Wasps—Predators of *Heliothis* on Pigeonpea

Heliothis armigera, which is the major pest of pigeonpea in most areas of the Old World, has many natural enemies. At ICRISAT we are exploring the possibilities for increasing the effectiveness of these in reducing the losses caused by this pest. Bhatnagar (1981) recorded that the mud-wasp, *Delta conoideum* (Gmelin), preyed upon *H. armigera*, and that up to 26 larvae could be found in a single group of mud cells.

In 1981-82 we conducted studies of mud wasps in a field cage and in crops in open fields at ICRISAT Center. We recorded that *D. pyriforme* (Fab.) and *D. campaniforme esuriens* (Fab.) as well as *D. conoideum* preyed upon *Heliothis* larvae (Fig.1). *D. campaniforme esuriens* preyed mainly upon 2nd and 3rd instar larvae while the other two species preferred the larger 4th-6th instar larvae. Several other lepidopteran larvae were also collected by these wasps including *Plusia* spp.

We kept the wasps in a field cage (2.5 x 2.0 x 1.5 m) placed on an Alfisol. A small pool of water was provided and *Heliothis* larvae were placed on pigeonpea plants grown in pots inside this cage.

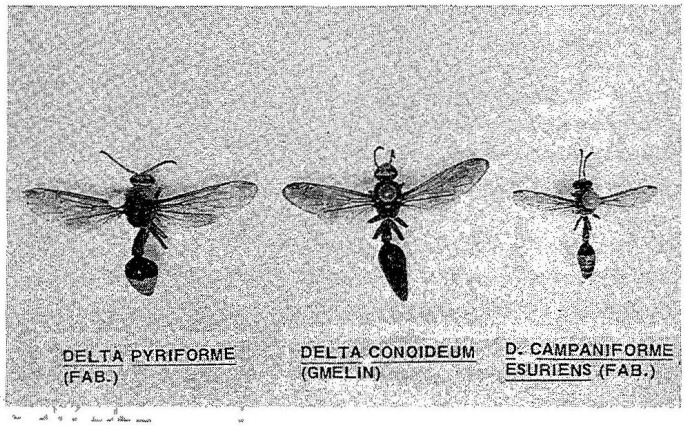

Figure 1. Three species of wasp found to prey on larvae of Heliothis armigera *at ICRISAT Center, Patancheru, India.*

The wasps were seen to drink water and then regurgitate onto the soil to make a small mud ball. The mud ball was then carried between the fore legs and mouthparts to a solid surface and used for the construction of the cells making up a "nest." In the cage the nests were built on the metal cage supports while in the fields they were found on rocks, trees, and buildings. A single drink of water appeared to be sufficient for the preparation of two or three mud balls and five or six balls were generally required to construct each cell. In the cage the nests consisted of five to eight cells but in the field there were up to 16 cells in a nest. Most nests found in the field were constructed with red soil.

After each cell was constructed, the wasp collected larvae and placing four to seven of them in each cell. The larvae were paralyzed by stinging, pressed between the mandibles and then carried to the nest. A single egg is laid inside each cell, before or after the first larva is entered. After filling, each cell is then sealed. Only the female wasps built cells and collected larvae, the males appeared to have no role except in mating.

The field-collected adult wasps were fed with honey solution in our cage and they lived for up to 67 days after capture. In the field we have observed them apparently feeding upon the nectar of flowering plants, including *Vernonia* sp. Each female constructed and filled more than one mud nest. The time taken from cell closure to emergence of the young adult from the cell varied from 34 to 48 days for *D. pyriforme* and 30 to 40 days for *D. conoideum*.

The *D. campaniforme esuriens* wasps in our cage were not successful in reproduction, because ants fed on the cell contents before the adult wasps could emerge. We also recorded predation by ants in nests in the field. In addition we found that the parasites, *Chrysis fuscipennis* Brulle, *Chrysis quaerita* Nurse, and *Stilbum cyanurum* (Forster) emerged from the cells of *D. conoideum* and *D. pyriforme* having fed upon either the lepidopteran larvae and/or the wasp larvae. The adults of these parasites were seen to follow the female wasps while they were constructing their nests. These elements obviously limit populations of wasps and hence the level of predation on *Heliothis* larvae. It is also probable that the activity of wasps is limited by the nonavailability of water.

Possible means of increasing the activity of these predatory wasps in pigeonpea fields would be to provide sources of water, and nesting sites protected from ants. However, the long generation time and the high level of parasitism would appear to impose strict limitations on the natural increase of populations and consequently the value of these wasps in *Heliothis* control.

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Reference

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