Ecology and Behaviour of *Plutella xylostella* IV. Fecundity with and without Host Plant[1]

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ABSTRACT

The adults of *Plutella xylostella* L. lay different numbers of eggs in the presence and absence of the host plant. Experiments were carried out in controlled environment rooms (20°C, 16 h light/day, 44% - 52% relative humidity). Specially developed, individual oviposition cages were used. The mated females in presence of the host plant lived a maximum of sixteen days, and in its absence 28 days. The females started to lay within 24 h; in the absence of the host plant, there was a pre-oviposition period of one day in a few females. The maximum number of eggs laid per female in one day was 56 in the absence and 86 in the presence of the host plant. The females laid until the day they died. The mean oviposition period was 11.3 d for females in the presence of the host plant, and 18.6 d in its absence. The mean and standard deviation of the number of eggs/female was 246.4 ± 29.9 in presence and 162.9 ± 11.2 in absence of the host plant.

COMPENDIO

Los adultos de *Plutella xylostella* (L.) ponen diferente número de huevos en la presencia o en la ausencia de la planta hospedadora. Se llevaron a cabo experimentos en cuartos de ambiente controlado (20°C, 16 horas luz por día, 44% - 52% de humedad relativa). Se usaron jaulas individuales de oviposición especialmente diseñadas para el estudio. Las hembras apareadas en presencia de la planta hospedadora vivieron un máximo de dieciséis días, y aquellas apareadas en su ausencia, un máximo de veintiocho días. Las hembras comenzaron a poner huevos en las primeras veinticuatro horas; aunque en la ausencia de la planta hospedadora hubo un período de pre-oviposición de un día en unas pocas hembras. El número máximo de huevos puestos por hembra en un día fue de 56 en ausencia de la planta hospedadora y de 86 en su presencia. Las hembras pusieron hasta el día en que murieron. El período medio de oviposición fue de 11.3 días por hembra en presencia de la planta hospedadora y de 18.6 días en ausencia de ésta. La media y la desviación estándar del número de huevos por hembra fue 246.4 ± 29.9 en presencia de la planta hospedadora y 162.9 ± 11.2 en su ausencia.

INTRODUCTION

The diamondback moth, *Plutella xylostella* L. (Lepidoptera: Plutellidae), is a very serious pest of cruciferous crops in all the countries where these vegetables are cultivated (2, 3, 5, 6). The economic importance of the species is highlighted in the presentations given in three recent international meetings convened to discuss its biology, ecology, damage and control: the First International Workshop on Diamondback Moth Management, Tainan, Taiwan, 1985; The International Workshop on Integrated Pest Management of Cabbage, El Zamorano, Honduras, 1988; and the Second International Workshop on the Management of Diamondback Moth and Other Crucifer Pests, Tainan, Taiwan, 1990.

MATERIALS AND METHODS

Fecundity was studied under constant conditions described previously by Salinas (5) and summarized as follows: 20°C temperature, 16 h light/day from six 125-watt fluorescent tubes, and 44% - 52% relative humidity.

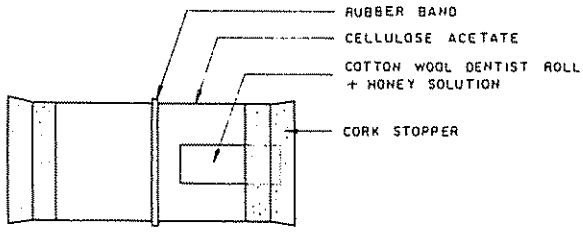

Fig. 1. Fecundity cage

Recently-emerged adults were paired in individual oviposition cages especially developed for the study. Each cage consisted of a piece of thin transparent

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cellulose acetate (5 x 10 cm) rolled into a cylinder and held by a rubber band at the middle with two cork stoppers of 2.5 cm diameter at each end (Fig. 1). These cages have the advantages of being small and easy to store, unbreakable, and can be opened for the examination and collection of eggs, and cleaning. One of the cork stoppers had a hole in the center to hold half of a dental cotton wool roll impregnated with a honey solution. Inside the cage, a piece of leaf from a young cabbage leaf was introduced together with a pair of recently-emerged adults. Every day the adults were transferred to new cages, and the number of eggs laid was recorded.

RESULTS

The longevity was recorded in mated females only, and there was a great difference between those which were kept in the presence of the host plant (a piece of cabbage leaf inside the oviposition cage) and those kept in its absence. Those kept in the presence of the host plant lived for a maximum of 16 d and those kept without the host plant lived for 28 d (Fig. 2). This difference may be because the female, in the presence of the host plant, laid more eggs than in its absence and therefore deteriorated more quickly, having fulfilled her biological function.

