



Biometrical study of Diamondback moth, *Plutella xylostella* (L.) On cabbage

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ABSTRACT

The laboratory experiments were conducted to study the biology, of P. xylostella on different host plants at the Department of Agricultural Entomology, College of Agriculture, Latur during 2015. The mean measurements of larval head capsule width and larval body length, width and weight of P. xylostella reared on cabbage was 0.54 mm, 8.60 mm, 1.39 mm and 1.10 mg for last larval instars.

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INTRODUCTION

Among vegetable crops, cruciferous (cole) crops are economically important throughout the world. Diamondback moth (*Plutella xylostella* Linnaeus), a cosmopolitan pest hampers the successful cultivation of cabbage in the world. It is being a ubiquitous pest, the knowledge of its biology and biometrics is very much essential especially with respect to the influence of geographic location, climate change and host plants.

MATERIAL AND METHODS

The studies on biometrics of *Plutella xylostella* (L.) on different host plants were conducted at the Department of Agricultural Entomology, College of Agriculture, Latur during the year 2015-2016.

Biometrical studies

The studies on biometrics of *P. xylostella* (L.) were also carried out on cabbage plant at room temperature. Immediately after hatching fifteen larvae of *P. xylostella* (L.) for each instar were transferred into separate small plastic container. They were reared individually on cabbage. Every day fresh leaves of the respective host plants were provided to the larvae. The observations on the casting of exuviae were made under microscope. During each instar immediately after moulting, the head capsule width and body length, width and weight of each larva was measured with the help of ocular and stage micrometer to the nearest value of 0.0091 mm. The regression relationship between the instar and mean head capsule width, body length, body width and body weight of larvae in different instars was calculated by using the following formula.

$$\text{Log}_{10} Y = a + bx$$

Where,

Y = Head capsule width / body length / body width / body weight of larva (mean)

a = Constant

b = Logarithm of growth ratio

x = Number of instars

Growth ratio

It was calculated by dividing the mean value of head capsule width / body length / body width / body weight of larval instar by the value of mean head capsule width / body length / body width / body weight of larva of preceding instar.

Progression factor

It is the average of growth ratio.

RESULTS AND DISCUSSION**Larval head capsule width**

The larval head capsule width of *Plutella xylostella* on cabbage was varying. The larval head capsule width of I to IV instar ranged between 0.16 ± 0.01 and 0.54 ± 0.01 mm. The mean observed and calculated progression factors were 1.54 and 1.52, respectively.

Table 01 :Comparison of observed and calculated values of mean measurements of larval head capsule width (mm) of *P. xylostella* reared on cabbage

Parameter	Larval instars				Progression factor
	I	II	III	IV	
Observed head capsule width (mm)	0.16	0.31	0.49	0.54	
± S.E.	± 0.01	± 0.01	± 0.01	± 0.01	
Growth ratio	--	1.93	1.58	1.10	1.54
Calculated head capsule width (mm)	0.18	0.27	0.41	0.63	
Growth ratio	--	1.50	1.52	1.54	1.52
Difference	-0.02	0.03	0.07	-0.08	
Per cent difference	-12.50	9.67	0.07	-14.81	

Larval body length

In Table 02 revealed that the larval body length of *P. xylostella* for I to IV instars reared on cabbage ranged from 1.29 ± 0.02 to 8.60 ± 0.09 mm. The mean observed and calculated progression factors were 1.88 and 1.89, respectively.

Table 02: Comparison of observed and calculated values of mean measurements of larval body length (mm) of *P. xylostella* due to feeding on cabbage

Parameter	Larval instars				Progression Factor
	I	II	III	IV	
Observed larval body length (mm)	1.29	2.50	5.10	8.60	
± S.E.	± 0.02	± 0.05	± 0.07	± 0.09	
Growth ratio	--	1.93	2.04	1.68	1.88
Calculated larval body length (mm)	1.31	2.50	4.75	9.01	
Growth ratio	--	1.90	1.90	1.89	1.89
Difference	-0.02	-0.003	0.34	-0.41	
Per cent difference	-1.55	-0.12	6.60	-4.76	

Larval body width

In Table 03 revealed that the larval body width of fourth instar *P. xylostella* when moulted three times was 1.39 ± 0.03 mm. The mean progression factors for observed and calculated values were 2.1 each.

Table 03: Comparison of observed and calculated values of mean measurements of larval body width (mm) of *P. xylostella* reared on cabbage

Parameter	Larval instars				Progression Factor
	I	II	III	IV	
Observed larval body width (mm) ± S.E.	0.19 ± 0.02	0.30 ± 0.06	1.15 ± 0.03	1.39 ± 0.03	
Growth ratio	--	1.57	3.80	1.20	2.1
Calculated larval body width (mm)	0.18	0.38	0.79	1.64	
Growth ratio	--	2.10	2.07	2.07	2.1
Difference	0.006	-0.08	0.35	-0.25	
Per cent difference	3.15	-26.66	30.43	-17.98	

Larval body weight

Table 04 indicated that the larvae of *P. xylostella* reared on cabbage recorded their body weight to the tune of 0.36 ± 0.04 , 0.42 ± 0.09 , 0.86 ± 0.10 and 1.10 ± 0.10 mg for I, II, III and IV instars, respectively. The mean observed and calculated progression factors were 1.49 and 1.50, respectively.

Table 04: Comparison of observed and calculated values of mean measurements of larval body weight (mg) of *P. xylostella* fed on cabbage

Parameter	Larval instars				Progression Factor
	I	II	III	IV	
Observed larval body weight (mg) \pm S.E.	0.36 \pm 0.04	0.42 \pm 0.09	0.86 \pm 0.10	1.10 \pm 0.10	
Growth ratio	--	1.16	2.04	1.27	1.49
Calculated larval body weight (mg)	0.33	0.50	0.75	1.13	
Growth ratio	--	1.51	1.50	1.50	1.50
Difference	0.02	-0.008	0.10	-0.03	
Per cent difference	5.55	-19.04	11.62	-2.72	

The results of the larval body length and width of *P. xylostella* reared on cabbage are in conformity with the results [1-4].

The mean measurements of larval body length and width of *P. xylostella* on the cabbage to the tune of 1.34, 3.53, 5.92 and 9.92 mm, 0.20, 0.25, 1.18 and 1.50 mm, for I, II, III and IV larval instars, respectively [1, 5]. According to Hafeez [4] the larval body length and width of *P. xylostella* on cabbage was found to be 1.25, 3.14, 4.63 and 8.62 mm and 0.17, 0.23, 1.09 and 1.34 mm respectively.

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