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**COMPARATIVE STUDIES OF THREE APHELINID
PARASITOIDS OF *TRIALEURODES VAPORARIORUM*
(WESTWOOD) (HEMIPTERA: ALEYRODIDAE) WITH
EMPHASIS ON *ERETMOCERUS EREMICUS* ROSE AND
ZOLNEROWICH**

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Abstract

This thesis investigates the effectiveness of *Eretmocerus eremicus* Rose and Zolnerowich (Hymenoptera: Aphelinidae) as a parasitoid of the greenhouse whitefly, *Trialeurodes vaporariorum* (Westwood) (Hemiptera: Aleyrodidae). This investigation was performed on glasshouse tomatoes, because this is most economically important glasshouse crop in New Zealand. The *Er. eremicus* strain used in this study has been recently identified in New Zealand and differs significantly from other strains of *Er. eremicus* found in Europe and America.

The parasitism and host-feeding of *Er. eremicus* were investigated and compared to two other whitefly parasitoids (*Encarsia formosa* and *Encarsia pergandiella*) to determine which is the most effective parasitoid of the greenhouse whitefly. The parasitism study was performed on tomato plant leaf cuttings and the host-feeding study on tomato plant leaf disks. The leaf materials used in these studies were infested with 2nd instar greenhouse whitefly nymphs. To replicate the range of temperatures encountered in a glasshouse, these studies were performed within temperature controlled rooms set to 15, 20, 25, and 30°C.

The results indicated that at temperatures of 25 and 30°C, both *Er. eremicus* and *En. formosa* performed better in terms of parasitism and host-feeding than *En. pergandiella*. *En. formosa* parasitised the highest average number of whitefly nymphs (26 nymphs), which was 19% higher than *Er. eremicus* (21 nymphs) and 42% higher than *En. pergandiella* (19 nymphs). *En. formosa* also killed a significantly higher average number of whitefly nymphs through host-feeding (8 nymphs), which was 13% greater than *Er. eremicus* (7 nymphs) and 25% greater than *En. pergandiella* (6 nymphs). Furthermore, *En. formosa* also had a significantly longer average longevity (6 days), which was 17% greater than the *Er. eremicus* and *En. pergandiella* (both 5 days). At 30 and 20°C, *En. formosa* had a higher parasitism than *Er. eremicus* and at 30°C also a higher level of host-feeding. However the difference between these two parasitoids was small overall. *En. pergandiella* only displayed a high level of parasitisation at 15 and 20°C, indicating it has adapted to cool temperatures, in New

Zealand, and is unlikely to be beneficial as a biological control agent in glasshouses - except in winter.

Two further studies were performed on *Er. eremicus* to determine the effect of adult parasitoid age on levels of parasitism and preference for specific greenhouse whitefly nymph instars. These studies found that the highest levels of parasitism occur in the first 5 days after the adult parasitoid emerges and a clear preference for early instar nymphs (1st, 2nd, and 3rd instars).

These results of the studies presented in this thesis do not indicate any advantage in developing *Er. eremicus* as a biological control agent of greenhouse whitefly in tomato glasshouses in New Zealand. *En. formosa* had a significantly higher level of parasitisation and host-feeding with a wider temperature tolerance and greater longevity. Since *En. formosa* is already used as a biological control agent in New Zealand tomato glasshouses, this study shows no benefit in replacing it with *Er. eremicus*.

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