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Biology of diamondback moth, *Plutella xylostella* (Lepidoptera: Plutellidae) of cauliflower under laboratory condition

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Abstract

Diamondback moth, *Plutella xylostella* (L.) (Lepidoptera: Plutellidae), is cosmopolitan in its geographical distribution, occurring in all major zoogeographical regions of the World wherever crucifer crops are cultivated. *Plutella xylostella* is commonly known as diamondback moth, is a serious pest of crucifers throughout temperate and tropical climates. It is an important pest and the larvae feeds on the foliage of the cruciferous plants from the seedling stage. The biology of *P. xylostella* was studied to elicit information on first, second, third and fourth instars, pupa and adult emergence.

Keywords: Biology, *Plutella xylostella*, Brassica crops, larval instars

1. Introduction

Diamondback moth, *P. xylostella* (Linn.) is a major pest of cabbage and cauliflower has caused serious damage Worldwide. The biology of diamondback moth was studied by different researcher in India (Harcourt, 1957; Bhalla and Dubey, 1986; Chellian and Srinivasan, 1986)^[4, 1, 3]. It has an ability to survive a wide range of temperature, (Ooi, 1986)^[7] and prefer a warmer environment for its development (Hardy, 1938)^[7].

Cauliflower is an input intensive crop, which is prone to many insect pests especially to diamondback moth (Bonnemaïson *et al.*, 1965)^[2]. This is one of the most serious and widely distributed pests of the cruciferous crops in many countries including India. The diamondback moth feeds on cabbage (*Brassica oleracea* var. *capitata*), cauliflower (*B. oleracea* var. *botrytis*), broccoli (*B. oleracea* var. *italica*), radish (*Raphanus sativus*), turnip (*B. rapa pekinesis*), brussels sprouts (*B. oleracea* var. *gemmifera*) and kohlrabi (*B. oleracea* var. *gongylodes*) (Talekar and Shelton, 1993)^[8]. In view of the above problem, the present study was undertaken to study the biology of diamondback moth, *P. xylostella*.

2. Material and Methods

2.1 Biology of *P. xylostella* (L.)

The biology of diamondback moth, *P. xylostella* was studied under laboratory condition at 25±20°C constant temperature and natural conditions in relation to ecological factors. The cauliflowers were collected from the Saibaba colony market of Coimbatore district, Tamil Nadu, India. Fourth instar larvae were collected and adults were released with brassica leaves and cotton soaked with sugar solution in glass for egg laying and daily transfer of diamondback moth for incubation. After hatching of eggs, fresh leaves will be provided for pupation and adult were counted after emergence from pupa. Biology of *P. xylostella* was studied to elicit information on first instar, second instar, third instar, fourth instar, pupa and adult emergence.

3. Result and Discussion

Larvae of *P. xylostella* feed on the foliage of the cruciferous plants from the seedling stage to harvest and greatly reduce the yield and quality. *P. xylostella* has only become a significant pest, with major problems. Wing span of male and females were different from each other and it was larger in females than males. There was no difference between both sex lengths. Adult males live about 12 days and females live about 16 days.

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Table 1: Survival of different stages of *P. xylostella*

No. of eggs	Number survived		
	Egg stage (0 – 3days)	Larval stage (4–12 days)	Pupal stage (13–16 days)
20	20	18	18
20	20	18	17
20	20	20	20
20	20	20	17
20	20	18	18

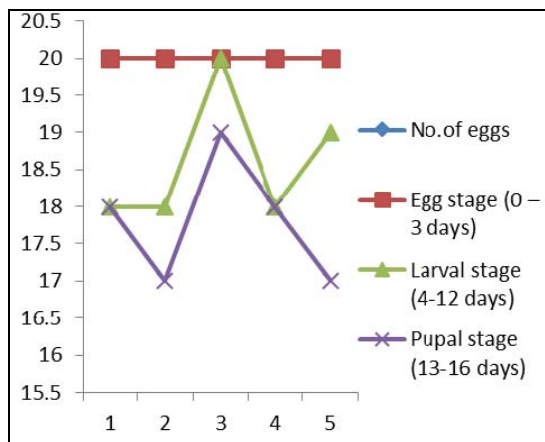


Fig 1: Survival of different stages of *P. xylostella*

Table 2: Life cycle of *P. xylostella*

Stage	Laboratory Condition
First instair	17.06±6.37
Second instar	15.70±6.22
Third instar	13.31±5.89
Fourth instar	11.17±5.02
Prepupae	9.68±5.12
Pupae	8.96±5.81
Adult	8.35±5.14
Male	3.56±2.38
Female	4.81±2.86

