

Parasitic wasps for Silverleaf whitefly control in vegetable crops




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Several parasitic wasps, including *Eretmocerus mundus*, *E. hayati* and *Encarsia* species attack silverleaf whitefly (SLW) in vegetable crops. *Eretmocerus hayati*, originally from Pakistan, more readily attacks SLW nymphs than local species. It was imported by CSIRO for SLW biological control in Australia.




Discription and Lifecycle

Eretmocerus hayati is a minute wasp, 0.8-1.0 mm long. Females have bright yellow bodies with clubbed antennae (**Fig 1**). Males have long antennae with black markings and are a dark yellow brown (**Fig 2**). Males and females occur in almost equal numbers.




 A photograph of a male Eretmocerus hayati wasp, showing its dark yellow-brown body and long, segmented antennae with distinct black markings.	 A photograph of a female Eretmocerus hayati wasp, which is bright yellow, feeding on a silverleaf whitefly nymph. The nymph is visible as a translucent, rounded mass on a green leaf surface.	 A photograph of a native Encarsia wasp, which is bright yellow with a prominent black marking on its thorax and abdomen.
Fig 2. <i>Eretmocerus hayati</i> male (antennae with black makings)	Fig 1. <i>E. hayati</i> , female host-feeding on whitefly nymph	Fig 3. <i>Encarsia</i> (Native) adult with black making on body

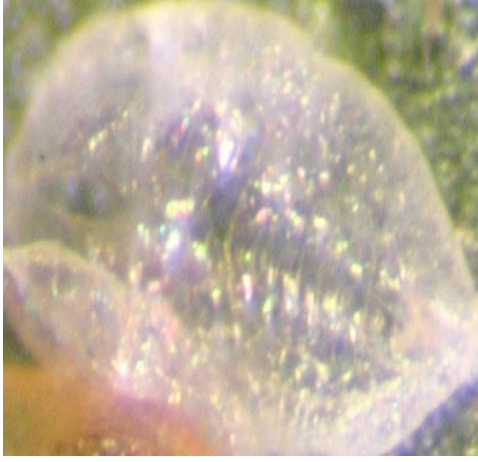

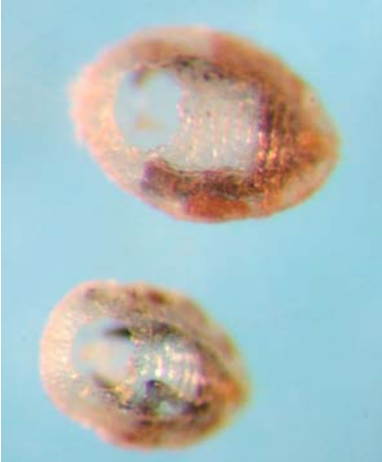
The parasitic wasp completes its developments within the host SLW. Female wasps lay their eggs under the SLW nymphs. The larvae hatch from the eggs and penetrate into the whitefly nymphs. During the early development the parasitised nymph turn turbid white, and its yellow internal bodies (mycetomes) displace to edges (**Fig 5**). Unparasitised nymph shows symmetrical mycetomes (**Fig 4**). As they grow, parasitised nymphs become shiny yellow pupae. At a later stage, the yellow coloured wasp is clearly seen through the host's skin (**Fig. 8**).

After completing development, the adult wasp chews a round hole to emerge from the whitefly remains (**Fig 11**). The newly emerged wasp mates, and then begins to search for new whitefly nymphs to attack. During the warmer months, the wasps take around 13 to 20 days to complete their lifecycle.

		
<p>Fig 4. SLW nymph, unparasitised</p>	<p>Fig 5. SLW nymph parasitised by <i>E. hayati</i> with displaced mycetomes</p>	<p>Fig 6. SLW nymph parasitised by <i>Encarsia</i> sp.</p>

Whitefly nymphs parasitised by *Encarsia* turn a dark brown or blackish colour (**Figs 6 & 9**). Unparasitised SLW nymphs turn yellow with white wing-pads on each side (**Fig. 7**). A round hole in the pupal skin shows that a parasitoid has emerged from the pupa (**Fig 12**).

		
<p>Fig 7. Unparasitised SLW pupae with white wing-pad on each side</p>	<p>Fig 8. <i>E. hayati</i> pupae inside the pupal skin of a SLW</p>	<p>Fig 9. <i>Encarsia</i> pupae with brown Meconia</p>

		
<p>Fig 10. Empty pupal skin of SLW</p>	<p>Fig 11. Empty pupal skin of <i>E. hayati</i> with round exit hole</p>	<p>Fig 12. Empty pupal skin of <i>Encarsia</i> with round hole</p>

How does it works

The parasitic wasp contributes to SLW control in two ways. The first is by parasitising young SLW nymph stages to produce new generations of wasps. *Eretmocerus hayati* females very effectively search for whitefly nymphs on the underside of the leaves. On finding a suitable nymph, the wasps insert a single egg between the host and the leaf surface. As the parasitic larvae grow inside nymphs they stop the whiteflies' development. One female wasp can parasitise over 40 whitefly nymphs during its lifetime.

Secondly, female wasps require protein in their diet which they acquire by feeding on the whitefly nymphs' body fluid (*called host feeding*). They cause significant mortality in nymphs (recorded between 15 to 40% in experimental crops) through host feeding. Inundative releases in the field often cause high whitefly nymphal mortality due to host feeding.



Field releases and establishments

During 2006 and 2007 seasons, over 500,000 wasps were released on 22 farms in Bowen, Gumlu, Guthalungra, Ayr, Giru and Rockhampton. Post release evaluation results show that the parasitic wasp was established in all released locations where parasitism levels ranged between 30 to 85%. The high level of parasitism was often recorded in minimally sprayed crops.

In susceptible crops (such as pumpkins, zucchini and tomatoes), one or two early releases are required during early growth of the crops so that they can breed and arrest the whitefly populations.

Pesticide use

Some insecticides can be used with the parasitic wasps. Pyriproxyfen, pymetrozine and imidacloprid soil injection are less toxic to adult wasps. Broad spectrum insecticides sprays such as dimethoate, trichlorfon, methomyl and methamidophos are highly toxic to the wasps and this often flares whitefly populations. Avoiding highly toxic chemicals during early part of the crops will help in establishing the parasitoid populations.

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