LARVAL PARASITES - A BIOLOGICAL OPTION?

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Any agent which reduces damage caused by heliothis is a valuable asset. In Australia we are fortunate to have several species of native parasites which attack heliothis, but not all of them are useful for within-crop management. Some parasites kill heliothis only after the larval stage has completed feeding, so in terms of crop damage, there is no difference between parasitised and unparasitised larvae. Current research at Toowoomba is investigating a native parasite, *Microplitis demolitor* Wilkinson [Hymenoptera: Braconidae], that kills heliothis during the fourth instar, before causing serious feeding damage. Results are presented on some aspects of this research. The release of two exotic species with attributes similar to *M. demolitor* is also discussed.

Are there different species of *Microplitis* parasitising heliothis?

The most fundamental question relating to research on *Microplitis* was whether different species parasitised heliothis throughout their Australian distribution. Characterisation of *Microplitis* reared from heliothis collected at different locations (Biloela, Dalby, Diamantina Lakes, Great Victoria Desert, Narrabri and Winton) indicated that all populations sampled were representatives of a single biological species (Austin *et al.* 1992). It remains to be shown whether differences exist between populations of *M. demolitor* with regard to preferences for and performance on different host species.

Life cycle of *Microplitis*

The adult *M. demolitor* is a small wasp which forages actively on crops in search of young (3-5 day old) heliothis larvae. Using a small ovipositor at the tip of the abdomen, the female inserts an egg into the body cavity of the host larva. After hatching, the parasite larva grows as it consumes the internal structures of its host, and when fully grown, exits the host from the posterior abdominal segments. Here it spins a fawn coloured cocoon in which it pupates beside the host. At

25°C it takes about 7 days from egglay to emergence of the mature parasite larva from the host. At this stage the heliothis larvae does no further feeding and movement is restricted to aggressive waving of the head and anterior body segments. Pupal development takes about 5 days at 25°C. The end of the cocoon is neatly cut off by the emerging wasp and the cycle is completed (Figure 1).

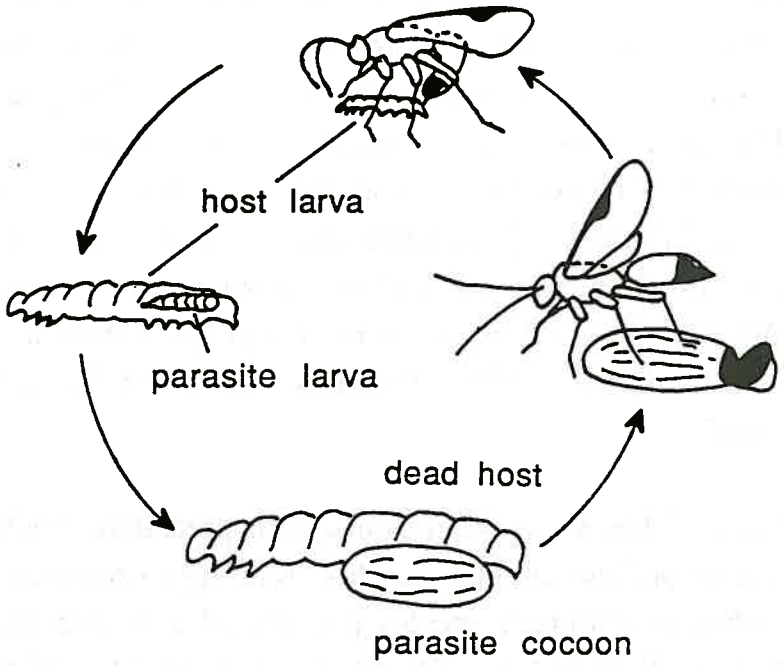

Figure 1. Life cycle of the larval parasite *Microplitis demolitor*.

Effect of *M. demolitor* on host larvae

The most valuable feature of *M. demolitor* is that parasitised heliothis larvae are killed before completing more than about 10% of their potential feeding (Cobb *et al.* 1985, Powell 1989). Growth and development of parasitised larvae are much less than those of unparasitised larvae. Figure 2 compares the weight of parasitised and unparasitised *Helicoverpa armigera* (Hübner) larvae. Although feeding by parasitised larvae is greatly reduced, some losses of cotton fruiting structures will occur. Feeding relationships for parasitised larvae could be used in crop models to predict the reduced effect of parasitisation on plant damage.

