

**Parasitism by *Diadgama semiclausum* wasps of diamond
back moth larvae on three cruciferous host plants.**

By

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ABSTRACT

The diamondback moth (DBM), *Plutella xylostella* (L) (Lepidoptera: Plutellidae), is a major pest of Brassica crops in many parts of the world. Because of its ability to develop resistance to virtually all major groups of insecticides, including *Bacillus thuringiensis* Berliner (Bt), much attention has been devoted to biological control using parasitoids. Israel has abundance of parasitoids attacking this pest. *Diadgema semiclausum* (Hellén) (Hymenoptera: Ichneumonidae) is found to be the most abundant larval parasitoid of *P. xylostella* in Israel.

Much attention has been devoted by ecologists and biological control researchers to interactions between natural enemies and their prey. Yet parasitoids and predators are influenced also by characteristics of the food plants of their prey/host. Recent studies with the DBM have illustrated that both intra- and interspecific variations in its *Brassica* spp. host plants may have a profound effect on the performance of its larval parasitoids. Host plants have a central role in host finding by natural enemies and this enhance the effectiveness of natural enemy. This study was initiated to examine preference of DBM parasitoid to three cruciferous DBM host plants under laboratory condition. Results would suggest (i) the importance of two wild host plants - wild radish, *Raphanus sativus*, and white mustard, *Sinapsis alba* - in augmenting level of biological control of DBM in cabbage fields, and (ii) whether these plants could be used as trap crops for the pest. Earlier studies show that mustard and radish are attractive to DBM but the pest suffers high mortality on these hosts, compared to that on cabbage plants.

The preference of *Diadgema semiclausum* for cabbage, mustard and radish plants was tested in choice experiments in laboratory. Mated female wasps were offered either DBM-infested or un-infested plants and their behavior

was recorded for one hour. The experiments were replicated six times and ANOVA's were used to compare parasitism rate in DBM larvae, and wasps' time budget, efficiency, size of the pupae, and sex ratio on different host plants.

Results show that *D. semiclausum* prefers to forage for DBM larvae on mustard significantly more than on radish and cabbage. The proportion of time the wasps allocate for host location was similar on radish and cabbage. On un-infested host plants, however, no significant difference was detected in wasp preference for radish, mustard and cabbage plants. Yet within 10 minutes after they were introduced to the experimental cage, the wasps spent about 75% of their foraging time on mustard than on the other plants. Later on, they move to forage radish plants. The wasps hardly spent any time on un-infested cabbage. It appears therefore that the wasps are initially attracted to mustard and search radish only when no larval hosts are found on mustard.

More DBM larvae were parasitized by *D. semiclausum* on mustard than on the other host plant, yet the difference in parasitism on mustard and radish was not statistically significant. This outcome is probably the result of wasps spending more of their time foraging on mustard and radish than the cabbage. Whereas parasitism rate is correlated with attack rate on the three host plants, it is not a good indicator for wasp efficacy (number of parasitized larvae that yielded wasp per minute). Parasitoid efficiency was higher on cabbage than on mustard and radish plants. Likewise larger cocoons were formed in host larvae that fed on cabbage than in those feeding on mustard and radish. This difference, however, was not statistically significant. Finally, I did not detect any appreciable effect of the host plants on parasitoid sex ratio.

Observation on the oviposition behaviour of *D. semiclausum* showed that when female wasps attack *P. xylostella* larvae, the host wiggles and twirls for in an attempt to escape parasitism. The two separate few seconds later. It is assumed that during the wrestling, the parasitoid egg is being deposited in the host.

In summary, *D. semiclausum* preferentially attacks *P. xylostella* larvae on mustard than on cabbage. It appears therefore that growing white mustard near cabbage fields would not enhance level of biological control on the crop because the wasps would remain to forage the mustard for hosts. However, a companion study indicates that DBM females too are more attracted to white mustard over cabbage. Therefore mustard could serve as trap crop to the pest, even though it is not likely to enhance parasitoid activity in cabbage fields.