Bionature, 35 (1 & 2), 2015 : 29-33

LARVAL PERIOD OF *ENDAPHIS APHIDIMYZA* (SHIVPUJE & RAODEV) *(ZOOPHAGOUS CECIDOMYIIDS)* (DIPTERA : CECIDOMYIIDAE) IN CHITRAKOOT, INDIA

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(Revised 10th July, 2015)

ABSTRACT

This paper asserts that life cycle pattern of *Endaphis aphidimyiiza* creates a balance between environment and safe guards the ecological factors for good harvesting practices. *Zoophagous cecidomyiids* is ecofriendly and is said to be crop protecting insect.

Keywords : *Endaphis aphidimyza,* Tempreture, Humidity, Rain fall, Wind velocity, PVNS – 12, Zoophagous Cecidomyiids,

Introduction

The Cecidomyiids are fragile and delicate small flies ranging from 0.5 mm to 8.0 mm in length. They have long moniliform antennae and a pair of wings with a few veins. Their larvae considerably damage the different parts of plant tissue and encourage the development of mal formation that is known as “gall”, that’s why they are also known as gall midges. There are four instars in the larval stage of cecidomyiids (Metcalfe 1933,Abbas,1965, and Prasad and Grover, 1966).

Cecidomyiidae is the youngest and largest family of the order Diptera, comprises approximately 6000 species (Bayrams and Sukhrava 2004). *Zoophagous gall midges* comprise more than 20 genera and 300 species in the world (Abe and Yukawa, 2006). Many larvae of gall midges have been occurring for a long time as enemies of aphid. In India 787 species of aphids are reported. Among them 250 aphid species are major insect pest of different crops. There are about 4000 species of aphid world wide (Dixon, 1998). Aphid suck the vital nutrient on the plant sap from the different part like lower surface of leaf, stem, tender branches, and inflorescence of the plant.

In the present work the effect of abiotic and biotic factors on different life processes viz. emergence, egg laying, incubation period, sex-ratio, larval period, pupal period, fecundity and longevity were studied. The structure of egg, larva, pupa and adult of *zoophagous cecidomyiids* was also studied to confirm the identification of *Endaphis aphidimyza*. The experimental data on the population dynamics of safflower aphid and its endoparasitoid *Endaphis aphidimyza* were also recorded. The influence of

substrate on fecundity and longevity was assessed. In this study the zoophagous cecidomyiid, *Endaphis aphidimyza* (Shivpuje and Raodev1985) was selected as subject. The larvae of this endoparasitoid cecidomyiids feed the contents of body of the aphids internally and ultimately killed the aphids.

Materials and methods:

The experiment was conducted w.e.f. 2007 to 2010 at agriculture farm house of Mahatma Gandhi Chitrakoot Gramodaya vishwavidyalay Chitrakoot Satna (M.P.) India by Tripathi (2012). Safflower aphids Uroleucon gobonis were collected on safflower plant (*Carthamus tinctorius*) in an agricultural research farm of Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalay Chitrakoot Satna (M.P.) in the rabi season. For the present study 60 plants of safflower (*Carthamus tinctorius*) have been planted in the field. Out of these 20 plants were randomly selected and caged by muslin-polythene bag to observe development attributes and behavior. The effect of climatic factors like temperature, humidity, rainfall and wind velocity were recorded at regional meterological laboratory Nagpur Maharashtra on life cycle of *Zoophagous gallmidges* (*Endaphis aphidimyiiza*) was also worked out.

Result and Discussion

The observations on larval period recorded from 2007 to 2010 for 20 periods each. The difference between egg hatched on and fully develop larva coming out was 8-10 days depending on temperature. The statistical tools like, coefficient of dispersion, student t-test along with their averages were worked out.

The larval period of various hatched eggs are given in the following table.

