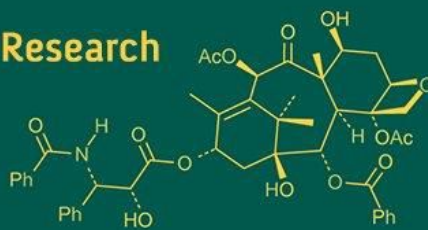


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
 ISSN Online: 2617-4707
 NAAS Rating (2026): 5.29
 IJABR 2026; 10(3): 609-611
www.biochemjournal.com
 Received: 11-12-2025
 Accepted: 15-01-2026

Pritansha Bhagat
 Department of Entomology,
 College of Agriculture and
 Research Station, Jashpur,
 Chhattisgarh, India

Vandana Shukla
 Department of Plant
 Pathology, Ramprasad Ppotai
 College of Agriculture and
 Research Station, Kanker,
 Indira Gandhi Krishi
 Vishwavidyalaya, Raipur,
 Chhattisgarh, India

Bionomics of diamondback moth, *Plutella xylostella* (Linn.) on cabbage crop under laboratory condition

Pritansha Bhagat and Vandana Shukla

DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i3h.7931>

Abstract

Investigations on biology of diamondback moth were carried out in the laboratory of Department of Entomology at Indira Gandhi Agricultural University, Raipur (C.G.) during year 2015-16 and 2016-17 on cabbage plant leaves with temperature range of 25.12 °C –38.9 °C. Total 140-175 eggs laid by a single female and mean incubation period was recorded 4.4±0.22 days. The period of incubation of egg was 4-6 days. Total four instars 1st, 2nd, 3rd and 4th were recorded as 2-4, 2-3, 2-3 and 3-4 days with mean 2.5±0.16, 2.6±0.16, 2.3±0.15, and 3.4±0.17days, respectively. The total larval period was observed for 10.7±0.52 days with range 9-14 days. Length of DBM larvae for different stages *i.e.* 1st, 2nd, 3rd and 4th instars were recorded as 1.22-1.34, 2.78-3.53, 4.05-5.92 and 6.72- 9.92 mm, respectively. Similarly range for breadth measurement for 1st, 2nd, 3rd and 4th instars were recorded as 0.16-0.20, 0.23-0.25, 1.09-1.18 and 1.32-1.50 mm, respectively and larval head capsule observed with range 0.11-0.17, 0.21-0.31, 0.33-0.47 and 0.52-0.61 mm, respectively. The combined pre-pupal and pupal period was 5.8 ± 0.39 days with range 4-8 days. The range of length and breadth of pupa recorded was 7.50-8.50 mm and 2.50-3.00 mm. The range of development period from egg to adult stage of male and female was observed as 24-36 days and 27-41 days, respectively. Adult emergence calculated in per cent for male and female both were 65% and 35%, respectively.

Keywords: Diamondback moth, *Plutella xylostella* (Linn.), laboratory, length, instar, male, female

Introduction

The diamondback moth (DBM), *Plutella xylostella*, is globally distributed pest, which was reported from India in 1914 (Fletcher, 1914), but now widely distributed in 128 countries (Shelton, 2004). This has been reported to cause 52% yield loss on cabbage in India (Krishnamoorthy, 2004) [3]. Globally, this pest has been reported to cause more than 90% of production loss of crucifer crops (Talekar and Shelton, 1993; Furlong *et al.*, 2013; Paudel *et al.*, 2022) [7, 1, 5]. Like other brassicas, wide spectrum of pests attacked on cabbage plant. In cruciferous crops, 51 insect pests were listed throughout the world, out of which diamondback moth (DBM), *Plutella xylostella* (Linnaeus); cabbage butterfly, *Pieris brassicae* Linnaeus; cabbage semilooper, *Trichoplusia ni* Hubner; head borer, *Hellula undalis* Fabricius; tobacco caterpillar, *Spodoptera litura* (Fabricius); cabbage aphid, *Brevicoryne brassicae* Linn., and green peach aphid, *Myzus persicae* (Green) are the major productive constraints (Maison, 1965) [4]. Diamondback moth is recorded as a major and oligophagous pest with the larvae feeding specially on the members of the family cruciferae, cabbage, Chinese cabbage, cauliflower, broccoli, knolkhol, radish, turnip and mustard. It has been recorded since 1746 (Harcourt, 1962) [2]. Among all the crucifer vegetables, cabbage and cauliflower are the most preferred host plants for diamondback moth due to the fact that both plants possess fleshy and succulent leaves having glucosides and glucosinolates which stimulate feeding and oviposition. Commercial considerations of this crop have, compelled the growers to go for more frequent and injudicious use of insecticides for better marketable yield (Tabashnik and Cushing, 1987) [6]. However, excessive use of insecticides has led to insecticidal resistance development, pest resurgence, residue hazards in foods and overall environmental contaminations. Various management strategies of cruciferous pests are completely based on chemical pesticides without giving much importance to the bio-pesticides, botanicals and cultural control. Studying bionomics is essential for effective pest management because it provides the foundational knowledge needed to create sustainable, precise, and ecologically sound control strategies. By understanding insect's life cycle,

