BIOGLOBIA Vol. 4 (2): 53 – 57, 2017 **ISSN: 2349-5626**

Food Plant spectrum of *Agrotis ypsilon* (Noctuidae: Lepidoptera) related to its growth potential

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Received: 20.08.2017 **Revised: 25.08.2017** **Accepted: 30.08.2017**

ABSTRACT

The effect of four food plants *viz*., Gram (*Cicera arietinum* Linn.) Peas (*Pisum sativum*), Mustard (*Brassica comprastic*) and wheat on the post embryonic development of *A. ypsilon* Rott were studied. On the basis of survival percentage, growth-index values, gain in length and weight of larvae, pupal weight, percentage of adult emergence, size and fecundity of moths, Gram was the most preferred food and Peas the least among the tested food plants. On the basis of growth index values all the food plants could be arranged in the following descending order: Gram > Peas > Mustard> Wheat. The growth index value was correlated with the development of pupae. The pupal weight was directly proportionate to the fecundity of moths. The females emerged from the heavier pupae lay more eggs as compared to the females emerged from lighter pupae.

Keywords: *Fecundity, Pupae, Cultivated, Turgidity*

INTRODUCTION

A. ypsilon Rott is a polyphagous insect and is known to attack a large number of cultivated and ornamental plants the larval and post-larval development of this insect on 12 different host plants, including pulses, oil seeds, fiber crops and millets. Katiyar *et al.* (1975) reported the effect of certain vegetables on the larval development. But the effect of these food plants on their life history has not yet been described in the literature. The type of food is known to play an important role with polyphagous insects in building up of the pest population. Therefore, in the present study efforts have been made to find out the effect of four cultivated crop *viz*., Gram, Peas, Mustered, Wheat on the larval and post-larval development of *A. ypsilon.*

MATERIALS AND METHODS

The larvae of *A. ypsilon* were collected from the field in the campus of Krishna College of Science And Rural Technology, Agra and reared in the laboratory. Newly hatched larvae were transferred with the help of soft brush on the leaves of five mentioned plants kept separately in round plastic containers 9 cm x 8 cm size fitted with perforated screw cap for aeration. Twenty larvae were kept in each container and in three replications pormiag 60 larvae per host plant. The lower portions of the leaves were soaked with wet cotton to maintain the turgidity and freshness of the leaves. The food was changed each day to shop starvation, the grown up larvae were transferred to the rectangular plastic containers of 13 cm x 13cm x 8.5cm. The pupae were transferred to separate plastic jars.

Newly emerged adults were separated and kept in round plastic containers of 9cm x 8cm size covered with glass chimneys provided with absorbent cotton soaked in 5 percent money solution as food for adults and paper for egg laying. Data were recorded on the growth and development of the insect on different food plants with regard to length and weight of larval after hatching at five different intervals (8, 14, 20 and 26 days), length, girth and weight of pupae after 4 days of pupation, number of pupae named, the larval and pupal period, percentage of adult emergence, size, sex ratio, longevity and fecundity of moths and incubation period of eggs. The rearing was inducted through two consecutive generations and the results are based on the average of two generations. All the tests were conducted at room temperature 23±2ºC and 50 to 70 per cent relative humidity. The data so obtained were analysed statistically and have been presented in the Tables 1 to 6. All the comparisons are adult at 5 per cent level of significance.

RESULTS AND DISCUSSION

Effect of food plants on the larval development: On the basis of growth index values the development of larvae on different food plants could be arranged in the descending order of Gram, Peas, mustered, wheat. The duration of different stages of caterpillars on the host plants are in order of Wheat > Mustard > Peas > Gram. The entire larval life is completed in 49.7 days on Gram. The Gram is the most preferred while Wheat the least. The percentage of survived larvae is lowest on Wheat (16.2 percent) and highest on Gram (98.6 percent).

Table 1

Growth-index values of *A. ypsilon* on different food plants

Host plant	% Larvae pupated (n)	Range of larval period in days	Average larval periods in days (AV)	Growth index value (n/AV)
Gram	98.6	24 – 29	26.25	3.41
Peas	93.6	27 – 30	28.8	3.16
Mustard	83.4	30 – 32	31.00	2.56
Wheat	16.2	32 – 35	33.5	0.32

Eight days after hatching Mustard produced the heaviest larvae and Wheat the lightest. With regard to the length Gram occupied first place where as wheat the last. All the food plants were significant among themselves except, wheat which was at par to Mustard for the weight. Fourteen days after hatching both weight and length of the larvae breed from all the food plants showed significant superiority over wheat, peas and gram were significantly superior over mustered also but non-significant among themselves. Wheat occupied first place with regard to length but 2nd place for weight. Just opposite is the case with Gram which occupied 1st place for weight and 2nd place for length. After 20 days, with regard to the weight, Gram was significantly superior over all the food plants and Peas over rest of the food plants *i.e.* Mustard and Wheat. In case of length all the food plants were significantly superior over Wheat though non-significant among themselves (except Gram which was superior over Mustard). This indicates that at different age of caterpillars the consumption of food varies on different host plants. Twenty six days after hatching the caterpillars reared on were significantly superior in respect of weight gained by them over all the others. The caterpillars fed on Peas however, also showed significant superiority over the caterpillars provided. Wheat length gained by the caterpillars on Gram and Wheat were significantly superior over Mustard and Wheat though they were non-significant to each other. Issac

(1933-34) and Perumal *et al.* (1972) are of the opinion that there is no correlation between the increase in larval weight and length of P. ricini on the four natural host tested. Katiyar *et al.* (1975) reported that they are positive correlation between weight and length of *Agrotis ypsilon* larvae reared on four vegetable plant. The findings presented (Table 1, 2, 3) in this paper, show direct correlation between larval weight, length and growth index value. Larvae from higher growth index value are more longer and heavier as compared to the larvae having low growth index value.