Table 4.7 – Larval period of *Endaphis aphidimyza* in 2007-08

S.No.	Egg hatched on		Fully developed larva coming out		Larval period
	Date	Time	Date	Time	(days)
1	11.01.2008	1.10 pm	21.01.2008	10:20 am	10
2	12.01.2008	11.10 am	22.01.2008	8:20 am	10
3	14.01.2008	5.35 pm	24.01.2008	10:45 am	10
4	15.01.2008	7.15 am	24.01.2008	8:35 am	9
5	16.01.2008	10.25 am	26.01.2008	9:30 am	10
6	16.01.2008	8.10 pm	26.01.2008	10:45 am	10
7	18.01.2008	7.10 am	28.01.2008	8:25 am	10
8	18.01.2008	7.50 pm	28.01.2008	10:00 am	10
9	20.01.2008	12.10 pm	30.01.2008	7:40 am	10
10	20.01.2008	2.45 pm	29.01.2008	11:12 am	9
11	21.01.2008	10.10 pm	31.01.2008	10:47 am	10
12	22.01.2008	6.15 pm	1.02.2008	9:46 am	10
13	23.01.2008	7.35 pm	2.02.2008	8:22 am	10
14	24.01.2008	10.55 pm	3.02.2008	4:25 pm	10
15	19.02.2008	8.25 pm	28.02.2008	2:30 pm	9
16	20.02.2008	6.25 pm	29.02.2008	4:37 pm	9
17	20.02.2008	5.45 pm	29.02.2008	8:10 am	9
18	21.02.2008	5.35 pm	30.02.2008	4:12 pm	9
19	11.03.2008	4.55 pm	20.03.2008	3.25 pm	9
20	12.03.2008	3.25 pm	21.03.2008	2.40 pm	9

Table 4.8 – Larval period of *Endaphis aphidimyza* in 2008-09

S.No.	Egg hatched on		Fully developed larva coming out		Larval period
	Date	Time	Date	Time	(days)
1	14.01.2009	11.40 am	24.01.2009	1.10 pm	10
2	16.01.2009	8.59 am	26.01.2009	2.05 pm	10
3	17.01.2009	9.12 am	27.01.2009	3.10 pm	10
4	18.01.2009	12.10 pm	28.01.2009	8.40 am	10
5	18.01.2009	10.27 pm	27.01.2009	10.05 am	9
6	20.01.2009	2.45 am	29.01.2009	2.35 am	9
7	22.01.2009	10.15 am	30.01.2009	4.10 pm	8
8	22.01.2009	5.50 pm	1.02.2010	10.35 am	10
9	23.01.2009	7.10 pm	2.02.2010	11.12 am	10
10	25.01.2009	12.20 am	4.02.2010	2.30 pm	10
11	25.01.2009	7.25 pm	4.02.2010	4.10 pm	10
12	25.01.2009	2.49 pm	4.02.2010	7.35 pm	10
13	26.01.2009	9.25 pm	5.02.2010	1.10 pm	10
14	27.01.2009	7.55 pm	6.02.2010	3.33 pm	9
15	28.01.2009	11.10 pm	7.02.2010	12.30 pm	10
16	28.01.2009	8.00 pm	7.02.2010	7.40 am	10
17	2.02.2009	7.50 pm	11.02.2010	10.42 am	9
18	2.02.2009	10.20 pm	12.02.2010	8.40 am	10
19	4.02.2009	5.32 pm	13.02.2010	6.59 am	9
20	5.02.2009	5.10 pm	14.02.2010	10.25 am	9

Table 4.9 – Larval period of *Endaphis aphidimyza* in 2009-10

S.No.	Egg hatched on		Fully developed larva coming out		Larval period
	Date	Time	Date	Time	(days)
1	18.01.2010	5.00 pm	28.01.2010	10.20 am	10
2	17.01.2010	10. 25am	26.01.2010	11.10 am	9
3	19.01.2010	10.40 am	29.01.2010	9.30 am	10
4	20.01.2010	9.45 am	29.01.2010	8.40 am	9
5	21.01.2010	12.40 pm	30.01.2010	12.10 pm	9
6	22.01.2010	2.30 pm	1.01.2010	1.05 am	10
7	24.01.2010	11.20 pm	3.01.2010	10.05 am	10
8	15.02.2010	11.35 pm	24.02.2010	9.40 am	9
9	20.02.2010	3.23am	29.02.2010	4.12 pm	9
10	20.02.2010	1.25 am	2.02.2010	2.30 pm	10
11	21.02.2010	4.25 am	3.02.2010	5.10 pm	10
12	21.02.2010	8.56 pm	3.02.2010	6.08 pm	10
13	21.02.2010	10.33 pm	2.02.2010	8.10 pm	9
14	23.02.2010	8.59 am	4.03.2010	10.10 pm	9
15	26.02.2010	2.18 pm	7.03.2010	7.10 am	9
16	26.02.2010	1.25 pm	7.03.2010	10.35 am	9
17	27.02.2010	5.10 pm	8.03.2010	8.42 am	9
18	25.02.2010	10.42 pm	6.03.2010	7.32 am	9
19	27.02.2010	7.52 pm	8.03.2010	11.32 am	9
20	27.02.2010	5.05 pm	8.03.2010	12.35 pm	9