Corresponding Author:
Pritansha Bhagat
 Department of Entomology,
 College of Agriculture and
 Research Station, Jashpur,
 Chhattisgarh, India

behavior, and interaction with its environment, which helps to develop targeted, non-chemical solutions that minimize crop damage and reduce reliance on broad-spectrum pesticides.

Materials and Methods

- Investigations on biology of diamondback moth were carried out in the laboratory of the Department of Entomology at Indira Gandhi Agricultural University, Raipur (C.G.) during year 2015-16 and 2016-17.
- To maintain the culture of *Plutella xylostella*, the healthy larvae of DBM, diamondback moth were collected from unsprayed field and reared in glass jars (20 × 15 c.m.).
- Fresh tender leaves of cabbage were served as food to the larvae and food was changed daily. The full grown larvae were transferred to fresh chimneys for pupation.
- At every successive instar, the larvae were gently transferred to other clean jars containing fresh leaves.
- After adult emergence, each pair male and female were released on cabbage plants raised earlier in the earthen pots. These pots were kept in cage of (50× 50 ×50 c.m.) for mating and egg laying.

The cotton swab soaked in 10% honey solution was provided as food to the adults. Freshly laid larvae were separated gently. Larvae and adults (ten in number) were anesthetized in 70% ethyl alcohol. Measurement was done with the help of graph paper, scale and eggs under a microscope fitted with an ocular micrometre.

Results

Investigations on bionomics of DBM were carried out in the laboratory condition by using cabbage plant leaves. The laboratory temperature during this period ranged between 25.12 °C – 38.9 °C. The results are being presented in table 1, 2.

From maintained culture of *Plutella xylostella*, the freshly hatched larvae were lifted gently, transferred to Petri dishes (10 cm) and provided with fresh leaves daily till pupation. Observations were recorded on number of instars, duration

of instars, colour changes etc. Period from hatching to first moulting was recorded as developmental period. The time interval between inactivation and pupal formation was recorded as pre-pupal duration in days. Time of pupa formation till the emergence of moths was recorded as pupal period. The total duration (days) of adult male and female from emergence till death were computed.

1. Incubation period

The freshly laid eggs were yellow to pale green and oval shaped, length ranged from 0.46 - 0.49 mm and breadth from 0.24 - 0.26 mm. The mean incubation period was recorded 4.4 ± 0.22 days. The period of incubation of egg was 4 - 6 days.

2. Larval period

The larvae passed through four instars. Their chewing resulted in irregular patches of damage, and the upper leaf epidermis often remained left intact.

The range for larval periods, 1st, 2nd, 3rd and 4th instars were recorded as 2-4, 2-3, 2-3 and 3-4 days with mean 2.5 ± 0.16 , 2.6 ± 0.16 , 2.3 ± 0.15 , 3.4 ± 0.17 days, respectively. The total larval period was observed for 10.7 ± 0.52 days with range 9-14 days.

Morphometrics (length × breadth) of first, second, third and fourth instars (mean not included in Table 4.8) were $(1.25 \pm 0.01) \times (0.17 \pm 0.02)$, $(3.14 \pm 0.01) \times (0.23 \pm 0.01)$, $(4.63 \pm 0.18) \times (1.09 \pm 0.01)$ and $(8.62 \pm 0.15) \times (1.34 \pm 0.01)$ mm, respectively. Range for the measurements of length of DBM larvae for different stages *ie.* 1st, 2nd, 3rd and 4th instars were recorded as 1.22-1.34, 2.78-3.53, 4.05-5.92 and 6.72-9.92 mm, respectively. Similarly range for breadth measurement for 1st, 2nd, 3rd and 4th instars were recorded as 0.16-0.20, 0.23-0.25, 1.09-1.18 and 1.32-1.50 mm, respectively.

The larval head capsule was grey green and that of fourth instar was greenish brown in colour. The larval head capsule in first, second, third and fourth instars were recorded as (0.11 ± 0.17) , (0.21 ± 0.31) , (0.33 ± 0.47) and (0.52 ± 0.61) mm with range variation as 0.11-0.17, 0.21-0.31, 0.33-0.47 and 0.52-0.61 mm, respectively.

