Biological control ecology of *Aphidius colemani* Viereck (Hymenoptera: Braconidae: Aphidiinae) on *Myzus persicae* (Sulzer) (Hemiptera: Aphididae)

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Abstract

The solitary and koinobiont endoparasitoid, *Aphidius colemani* Viereck, is produced commercially for biological control of green peach aphid *Myzus persicae* (Sulzer) and cotton aphid *Aphis gossypii* Glover around the world. However, its production cost is still high and biological control efficiency is still uncertain, probably due to the lack of knowledge on its biological control ecology. To fill the knowledge gap, I investigated the biological control ecology of the *A. colemani*-*M. persicae* system. My results show that most emergence and reproductive activities of *A. colemani* occur during the photophase. After emergence, both sexes need about 2 hours for sex maturation, but once sexually mature, age of neither sex has any significant effect on mating success. Food supply to adult females is essential to mating success. The mating behavioural sequence is similar to that of many other braconid parasitoids. My findings suggest that *A. colemani* is an effective biological control agent of *M. persicae* because reproductive outputs of the parasitoid are twice as high as the aphid, the parasitoid reaches the maximum lifetime reproductive potential about a week earlier than the aphid, and parasitised aphids contribute little to their population growth and make limited damage to plants. The parasitoid prefers to attack larger hosts but such preference is counterbalanced by greater defensive ability of larger hosts, resulting in similar parasitism rate on hosts of all ages. As a result, parasitising mid-aged hosts allows *A. colemani* females to gain maximum fitness in developmental period, body size and parasitism of their progeny. Finally, my study confirms that *A. colemani* has a Type II functional response. However, it can still successfully control *M. persicae* regardless of pest density probably because parasitoid density has significantly more effect than host density on parasitoid reproductive fitness and the low mutual interference among the searching parasitoids encourages aggregation of the parasitoids on host patches of high density. The present study provides basic knowledge on the biology of *A. colemani* for development of effective measures for laboratory handling, rearing, and field release, and brings insight into the success of aphid biological control programmes using the parasitoid augmentation approach.

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