w.e.f. from the years 2007 to 2010.

LARVAL PERIOD VERSUS (temperature egg hatching)

1. Multivariate analysis among the variable t e h (x_1), humidity (x_2), rainfall (x_5) and wind velocity (x_6) revealed the fact that humidity (x_2) alone remained significant and the rest of the partial regression coefficient remained non -significant. The effect of (x_1) and (x_5) t e h and rainfall negative on the larval period where as humidity and wind velocity played and positive role on this period. The coefficient of determination was found to be 42.9 per cent. The highest correlation was observed between t e h (x_1) and larval period (Y) (r = 0.850) this was the case when eggs were laid (Fig. : 13).

Larval period Y = 8.29 – 0.00026 t e h (x_1) + 0.0249 humidity (x_2)

SE = (0.008328) (0.01148)
t = -0.03 2.17

-0.161 rainfall (x_5) + 0.040 wind velocity (x_6)
(0.1312) (0.2489)
-1.23 0.16

r^2 = 42.9 per cent

At the time of hatching, temperature played most important role and it was highly significant (-3.76). The effect of humidity (X_4) and rain fall adversely effected the hatching of eggs, whereas the effect of wind velocity remained meager (b_6=0.1302) the coefficient of determination was observed 61.6 per cent (Fig. : 14-16).

Regression analysis

larval period Y = 12.1 – 0.124 temp ful lar came (x_3) – 0.00545 humidity (x_4)

SE = (0.03309) (0.009324)
t = - 3.76 - 0.58

-0.097 rainfall (X_5) + 0.130 wind velocity (X_6)
(0.1100) (0.1941)
- 0.89 0.67

r^2 = 61.6 per cent

Correlations

	Larval period (y)	t e h (x_1)	humidity (x_2)
T e h (x_1)	-0.045		
Humidity (x_2)	0.610	-0.079	
Temp ful lar cam	-0.759	0.077	-0.699
Humidity (x_4)	0.128	0.409	0.436
Rainfall (x_5)	- 0.373	-0.022	-0.232
Wind velocity (x_6)	-0.426	0.026	-0.682
Temp ful lar cam	Humidity (x_4)	Rainfall (x_5)	
Humidity (x_4)	-0.308		
Rainfall (x_5)	0.311	0.034	
Wind velocity (x_6)	0.649	- 0.178	0.295

The correlation matrix revealed that the highest correlation was observed between fully develop larva came out and wind velocity (r = 0.649) followed by correlation between larval period and humidity (x_2) (r = 0.610). For rest of variable either the correlation were meager or negative.

Conclusion :

From the above results this may be safely concluded that in larval period humidity and wind velocity played an important role. The effect of (x_1) and (x_5) t e h and rainfall negative on the larval period where as humidity and wind velocity played and positive role on this period. The degree of association for these variables with larval period explained more than 40 per cent. [$r^2 = (0.649)^2 = 42.12\%$], and [$r^2 = (0.610)^2 = 37.21\%$]. This creates a balance between environment and safe guard the ecological factors for good harvesting practices. In absence of *Zoophagous Cecidomyiids* and absence of ppm this creates a balance for better productivity and production. In the light of this fact *Zoophagous Cecidomyiids* is ecofriendly and crop protected insect.

Acknowledgement :

We thank Dr. O. P. Khanna (Prof. of statistics C.S.A University Kanpur) for their valuable advice during this study.

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