Table 2
Effect of host plants on the weight of *A. ypsilon* caterpillars

Host plant	Average weight (mg) of caterpillar / days after hatching			
	8	14	20	26
Gram	1.99	25.80	217.75	699.55
Peas	1.75	22.07	110.29	400.22
Mustard	2.08	14.61	69.34	248.84
Wheat	0.72	2.92	20.07	69.98

Table 3
Effect of host plants on the length of *A. ypsilon* caterpillars

Host plant	Average length (cm) of caterpillar / day after hatching			
	8	14	20	26
Gram	0.55	1.16	2.56	3.56
Peas	0.53	1.23	2.01	3.41
Mustard	0.53	1.00	1.75	2.63
Wheat	0.36	0.66	1.11	1.90

Effect of food plants on pupal development: It is clear from Table 4, that the length, girth and weight of pupae on Gram were significantly superior over all the food plants tested and lowest on Mustered and not even a single larvae could pupate on Wheat. Effect of these food plants on pupal development *i.e.,* gain in length, girth and weight is, thus, apparently correlated with the gain in larval length, weight and their growth index value. Larvae with higher growth index value produce heavier pupae having slightly low pupal duration. The duration of pupal period was slightly variable on different food plants as compared to larval period which is in agreement with the findings of some workers (Baccaloni *et al.*, 2003; Chandra and Nema, 2006, 2017; Honek, *et al*., 2001; Pandey, *et al*., 1958 and Thobbi, 1961).

Table 4
Effect of food plants on the pupa of *A. ypsilon*

Host plant	Range of pupal period (days)	Average pupal period (days)	Average pupal length (cm)	Average pupal girth (cm)	Average pupal weight (mg)
Gram	11 – 16	13.6	1.77	0.75	387.50
Peas	11 – 16	12.8	1.66	0.63	250.60
Mustard	12 – 20	14.13	1.42	0.55	164.85
C.D. at 5 percent level of significance			0.1089	0.04414	59.3559

Effect of food plants on adult development: Detailed observations on the adult are presented in the Table 5 and 6. Percentage of adult emergence is affected by the respective food plants in the same way as the survival percentage of the larvae.

Table5
Effect of host plants on adult emergence and size of *A. ypsilon*

Host plant	% of adult emergence	Mean size of male moth (cm)		Mean size of female moth (cm)	
		Length	Width (wing expance)	length	Width (wing expance)
Gram	98.3	1.64	3.70	1.79	4.74
Peas	95.7	1.50	3.48	1.66	4.40
Mustard	88.5	1.42	3.26	1.54	4.00
C.D. at 5 % level of significance		N.S.	0.2559	N.S.	0.3689

Table 6
Effect of host plants on sex ratio, adult longevity and egg laying of *A. ypsilon*

Host plant	Sex ratio		Average longevity		Average no. of eggs per female	Average incubation period (days)
	Male	Female	Male	Female		
Gram	1	1.75	3	5	360	3
Peas	1	0.92	4	5	310	3
mustard	1	1.31	3	4	254	2.5

Highest percentage of adult emergence was recorded on Gram while the lowest was on Mustard. It is also clear from the data that there is no statistical difference among the adult length. Wing expance significantly differ among themselves. The size of the adults depend upon the weight of pupae. Adults emerged from the heavier pupae are more healthy than the lighter one. The population of females exceeded the males on Gram and Mustard while males out-numbered the females of Peas. It is interesting to note that Peas which has got higher growth index values as well as survival percentage than Mustard produce lesser number of female moths, indicating that this food plant contain substances which may be inhibitory to the development of female. With regard to the longevity and fecundity of the moths bred at 5 per cent honey solution from larvae reared on different food plants, it was found that the females lived slightly longer than the males in all the cases. The greater longevity was observed when they are bred on Peas and shortest on Mustered.

Marked differences are however, seen in regard to the number of eggs laid by the females. The largest number of eggs was laid by the moths reared on Gram followed by Peas and Mustard. The incubation period of eggs varied very slightly being three days on Gram and Peas whereas 2.5 days on Mustard. It is clear from the Tables 4, 5 and 6 that the fecundity of the females is proportionate to the pupal weight, heavy pupae producing females lay more eggs than those from lighter pupae. Finally, the time for completing the life cycle was longest on Mustard and shortest on Gram being about 41.51 days on Gram, 46.18 days on Peas the and 47.50 days on Mustard. Larvae from Wheat plants were unable to pupate. Thus, it is probable that the polyphagous insects relatively with phytophogous food habit grow faster, live longer and reproduce better on some plant species than the others.

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