to 600. The female laid the eggs at night. After the incubation of 02 to 15 days the tiny cater pillar hatched out from egg in night. The neonates started feeding their eggshell and grow rapidly.

The larvae curled into C shape when disturbed and remained motionless, for short period they were extremely active during night and cutting down the foliage much more as they can devour. Up to 3rd sometimes 4th instar the larvae remain on foliage on day time thereafter they enter in the soil, the crack or in the crevices and come out during night. After six to eight instars the larva reached to full grown stage, it would be 02 cm long maximum. The mature caterpillar enters in to the soil up to 35 mm below and get in rest, after one week of rest it start pupation in an earthen chamber. Later with the duration of 08 to 30 days the moth emerges out from pupa during night. The life cycle were completed in 35 to 80 days. Three to four generations had been observed in a year.

Tabular representation of life-cycle of pest*Agrotis ypsilon* Rott. on host plant *Cicer arietinum.*



Lifecycle of *Agrotis ypsilon* Rott on the host plant *Cicer arietinum*

SUGGESSION FOR CONTROL OF PESTS

- Farmers were advised toadopt the clean cultivation.
- The caterpillars can be trappedusinghand-pick method and this depends on area.
- Field should be often flooded moderately.
- Regular raking up of soil the cultivated field help to destroy the pupa.
- The application of 02 percent lindane after the sowing of crop can control the pest.

DISCUSSION

Moderate temperature, more than average rain fall, various types of forest and vegetation makes Ramgarh a natural nursery for organisms and a bank of biodiversity. It is a habitat of several organisms, pests including *Agrotis ypsilon* Rott. It is a serious and cosmopolitan species that feeds on numerous cultivated plants and herbaceous plants, causes significantly economic loss in agricultural products and in industrial plants and vegetables. It is polyphagous in nature. It damaged so many crops of rabbi. Even up to 80 percent of destruction were observed in the plant *Cicer arietinum*. The crop *Cicer arietinum* is a cash crop cultivated in Ramgarh by some special farmers having irrigated land. The experimental host plant produces one of the most important grain “gram” consumed by the population around the globe. It is rich in fibres, various essential vitamins, free from fat, free from cholesterol, use in various traditional medicines, control the blood sugar, weight-loss, improve immunity. The high nutritional values, high contents of minerals, low in calories, makes it a good health supplement (Upadhyay 2020,2021). All the aerial parts of the host plant *Cicer arietinum* is edible as green leaves and soft parts, green soft pods, mature pods etc. It is an essential component of all the delicious food items in the kitchens. The experimental pest was a serious pest of gram plant. It attacks at the time of seedlings appear. The adult female lays eggs at base of green leaves on the back side or at the moist soil near the plant.

After the incubation of 02 to 15 days the tinny larvae appears. The neonates consume their eggshell and grows rapidly. They turn C shaped and motionless when disturbed. The tiny larvae become extremely active at night and cut the foliage more than they consumed. The larvae become nocturnal after 03 to 04 instar and hide in the soil during day and come out at night. Larvae were the only destructive stage. The fully developed larva enters in the deep soil after 06 to 08 instar. The larvae are very sensitive to light, they hide in daytime in soil and come out at night. The life cycle is directly influenced by light, temperature, humidity, pH. etc (Upadhyay and Verma 2004,2005, Mala and Kumar 2019 and Upadhyay 2009,2020,2021). The pest declines the production of pods, their size, number and the taste of the crops.

The pest not only declines the production of the crop but also declines the financial status of the farmer (Upadhyay 2017,Upadhyay and Bakshi 2019). The town Ramgarh is situated at very prime location. It is surrounded by wide National Highway and good connectivity of railway which makes Ramgarh good and prime market for vegetable sale (Upadhyay, 2017, Upadhyay & Bakshi, 2019, Upadhyay, 2020). The life cycle of this moth was very simple. It was observed that the larvae were very active during night and the full mature larvae enter the soil, cracks or the crevices, form an earthen chamber and pupate there. The adult emerged out in the morning and took part in reproduction at night. Life cycle of Larvae gets completed in minimum of 35 days and maximum up to 80 days. The life span may increase depending upon availability of food and favourable temperature (Upadhyay, 2021). It has been observed that the moth migrated to hilly cold region during extreme hot season, with the help of wind current some times they rich up to 1000 km. Prevention and control of the pest was a difficult phenomenon. The spray of chemical pesticides like 02 percent lindane, kill the eggs, larvae and adults on the surface of the host plant (Kumar &Tiwari 2009; Prabhakar & Roy 2009). Some natural enemies as moles, grubs, wasps, predaceous and parasitic flies destroy the larvae and control the pest population.

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