

SEASONAL HISTORY OF GREASY CUTWORM *AGROTIS YPSILON* ROTT AT PESHAWAR

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Abstract

The seasonal history studies revealed that moth emergence starts in the end of February or early March reaching the maximum of 84 moths in the 2nd week of March. The moth catch went down to zero in the end of March and again rose to a peak of 42 in the 2nd week of April. It once again touched the base and rose again to another peak of 74 moths in the 2nd week of May. The egg population was maximum a week after the peak emergence of moths. The larval population was found maximum one week after the maximum egg population. The pupal population collected from field showed three population peaks, in the end of February, in the 2nd week of April and 2nd week of May.

Observations recorded on the aestivation/hibernation revealed that cutworm larvae and pupae were found from cages provided with eggs in the month of May. No stage of cutworm was recovered from cages provided with larvae or pupae of cutworms before the hot summer started. It indicates that the larvae and pupae of cutworm did not survive in hot dry weather of June where as the eggs aestivated successfully.

Introduction

Cutworms are the larvae of certain genera of Noctuid moths. Their wide distribution and obnoxious nature of activities have made them well known all over the world. The two major species found in Pakistan are *Agrotis ypsilon* and *A. segetum*. The former is found in the plains while the latter is a pest in hilly areas.

The types of damage done by cutworms are (a) cutting of young plants close to soil surface (b) gnawing on roots or other subterranean parts of plants, which may result in complete destruction of crop. The damage to tobacco, potatoes, vegetables, wheat, rice, mustard, gram and cotton seedling, is well known. They are also serious pests of forest nurseries especially conifer seedlings and new plantings in hills.

Metcalf and Flint (1962) classified cutworms into four categories on the basis of their habits: Solitary or surface, climbing, army and subterranean. The greasy cutworm, *Agrotis ypsilon* is a solitary or surface cutworm and is most common in north western part of Pakistan. The caterpillars remain hidden in the soil during day time and feed during dawn and dusk.

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Rehman (1940) reported *A. ypsilon*, *A. flammatra*, *A. segetum* and *A. spinifera* from Punjab. Studies conducted revealed that *Agrotis flammatra* Schiff to be the most destructive of the known cutworms. He noticed that the insect migrate during winter from hilly areas so as to reach the plains by end of October and vice versa during spring. Beeson (1941) reported *A. ypsilon* as a serious pest of forest nurseries in India. Many species of cut worms were recorded on several host plants in north western areas of Pakistan by Alam et al (1969).

On its migration there is a controversy. Singh (1949) conducted a series of experiments on diapause/aestivation host range and survival of *A. ypsilon* Rott in Bihar province during summer. He observed no summer diapause/aestivation of the pest. Host range showed gram to be the principal food beside little linked alternate i.e. Peas, tobacco, mash, cabbage, wheat and cauliflower. He worked out the probable occurrence of the pest during summer in plain from successful rearing of *A. ypsilon* Rott on certain weeds under laboratory conditions. Non availability of host crops during summer was considered by him to be a possible factor of pest survival on weeds in plains. He is of the view that the pest does not migrate to hilly areas but survive in small numbers in plains of Bihar province during summer. Sen (1952) supported Singh but Vankatraman (1954) did not rule out the possibility of migration of cutworms to Himalayas in summer months. Alam et al (1969) accept both possibilities, because the pest suddenly disappears from Rawalpindi in the end of May and reappears in next March but a few pupae are found in winter month.

Mangat (1970) reported that life cycle was completed in 12 days. Ionescu (1969) reported damp, easily flooded and fertile soil provided the best conditions for development of *A. ypsilon* and the highest survival of over-wintering larvae occurred in the absence of frost and excessive humidity during March, April. Adult emergence usually began in early May and continued until the end of June or the beginning of July, but it was delayed in season with daily mean temperature below 14°C and rainfall exceeding 40 mm. Mass emergence occurred when rainfall was low and the daily mean temperature rose to 16°C and above. The preoviposition period lasted for 2–10 days and oviposition began in May, the optimum temperatures for egg-laying were 16–20°C. The egg stage last for 1–9 days at 16–30°C in both field and laboratory conditions. In nature the 1st generation larvae hatched from mid May to July and were fairly resistant to rainfall and changes in the temperature, humidity or food. In both field and laboratory the larval stages lasted for 20–45 days at temperatures of 16–20°C. The first pupae were observed in the field towards the end of June and new adults emerged at the beginning of July and were observed until October.

Mangat (1971) reported life cycle, egg to adult of *A. ypsilon* studied on 20, 26 and 30°C controlled temperatures as 67.5 ± 4.8 , 41.2 ± 2 and 32.5 ± 1.9 days, respectively.