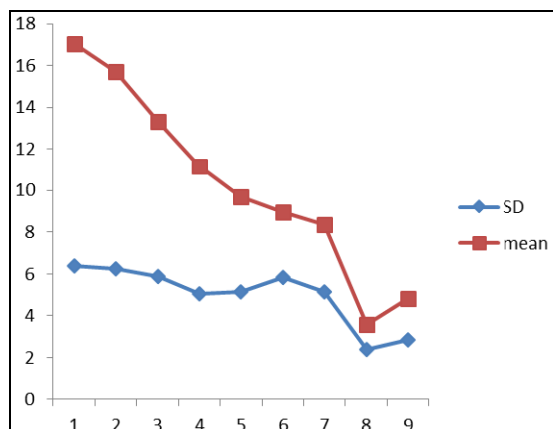


Fig 2: Life cycle of *P. xylostella*

3.1 Egg

Eggs are oval and protuberant in shape and lubricant pale to strong yellow in colour and hatching occurred in 2 to 3 days in laboratory conditions (Table 1&2). The incubation period of egg was 2 days. Mated females start laying eggs singly or in group 2 to 4 after one day of mating. 200 eggs are laid by a single female in field condition while 140 to 175 eggs in

laboratory condition. Duration of life span was 3 to 4 days in laboratory and 8 to 10 in field condition (Patil and Pokharkar, 1971)^[7]. Mated females started laying eggs in groups and 300 eggs were laid by single female in laboratory condition were observed in the present study.

3.2 Larval instars

The diamondback moth has four instars. First instar development was completed about 2 to 3 days (Fig 1&2). At early first instar larva head capsule was too wide than the body was observed in the early stages of first instar larva. Larvae feeds on lower leaf surface and end of the larval period it was pale yellow in colour and gradually become pale green to dark in other instars. Throughout their developmental period, larvae remain quite small and active. If disturbed, they often wriggle violently, move backward and spin down from the plant on a strand of silk.

The developmental period of second, third and fourth instars were lasted about 2-3 days. There are no differences between late first instar and early second instar in both length and weight. The body was transparent at early instar but it became cream colour with light green. In the second instar, larval cuticle and made an emergence hole on the lateral side of abdomen segments, there after third instar emergence from the host larva and spin a cocoon immediately beside the host. The body colour of parasitoid larvae was yellowish in green. While spinning cocoon, the colour of larvae change to yellowish white.

There are two inactive and non feeding stages called pre-pupa and pupa. The duration of pre-pupa was lasted for 2 days. prepupa moult in its cocoons and larval skin remains attached to the posterior end of the pupa. Development of pupal period was completed 3-4 days. Pupation occurs in a loose silk cocoon and usually formed on the lower or outer portion of the leaves. The duration of the cocoon averages about 7.5 days. The cocoon was oval and its colour was opaque white with a light green tint and was inclined to pale cream at end.

The newly hatched larvae emerged from the egg have pale brown colour head and similar observations were recorded by Chelliah and Srinivasan in 1986 that newly hatched larval head were pale brown in colour. The emergence of first instar moults beneath the leaf and there after feed on the lower surface of the leaf. The third instar feed more vigorously than first and second instar. Fourth instar larvae also feed like third instar larvae but before pupation it minimize the feeding and stop covered into pre-pupa (Jayarathnam, 1977)^[5].

4. Conclusion

Plutella xylostella is a serious threat to successful prediction of cruciferous vegetables. knowledge of the biology of Diamondback moth influences the host plant quality and helps in the management of this insect.

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