Table 1: Duration of different stages in the life cycle of *Plutella xylostella* (Linn.) on cabbage

S. No.	Particulars/Stage	Duration (Days)		Mean ± SEM*
		Minimum	Maximum	
1.	Egg period	4	6	4.4 ± 0.22
2.	Larval period			
	I instar	2	4	2.5 ± 0.16
	II instar	2	3	2.6 ± 0.16
	III instar	2	3	2.3 ± 0.15
	IV instar	3	4	3.4 ± 0.17
	Total larval period	9	14	10.7 ± 0.52
3.	Pre-pupal period	1	2	1.2 ± 0.13
4.	Pupal period	3	6	4.6 ± 0.37
5.	Total (Pre-pupal + pupal period)	4	8	5.8 ± 0.39
6.	Egg to adult emergence period	17	28	19.2 ± 2.21
7.	Total duration of life cycle			
	Male	24	36	30.4 ± 0.98
	Female	27	41	34.17 ± 1.16
9.	Adult emergence (%)			
	Male	65%		
	Female	35%		
	Male female ratio	1:1.86		

Based on 10 individuals (two times)

Table 2: Morphometrics of *Plutella xylostella* (Linn.) on cabbage

S. No.	Particulars/Stage	Measurements		Head capsule width (mm)
		Length (mm) Range	Breadth (mm) Range	
1.	Egg 0.46-0.49		0.245-0.259	
2.	Larval instars			
	I instar	1.22-1.34	0.16-0.20	0.11-0.17
	II instar	2.78-3.53	0.23-0.25	0.21-0.31
	III instar	4.05-5.92	1.09-1.18	0.33-0.47
	IV instar	6.72-9.92	1.32-1.50	0.52-0.61
3.	Pupa 7.50-8.50		2.50-3.00	
4.	Adult wingspan (mm)			
	Male		12.25-13.00	
	Female		12.75-13.25	
5.	Adult			
	Male		4.75-5.00	
	Female		4.75-5.25	

Based on 10 individuals (two times)

3. Pupal period

The newly formed pupae were yellowish green in colour and it became brownish and gradually attained dark brown colour covered all around from silken thread by the time of adult emergence. The range of length and breadth of pupa recorded was 7.50-8.50 mm and 2.50-3.00 mm.

4. Adult stage

Diamondback moth is a small moth with long antennae. The colour of male and female was grayish. The adult moths had a line of three diamond shaped markings on middle of the back. Males were slightly smaller than that of females. The duration from egg to adult emergence was 19.2 ± 2.21 days with range of 17-28 days. Total duration life span of adult male and female was completed in 30.4 ± 0.98 and 34.17 ± 1.16 days, respectively.

The range of development period from egg to adult stage of male and female was observed as 24-36 days and 27-41 days, respectively. It confirmed that female were bigger than the male with higher longevity.

The range of adult wingspan recorded in male and female both were 12.25 - 13.00 mm and 12.75 - 13.25 mm, respectively. Length of adult male ranged from 4.75 to 5.00 mm whereas in female, ranged from 4.75 to 5.25 mm.

Adult emergence was calculated in per cent for male and female both were 65% and 35%, respectively.

Adult emergence per cent was calculated as

$$\text{Adult emergence (\%)} = \frac{\text{No. of male/female emerged}}{\text{Total no. of male and female}} \times 100$$

References

1. Furlong MJ, Wright DJ, Dosdall LM. Diamondback moth ecology and management: problems, progress, and prospects. Annual Review of Entomology. 2013;58:517-541.
2. Harcourt DG. Biology of cabbage caterpillars in eastern Ontario. Proceedings of the Entomological Society of Ontario. 1962;93:61-75.
3. Krishnamoorthy A. Biological control of diamondback moth, *Plutella xylostella* (Linn.), an Indian scenario with reference to past and future strategies. In: Kirk AA, Bordat D, editors. Proceedings of the International Symposium; 2002 Oct 21-24; Montpellier, France. Montpellier: CIRAD; 2004. p. 204-211.
4. Maisson BL. Insect pests of crucifers and their control. Annual Review of Entomology. 1965;10:233-256.

5. Paudel A, Yadav P, Karna P. Diamondback moth *Plutella xylostella* (Linnaeus, 1758) (Lepidoptera: Plutellidae): a real menace to crucifers and its integrated management tactics. Turkish Journal of Agriculture Food Science and Technology. 2022;10(12):2504-2515.
6. Tabashnik BE, Cushing NL, Johnson MW. Diamondback moth (Lepidoptera: Plutellidae) resistance to insecticides in Hawaii: intra-island and cross resistance. Journal of Economic Entomology. 1987;80:1091-1099.
7. Talekar NS, Shelton AM. Biology, ecology, and management of the diamondback moth. Annual Review of Entomology. 1993;38:275-301.