Nash El said (1964) reported mean period that prepupal stage averaged 3.7 days and pupal stage 15.2 days for male and 14 days for female and mating did not affect the life span of males which was about 6.9 days whereas females survived for 9.3 days when mated and 6.6 days when unmated. The minimum, maximum and average number of eggs laid by 40 paired females provided only with water and kept at 18°C and 67% R.H. was 143,826 and 346

perfemal respectively. Santos et al (1982) reared *Agrotis ypsilon* in the laboratory in Brazil at $25 \pm 3^{\circ}\text{C}$ and $70 \pm 10\%$ R. H., the larvae being provided with cabbage leaves. The egg stage lasted for an average of 4 days, the larval stage collectively 19.46–21.09 days, the prepupal stage 1–7.4 days, the pupal stage 12.08 days, the preoviposition period 3.25 days and the oviposition period 8 days. Female laid an average of 1263.15 eggs each. Adult male lived for an average of 9.85 days and adult female for 14.4 days. The complete life cycle from oviposition to death of the adult averaged 53.31 days for females and 48.76 days for males. Pairing occurred about four days after adult emergence. Nasr. et al (1982) determined the effect of temperature, in the laboratory, on the development rate of different life stages of *Agrotis ypsilon* in Egypt. At 13, 18, 23, and 30°C egg stage lasted for 15.1, 9.5, 4.2 and 2.8 days, respectively, the larval stage 74.3, 48, 32.8 and 26 days and the pupal stage 28.3, 22.6, 15.6 and 11.2 days. The threshold temperature for the development of the eggs, larva and pupa were 12.5, 10.5 and 5.75°C . Nikolov (1982) discussed the factors responsible for the wide spread distribution of noctuid pests such as *Agrotis ypsilon*, the turnip moth *A. segetum* D & S and the grassy cutworm *A. exclamatoris* (L) in Bulgaria. Methods of forecasting their occurrence include the use of thermal constants, which vary according to food plant. The sum of effective daily mean temperature for the development of *A. segetum* is 37.4°C on onion, while for development of *A. ypsilon* the temperature sums are 42.3°C on lucerne, 40.6°C on clover, 39.29°C on beet and 44.3°C on mixed feed. Kaster et al (1982) reported that in studies in Iowa where *Agrotis ypsilon* is a pest of maize and other crops, the association of strong southerly winds with first spring captures of adults in black light traps and capture of males in traps baited with 40 m of synthetic pheromone (3:1 ratio of loop lure (Z)–7 dodecenyl acetate): (Z)–9–tetradecenyl acetate) indicated that the first flight adults immigrate to central Iowa. This hypothesis is supported by the fact that all captured first flight females are mated, a condition often associated with immigrating females. Additionally a development simulation model demonstrated the potential existence of 2 separate *A. ypsilon* populations.) Immigrants and progeny and (2) native and progeny. Low captures of males in a pheromone trap and catches in a black light trap mostly of unmated female during the autumn flight are attributed to reproductive diapause might mean that an autumnal southward migratory flight of *A. ypsilon* from Iowa may take place.

Materials and Methods

For seasonal history studies observations were recorded on the population of larvae and pupae in the field by taking measured plots of 1 x 1 metre and digging out the larval and pupal population from last week of February to first week of June while moths collected through light traps. The data collected was compiled and shown in the Graph.

For aestivation and hibernation two sets of experiments were conducted at the Silvicultural Research Garden, Pakistan Forest Institute, Peshawar during the last week of May, 1979. 30 small plots of 1 x 0.5 metre size and 0.25 metre deep were made in which host plants were grown. Out of 30 plots 15 were prepared under tree shades and 15 in open field.

The plots were covered with wire gauze cages and three hundred fertilized eggs, 30 small larvae and 30 pupae each were released in the caged plots.

