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Influence of Abiotic Factors on the Occurrence of Three Major Parasitoids of *Diaphania indica* (Lepidoptera:Pyralidae)

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ABSTRACT

A three year study on the influence of abiotic factors on the occurrence of major parasitoids associated with the pumpkin caterpillar, *Diaphania indica* (Saunders) revealed that *Apanteles taragamae* Vier.and *Goniozus sensorius* Gordh were active during the cooler months of the year (October-April) indicating that temperature had a negative influence on their occurrence. The activity of *Apanteles machaeralis* Wilkinson was maximum from April to August and its occurrence was positively influenced by temperature.

Key Words : *Diaphania indica*, parasitoids, influence of abiotic factors

The pumpkin caterpillar, *Diaphania indica* (Saunders) has been reported from several parts of India and other regions of the world as causing damage to various cucurbitaceous plants. Literature on the natural enemy complex of *D. indica* is very meagre. During the course of the studies on the bio-ecology of *D. indica*, three prominent parasitoids, *Apanteles taragamae* Viereck, *Apanteles machaeralis* Wilkinson and *Goniozus sensorius* Gordh were observed. In the present investigation, the seasonal incidence of these three parasitoids was studied for three years in relation to abiotic factors like temperature and relative humidity.

MATERIALS AND METHODS

The study was conducted at the research farm of the Fredrick Institute of Plant Protection and Toxicology for a period of three years from January 1985 to December 1987. One hundred larvae were collected from an unsprayed crop of *Coccinia grandis (L.)* Voight at weekly intervals and held individually in specimen tubes (10 x 2cm) covered with cotton plugs. The larvae were reared continuously on *Coccinia* leaves until emergence of parasitoid and pupation. Mean per cent parasitism exerted by each of the three different species of parasitoids was worked out for each month and year-wise. The data were later subjected to regression analysis. The rainfall data for the three years were also recorded but its influence on the parasitoids was insignificant.

RESULTS AND DISCUSSION

The results of the three year study conducted on the seasonal occurrence of the three major parasitoids of *D. indica* is summarised in Fig. 1.

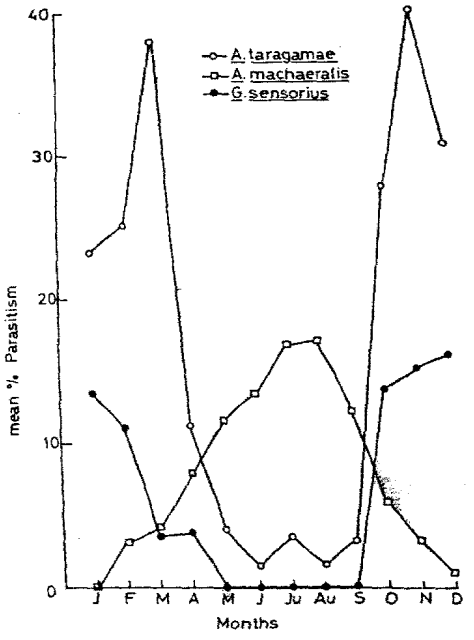

Fig. 1. Extent of parasitism by major parasitoids of *D. indica*

1. *Apanteles taragamae*

This parasitoid has not been reported on *D. indica* earlier, though it has been reported from the gourd semi looper *Plusia peponis* Fb. (Bhatnagar, 1948)

The observations recorded for the three years indicated that the maximum activity of the parasitoid was from January to April and October to December. Maximum parasitism of 40.62% was recorded during November alone. The parasitism between May and September remained very low. It was observed that temperature had a negative influence on the activity of *A. taragamae* in terms of parasitism (Y=121.0691-3.6288X). The analysis indicated that for every one degree increase in temperature, the extent of parasitism decreased significantly by 3.62%.

The influence of relative humidity on parasitism by *A. taragamae* was found to be positive (Y= -51.4017 + 1.0898 x). This Study also indicated that temperature range of 22 to 28° C and relative humidity of 67.17 to 89.13% appeared to be highly favourable for the activity of *A. taragamae*.

2. *Apanteles machaeralis*

A. machaeralis a solitary endo parasitoid, first described by Wilkinson (1928) from *Hapalea machaeralis* Walker was reported earlier to parasitize on *D. indica* (Bhatnagar, 1948).

The peak period of occurrence of *A. machaeralis* was between May and September. During this period, the maximum parasitism of 17.19 and 17.41% was recorded during July and August, respectively. Its activity from January to April and October to December was very low or completely absent.

The regression analysis of the data on parasitism revealed that there was a significant increase in the parasitism with increase in temperature (Y= -28.2824 + 1.2968 x). For every one degree increase in temperature, there was a significant increase in the rate of parasitism to the extent of 1.29%. Relative humidity did not exhibit any definite influence on the activity of the parasitoid.

These observations indicated that a temperature range between 28 to 32°C was favourable for the activity of this parasitoid. When temperature decreased below 26°C, parasitism by *A. machaeralis* decreased considerably.

3. *Goniozus sensorius*

The seasonal occurrence of *G. sensorius* followed a definite trend. During all the three years, it was found to be active from January to April and again from October to December. It was observed that temperature had a negative influence on the activity of *G. sensorius* in terms of parasitism (Y= 62.3921 - 1.19116 x). For every one degree increase in temperature, there was a significant reduction in parasitism to the extent of 1.19%. The analysis also indicated that relative humidity had a consistent and positive effect on the activity of *G. sensorius* (Y= -38.0157 + 0.7259 x). At higher levels of RH, there was a significant increase in the parasitism of *G. sensorius*. The study indicated that *G. sensorius* was active during the cooler months of the year and a temperature range between 22 to 26°C and 54 to 74% RH appeared to be favourable for its activity.

It is evident from this study that among the three parasitoids, *G. sensorius* was the most sensitive to the effect of abiotic factors and its activity was severely curtailed by the higher temperature conditions.

The present study has indicated that the activity of all three parasitoids of *D. indica* were greatly influenced by the role of abiotic factors. However, it was interesting to note that the distribution of their activity in a year is rather specific and restricted to certain periods of the year in terms of host- parasitoid(s) association. *A. taragamae* and *G. sensorius* occur during the cooler months of the year

complementing the role of each other, while *A. machaeralis* became active during the summer months when the former two parasitoids were absent. Thus, there was a continuity in the host- parasitoid interaction throughout the year though different parasitoids were involved at different periods. The host insect, *D. indica* occurred as a pest on *Coccinia grandis* throughout the year. This information on the influence of abiotic factors will be useful while deciding whether these parasitoids can be introduced into other areas for the control of *D. indica* or related *Diaphania* spp.

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