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Research Note

Cotesia plutellae (Kurdj.), a promising larval parasitoid of *Plutella xylostella* (Linnaeus) in Manipur

O. HEMCHANDRA and T. K. SINGH
Entomology Research Laboratory, Department of Life Sciences
Manipur University, Canchipur 795 003, Manipur, India
Email: hemchandra21@rediffmail.com

ABSTRACT: **In the field the extent of parasitism of *Plutella xylostella* larvae by *Cotesia plutellae* ranged from 5.50 to 36.80 per cent during 2001 and 10.00 to 36.00 percent during 2002 in Manipur. The parasitoid was active from first week of February to second week of April. The maximum parasitisation of 36.80 % on 3rd week of March, 2001 and 36.00 % on 4th week of March, 2002 synchronized with the maximum incidence of host larvae. The activity of parasitoid was found to have a significant positive correlation with incidence of host larval population, temperature and sunshine, negative correlation with relative humidity and total rainfall in both the cropping seasons.**

KEY WORDS: *Cotesia plutellae*, parasitism, parasitoids, *Plutella xylostella*, seasonal incidence

Diamondback moth (DBM), *Plutella xylostella* (Linnaeus), is a serious pest of cruciferous vegetables all over the world and causes upto 100 percent yield loss (Cardleron & Hare, 1986). It has developed resistance to various insecticides including bacterial pathogen, *Bacillus thuringiensis* (Liu and Tabashnik, 1998; Ramachandran *et al.*, 1998). For effective management of DBM, greater emphasis is now being laid on the interrelationship between the host and its natural enemies. Several natural enemies had been reported to regulate the DBM populations in nature (Lingappa, *et al.*, 2000). Among them *Cotesia plutellae* Kurdj. is an important larval endoparasitoid and causes to 52 % (Jayarathnam, 1977) to 75 % (Nagarakatti and Jayanth, 1982) parasitisation under natural condition. Therefore, studying the activity of this parasitoid in relation to abiotic factors and the role it played in the management of *P. xylostella* in nature, needs exploration for the formulation of future bio-intensive management strategy of *P. xylostella*. In view of this as well as the economic importance for both host and its parasitoid in cruciferous crop ecosystem in Manipur, the present investigation was conducted.

The field observation on the population build up of *P. xylostella* was recorded on unsprayed cauliflower late variety (Snowball) in Experimental field of Entomology, Department of Life Sciences, Manipur University, Canchipur, at weekly interval for two successive cropping seasons of 2001 and 2002. There were five plots having the size of 4 X 2 m^2 with 65 cm between the rows. The population assessment of the pest was made by direct counting of the larvae present on 25 randomly selected plants at weekly interval (5 plants in each plot).

For assessing the percentage of parasitism a total of 20 – 250 larvae of *P. xylostella* (depending on the density of host larvae) were collected from 50 randomly selected plants per week in both the cropping seasons. The collected larvae were brought and kept at ambient temperature of 19.28 - 22.07°C and relative humidity of 72.19 - 78.56 percent in the laboratory by rearing them on unsprayed cauliflower leaves in glass tube (16 X 2.5 cm) covered with muslin cloth. The leaves were changed regularly as and when required until pupation of the pest or parasitoid was observed. Data recorded on percent parasitism were correlated with the meteorological variables such as temperature, relative humidity, total rainfall, sunshine and subjected to multiple regression analysis as suggested by Gomez & Gomex (1983).

Though the parasitoid activity was noticed in last week of January, larval parasitisation could be recorded only after the appearance of pest from first week of February (Fig. 1a & b). The parasitoid remained active on cauliflower till second week of April in both the cropping seasons (Fig. 1a & b) when the temperature, relative humidity, total rainfall and sunshine ranged 14.63 - 23.05°C, 43.50 - 72.07 percent, 0.00 – 35.20 mm and 5.61 – 8.96 hrs, respectively. Similar results were obtained by Chandramohan (1994) in Nilgiris. In contrast, Kandoria *et al.* (1996) reported the activity of this parasitoid throughout the year except in December in Punjab.

In the present investigation the activity of this parasitoid commenced from 5.55 percent and 10.00 percent when the mean DBM larval density was 0.50 larvae/plant and 0.55 larvae/plant in 2001 and 2002, respectively (Fig. 1a & b). The peak parasitism of 36.80 percent and 36.00 percent was noticed in third week of March in 2001 (Fig. 1a) and fourth week of March in 2002 (Fig. 1b) when the temperature, relative humidity and sunshine value were 18.86°C & 21.00°C, 43.50 percent & 46.93 per cent and 8.91 & 6.61 hours, respectively. The corresponding mean DBM larval population was 56.80 larvae/plant and 30.05 larvae/plant in 2001 and 2002 (Fig. 1a & b). Thereafter, the percent parasitism gradually decreased and reached 10.00 and 12.00 corresponding with the DBM larval population density of 23.55 and 21.75 larvae/plant during second week of April in both the years (Fig. 1a & b). Chandramohan (1994) also observed similar finding. However, Kandoria *et al.* (1996) noticed 54.54 % during May; Nagarkatti and Jayanth (1982) reported 75.00 per cent parasitisation was observed during August – September and Yadav *et al.* (1975) reported 71.70 per cent parasitisation in the first week of September.