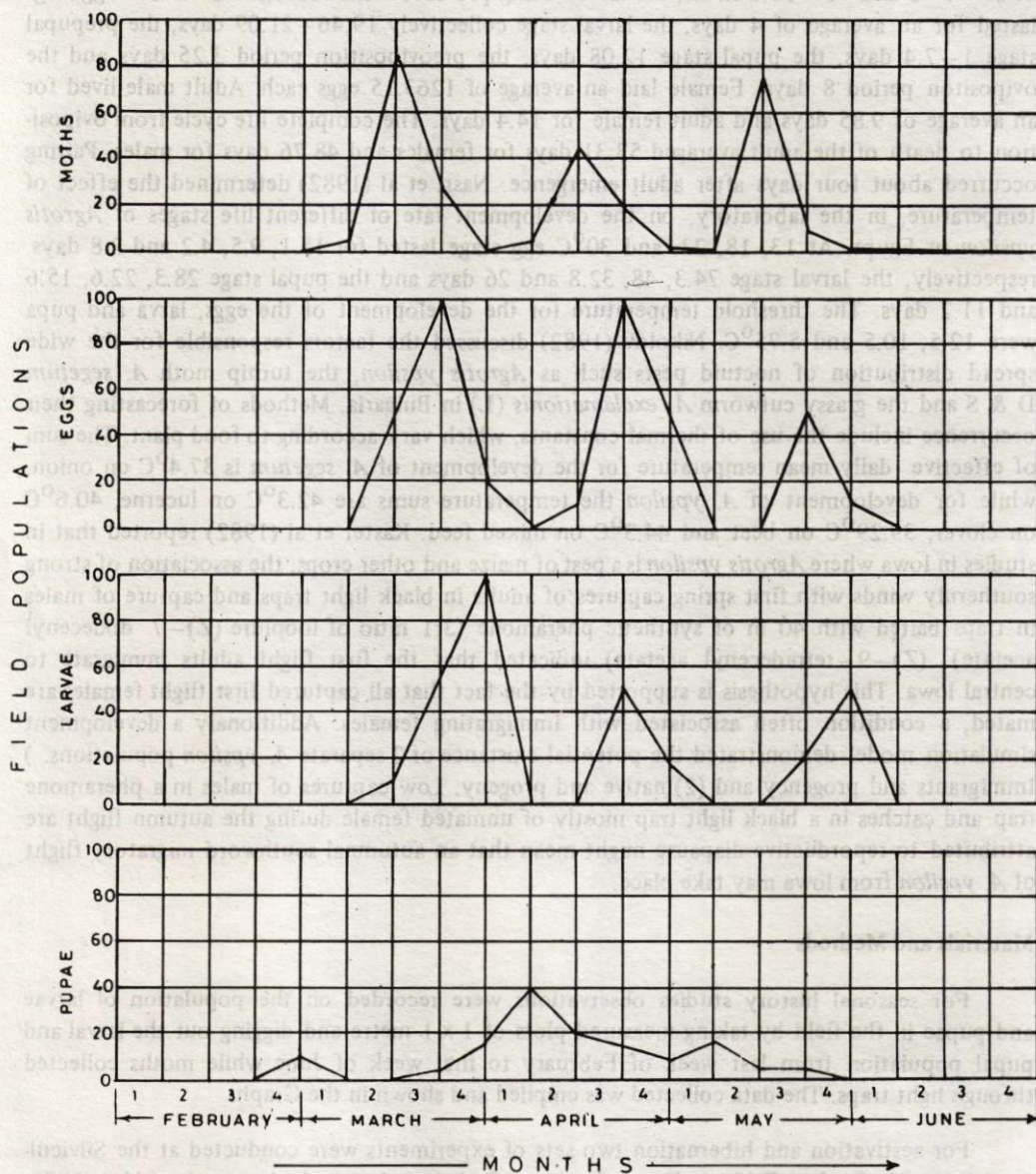


FIG. 1 CUT WORM-SEASONAL HISTORY
AT PESHAWAR

The plots were left as such for the whole summer season and observations were recorded 11 months after during the next April.

Results and Discussion

Aestivation/hibernation

Cutworm larvae/Pupae recovered after Aestivation/Hibernation from field cages

Location	Cage	Eggs-released cages	Larvae-released cages	Pupae-released cages
Under Tree Shade	1	2 pupae	Nil	Nil
	2	Nil	Nil	Nil
	3	Nil	Nil	Nil
	4	1 pupa	Nil	Nil
	5	1 fullgrown larva and 1 pupa.	Nil	Nil
In Open Field	1	3 pupae	Nil	Nil
	2	1 pupa	Nil	Nil
	3	2 pupae	Nil	Nil
	4	2 pupae and 1 larva	Nil	Nil
	5	1 pupa	Nil	Nil

It may be seen that cutworm larvae and pupae were found from cages provided with eggs in the month of May. No stage of cutworm was recovered from cages provided with larvae or pupae of cutworms before the hot summer started. It indicates that the larvae and pupae of the cutworms did not survive in the hot dry weather of June where as the eggs aestivated successfully. Since the advanced stage of larvae and pupae were found in the next April it seems that the aestivating eggs hatched in the fall and hibernated as cutworm larvae and pupae but not as eggs.

Seasonal History

As shown in the Graph the moth emergence started from end of February or early March reaching the maximum number of 84 moths in the 2nd week of March. The moth catch went down to zero in the last week of March and again rose to a peak of 42 moths in the 2nd

week of April. It once again touched the base and rose again to another peak of 74 moths in the 2nd week of May.

The perusal of graph on egg population shows that maximum number of eggs were found a week after the peak emergence of moth. The cutworm larval population record indicates the maximum population in the field, one week after the maximum egg population i.e. two weeks after the maximum adult emergence.

The population trend of adults, eggs and larval stages found in nature clearly describes the presence of three distinct generations of cutworm. The pupal population collected from field shows the three population peaks in the end of February (hibernating) in the 2nd week of April and 2nd week of May after which the dry hot weather compels the pest to aestivate and the pupal population is not available in June.

It appears that the 3rd generation larvae do not pupate due to adverse climate and the late brood of eggs of the third generation aestivates in summer. As the egg and larval population was not available in February and only pupal larval population was found, it implies that aestivating eggs hatched in September/October and majority pupated before the winter set in for hibernation.

The results of both the studies i.e. field collection of cutworms throughout the year and aestivation/hibernation experiment laid in the field are identical. Although cutworm population was not available during fall but hatching of eggs and maturing of larvae or pupation of major population is quite evident from the availability of mature larvae and pupae in the month of April next.

Since no food crops of the cutworms are available in the Pakistan Forest Institute no larval and pupal population was found during August to November. The results need confirmation in the areas where the food crops of the cutworm are grown.

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