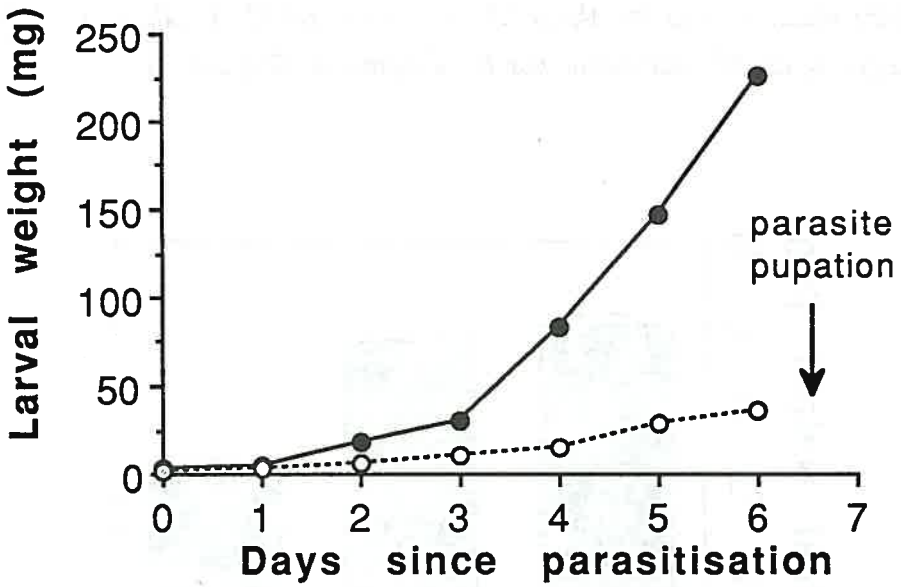

Figure 2. Comparison of larval growth between unparasitised (●—●) and *M. demolitor* parasitised (o - - o) *H. armigera* larvae reared at 25°C.

Two exotic partners

In other studies we are pursuing a classical biocontrol approach. Two exotic larval parasites of heliothis, *Cotesia kazak* Telenga [Hymenoptera: Braconidae] and *Hyposoter didymator* Thunberg [Hymenoptera: Ichneumonidae], have been released in southern and central Queensland during the 1991-92 summer.

Both species originated in south-eastern Europe where they were reared from *H. armigera*. They were first introduced into Western Australia in 1983 (Michael *et al.* 1984) and are now established. We obtained shipments from Western Australia during February 1991. *C. kazak* was also obtained from New Zealand. In collaboration with the Victorian Department of Food and Agriculture, we have commenced rearing parasites and making releases into eastern Australian cropping regions.

C. kazak and *H. didymator* have a host size preference similar to that of *M. demolitor* (Tillman and Powell 1989). As with *M. demolitor*, parasitised larvae are killed before they do more than 10% of their feeding damage. Prior to emergence of the parasite, host size is

significantly smaller than *M. demolitor* for *C. kazak*, and only slightly larger than *M. demolitor* for *H. didymator* (Figure 3).

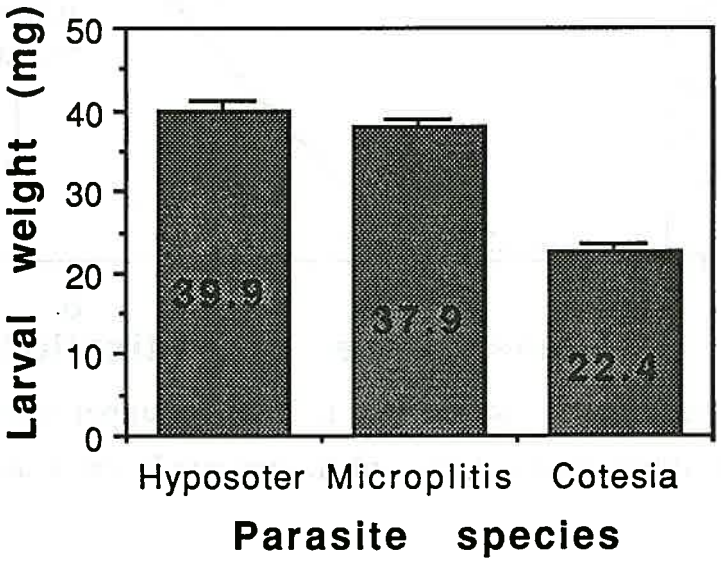

Figure 3. Comparison of larval *H. armigera* weight prior to parasite emergence for *H. didymator*, *M. demolitor* and *C. kazak*. Vertical bars denote standard error.

We will continue to rear and release these exotic agents throughout cropping regions and monitor their progress in the hope that they will become successfully established in the release areas. Although they may not cause the sensational demise of heliothis, they represent an additional and effective mortality component in an age class of heliothis that typically has high survival.

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