The percentage of parasitisation by *C. plutellae* exhibited significant positive correlation with the host population in both the cropping seasons. Among the abiotic factors significant positive correlation with temperature and sunshine and significant negative correlation was observed with relative humidity and total rainfall in the second cropping season (Table 1). The regression studies of the data pooled over two years ($X_1 = -48.07 + 0.13X_2 + 0.12X_3 + 0.48X_4 - 0.32X_5 + 3.97X_6$) indicated strong combined influence of abiotic factors on the parasitisation of *C. plutellae* with coefficient of multiple determination (R^2) of 81.1 per cent.

It is concluded that the maximum percentage of parasitism synchronised with the maximum incidence of host larvae and *C. plutellae* appears

Table 1. Correlation coefficients of *C. plutellae* with relevant biotic and abiotic factors

Crop seasons	Larval population (X)	Temperature (°C)	Relative humidity (%)	Rainfall (mm)	Sunshine (h.)
2001	0.813*	0.273	- 0.396	-0.136	0.237
2002	0.789*	0.582*	- 0.769*	-0.693*	0.565*

* Significant 5 % level

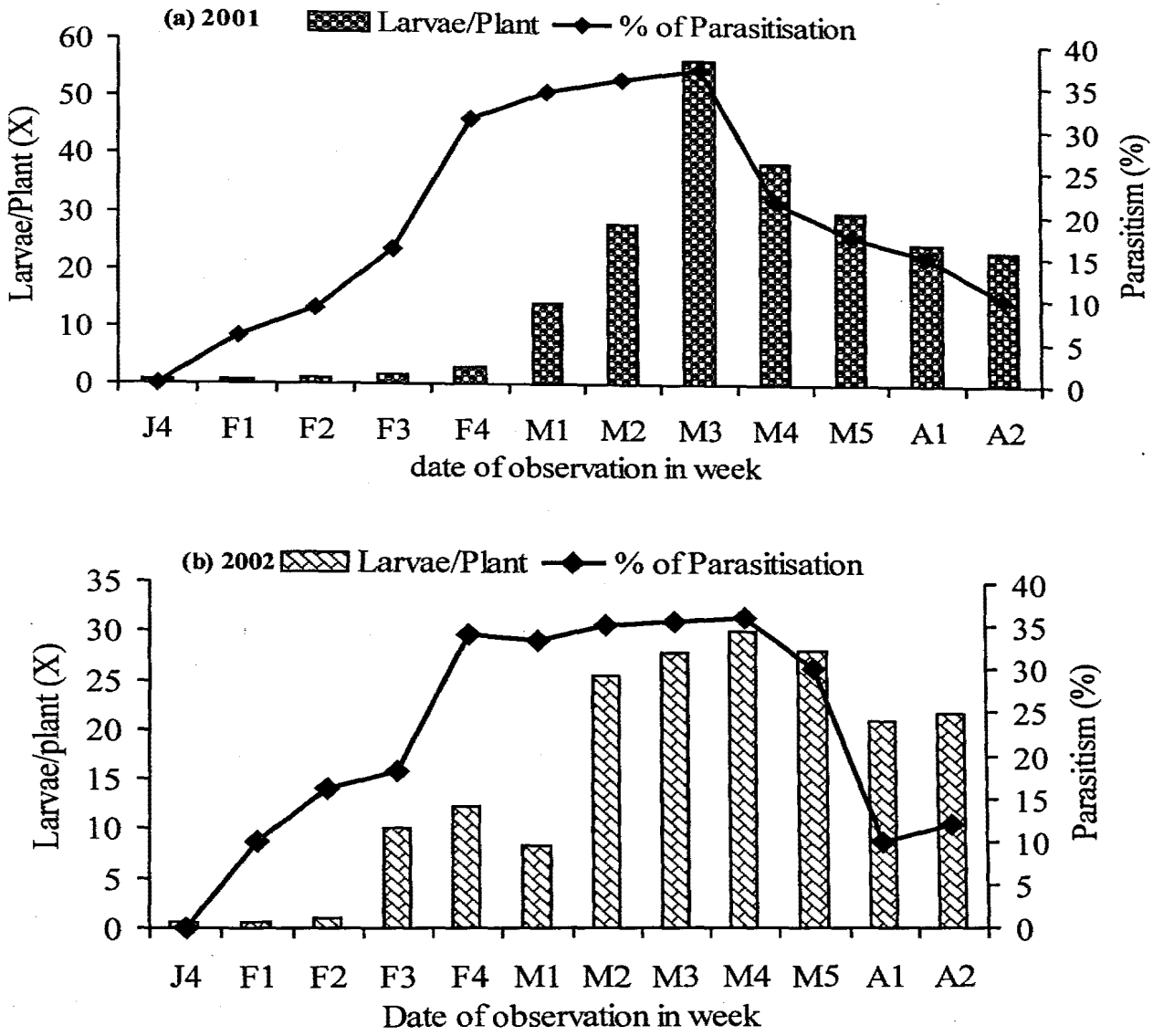

Fig. 1: Natural parasitism of *C. plutellae* and *P. xylostella* population

to be the most promising larval endoparasitoid of *P. xylostella*. However, the biocontrol potential of *C. plutellae*, in terms of conservation and augmentation needs further exploration.

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