

Biology of diamondback moth, *Plutella xylostella* (Linn.) on *Brassica juncea* cv. PUSA BOLD

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Biology of diamondback moth, *Plutella xylostella* was studied under protected natural and laboratory condition on mustard crop. Oviposition period 4.5 ± 0.38 days of *Plutella xylostella* in field condition while, 6.5 ± 0.41 days in laboratory condition. It passed through four instar, the larval periods are 9.5 ± 0.36 , 16.5 ± 0.41 , 7.5 ± 0.79 and 7.5 ± 0.72 days, respectively. The pupal period ranged from 10.0 ± 1.58 days. Adult longevity of males and females 12.5 ± 1.11 and 20.0 ± 1.00 days in field condition. In laboratory condition the larval periods ranged from 5.0 ± 0.55 , 3.5 ± 0.60 , 4.0 ± 0.45 and 3.5 ± 0.85 days and the pupal period ranged from 4.50 ± 1.11 days. The adult longevity of males and females 8.0 ± 0.70 and 11.0 ± 0.82 days. The life period of males and females 64.5 ± 5.02 and 72.0 ± 5.09 days in field condition while, in laboratory condition 32.5 ± 4.03 and 35.5 ± 4.32 days.

Key words : Biology, *Plutella xylostella*, *Brassica juncea*, Temperatures, Relative humidity etc.

INTRODUCTION

Diamondback moth, *Plutella xylostella* (Linn.) is a major pest of cabbage and cauliflower has caused serious damage world wide. The biology of diamondback moth was studied by different diamondback moth researcher in India *i.e.* (Harcourt, 1957, Bhalla and Dubey, 1986, Chellian and Srinivasan, 1986) revealed a variation in various parameters due to damage in environmental condition and different location. Diamondback moth has an ability to survive a wide range of temperature (Ooi, 1986). According to Hardy (1938), prefers a warmer environment for its development and he suggested the Mediterranean region as its most probable. Originated habitat diamondback moth is an oligophagous insect and feed on plants that contains mustard glycosides (Thorsteinson, 1953). Indian mustard (*Brassica juncea* (L) Czern) was reported to be a host for diamondback moth (Jayarathnam, 1977, Singh and Rawat, 1983). The diamondback moth also feeds on large number crucifers plants which considered to be weeds diamondback moth maintains itself on these weeds only in the absence of more proved cultivated host (Talekar and Shelton, 1993). The host range of *Plutella xylostella* is limited to crucifers because they contain mustard oils and their glycosides (Gupta *et al.*, 1960, Hillyer and Thorsteinson, 1971, Nayar and Thorsteinson, 1963, Thorsteinson, 1953 and 1955). In Kenya farmers reports that *P. xylostella* has expanded, its host range to include sugar snap. Peas mangietous and *Lisianthus*, (Lohr, 2001, Rossbach and Lohr, 2006). The mustard (*Brassica juncea*) is a second alternative

host of diamondback moth. The study of biology on mustard may be highly useful in IPM Gazette.

MATERIALS AND METHODS

The biology of diamondback moth, *Plutella xylostella* was studied under protected conditions on mustard crop and laboratory condition at $25 \pm 2^{\circ}\text{C}$ constant temperature. In laboratory condition adults are released with mustard leaves and cotton soaked with sugar solution in glass jar covered with muslin cloth for egg laying and daily transfer of DBM eggs place for incubation. After hatching of eggs daily provided fresh leaves till pupation and adult were counted after emergence from pupa. In field condition seed of mustard, *Brassica juncea* var. Pusa Bold were sown in plots measuring $2 \times 1 \times 1.5$ m (LxWxH) in *rabi* season. All agronomic practices were carried out along with dosage of fertilizers *i.e.* NPK 30 days after germination, thinning was done on 25 days after germination where row to row distance was 40 cm and interplant distance maintained at 45 cm. These plots were covered over by nylon net ($2 \times 1 \times 1.5$ m) and then released a pair of copulated diamondback moth and it was replicated three times.