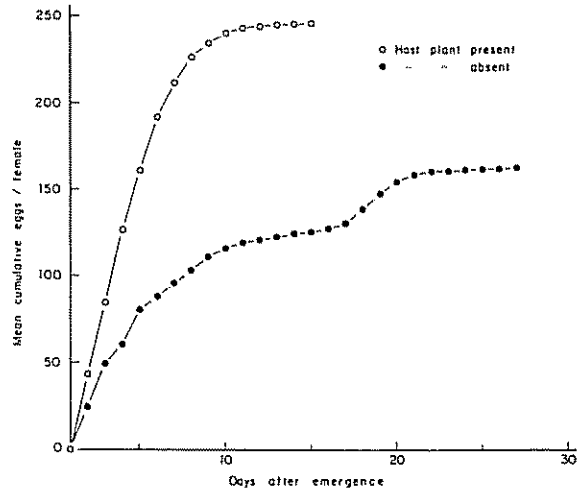

Fig. 3. Fecundity (mean cumulative number of eggs per female)

Fecundity was recorded in terms of eggs laid daily (Figs. 3 and 4). The adults were paired on the day of emergence and normally the females started to lay within 24 h, although, in the absence of the host plant,

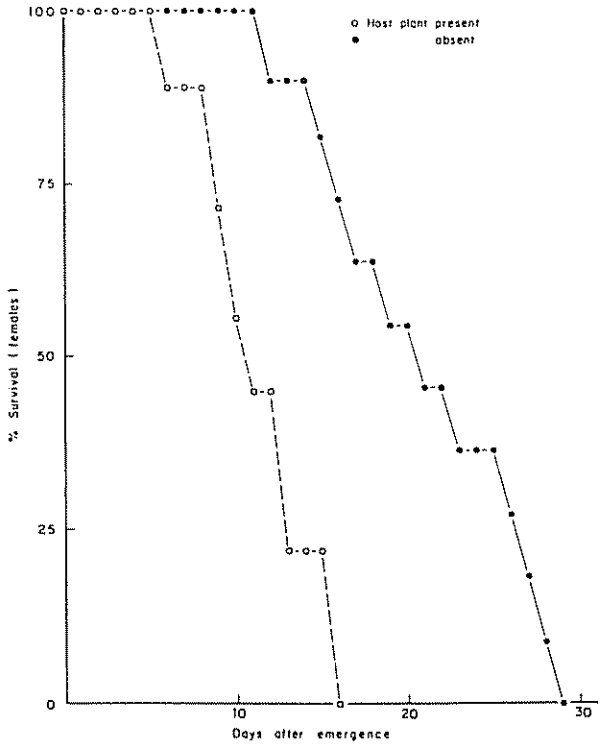

Fig. 2. Adult (females) longevity.

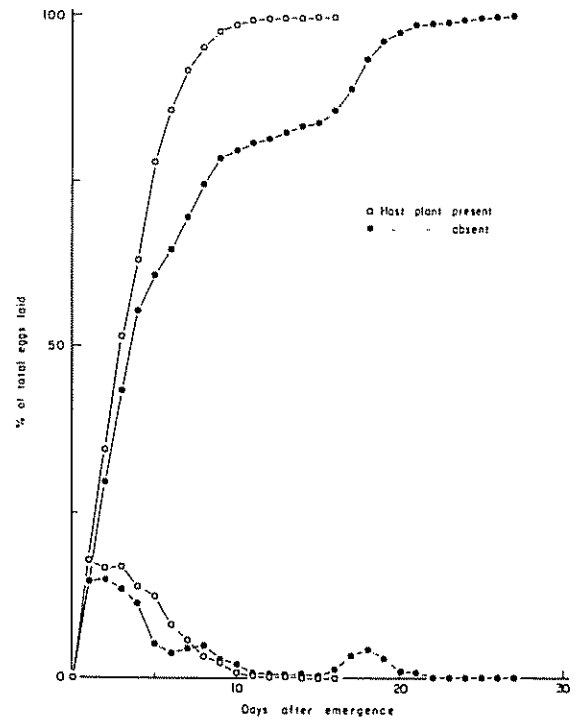

Fig. 4. Oviposition pattern (daily and cumulative).

Table 1. Longevity and fecundity.

	Number observed	Mean + (Range) Oviposition period	Mean Longevity (days)	Eggs/female (Mean ± S.E.)
Females in presence of host	8	11.3 (7-16)	11.4 (8-16)	246.4 ± 29.9
Females in absence of host	11	18.6 (5-27)	19.7 (11-27)	162.9 ± 11.2

there was a pre-oviposition period of one day in a few females. The maximum number of eggs laid by one female in any day was 56 in the absence and 86 in the presence of the host plant. The females generally laid until the day they died, although those kept in the absence of the host plant laid no eggs at all for up to 10 days and then began laying, sometimes more than they did prior to the resting period (Fig. 4). This is probably due to behavioral rejection by the female in the absence of the host plant, as later it was forced to oviposit as eggs accumulated inside.

The average number of eggs/female laid in the absence of host plant was 162.9, compared with 246.4 in the presence of the host plant (Table 1).

DISCUSSION

No significant pre-oviposition period was found, in contrast to the findings of Hyllier and Thorsteinson (1) who observed a mean pre-oviposition period of 4.2 days for mated females and 8.6 days for virgin ones. They also found that, of 67 freshly-emerged females, only nine contained eggs, and the rest had only immature cocytes in the ovaries. In the present study, virgin females were dissected within a few hours of emergence. All the ovaries were normally developed and contained mature eggs, immature eggs and cocytes. As it is difficult to differentiate the cocytes in the last section of the ovalioles, about 1 mm in length, they were not counted. The mean number of recognizable eggs contained in the four ovarioles of each ovary of newly emerged females were:

Right ovary: 123 eggs + cocytes
Left ovary: 131 eggs + cocytes
Total: 254 eggs + cocytes

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