RESULTS AND DISCUSSION

Eggs:

The mating takes place after few hours of emergence and only once in their life span of but male more than one time (Wang *et al.*, 2005). Mating pairs remain in copulation for 1-2 h at in laboratory condition but extend to 3 h in

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Table 1 : Lifecycle of diamondback moth, *Plutella xylostella* (Linn) on mustard under field condition

Items	Field condition	Temperature (°C)			Relative humidity (%)		
		Maximum	Minimum	Average	Maximum	Minimum	Average
Oviposition period (days)	4.5±0.38	19.86	16.78	18.32	71.00	58.6	66.8
Egg viability (%)	91.5±0.35	15.74	10.88	13.31	85.83	65.79	75.81
Larval period (days)							
1 st instar	9.5±0.36	15.40	10.00	12.70	85.66	71.85	78.75
2 nd instar	16.5±0.41	15.28	10.01	12.64	79.09	84.90	81.99
3 rd instar	7.5±0.79	16.75	10.55	13.65	83.00	75.50	78.75
4 th instar	7.5±0.72	16.75					
Total	32.00 (29-35)						
Larval mortality (%)	44.5±2.69						
Pupal period (days)	10.0±1.58	18.91	11.36	15.13	78.50	73.00	75.75
Pupal mortality	16.05±2.06						
Adult longevity (days) Male (♂)	12.5±1.11	18.50	12.81	15.66	75.50	78.80	77.15
Female (♀)	20.0±1.00	17.32	10.61	13.96	76.00	80.50	78.25
Lifecycle (days)							
Male (♂)	64.5±5.02						
Female (♀)	72.0±5.09						

field condition. Mated females start laying eggs singly or in group 2-4 after one day of mating. 200 eggs are laid by a single female in field condition while 140-175 eggs in laboratory. Duration of life span was 3-4 days in laboratory but 8-10 in field condition. While 4 to 6 were obtained under laboratory condition (Patil and Pokharkar, 1971) and 3-4 days under laboratory and field condition (Jayarathanam, 1977).

Larvae:

The newly hatch larvae are pale brown head while the fully grown caterpillar one light green measuring 10 mm (Chelliah and Srinivasan, 1986). The larvae soon after hatching make hole from side of the leaves and start mining. The entry was marked by very small dot like scratched area. (Nirmala Devi and Desh Raj, 1995). Initially the feeding habit of first instar larvae is leaf mining, although they are so small that the mines are difficult to notice. The larvae emergence from their mines at the conclusion of the first instar moult beneath the leaf and thereafter feed on the lower surface of the leaf. The chewing results irregular patches of damage and upper layer of epidermis is often left intact. The first instar larvae is 0.05-0.1 cm. The first instar larvae moult and change in to second instar after 4-5 in laboratory and 9-10 days in field condition. The second instar larvae is more potential than first and change into third instar 3-4 in laboratory condition and 8-9 days in field condition. The third instar feed more vigorously than first and second instar more vigorously than first and second. 3-4 days in laboratory and 7-8 days in field it field it change into fourth

instar larvae. Fourth instar also feed like third but before pupation its minimize the feeding and latterly stop covered into pre-pupa. Jayarathnam (1977) reported that them were only four instars. At the slightest disturbance the larvae wriggled actively and dropped down the leaf suspending themselves by silken threads (Bhalla and Dubey, 1986).

Pupa:

Before pupation the leave stopped feeding, became

Table 2 : Life cycle of diamondback moth, *Plutella xylostella* (Linn) on mustard under Laboratory condition

Items	Laboratory condition (25±2°C)
Oviposition period (days)	6.5±0.41
Egg viability (%)	94.5±0.38
Larval period (days)	
1st instar	5.0 ± 0.55
2 nd instar	3.5 ± 0.60
3 rd instar	4.0 ± 0.45
4 th instar	3.5 ± 0.85
Total	15.50 (12-17)
Larval mortality (%)	43.01±2.23
Pupla period (days)	4.50 ± 1.11
Pupal mortality (%)	20.07 ± 0.71
Adult longevity (days)	
Male (♂)	8.0 ± 0.70
Female (♀)	11.0 ± 0.82
Lifecycle (days)	
Male (♂)	32.5 ± 0.43
Female (♀)	35.5 ± 4.32

sluggish and selected a concavity near the midrib on ventral surface of and older leaf (Nirmala and Desh Raj, 1995). The pre-pupal stage are few hours its secrete the silicon thread and covered the body completely and convert into pupa. The mature pupa are 6 mm long and of light brown colour (Bhalla and Dubey, 1986). The pupal periods ranges in 4-5 days in laboratory and 9-11 days in field.

Patil and Pokharkar (1971) report the pupal periods to vary from 3-7 days with an average of 5 days. Jayarathnam (1977) reports the pupal period lost up to 4 days in the hot and rainy season and 4-5 days in the cold season.

Adult:

Adults are grey or brownish in colour it distinguish by having three pale triangular markings along the margin of the wings. Moth prefer to rest under the leaves and in protective plant structure. In field condition moth are more active and fly around the plants searching for the mate on place to deposit the eggs of *Plutella xylostella*.

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