

Impacts of ant-black scale mutualism on the biological control of red scale

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As part of my studies on the biological control of red scale (*Aonidiella aurantii*) in orange orchards on the central coast of New South Wales, I evaluated the impact of *Anonychomyrma itinerans* on five parasitoids and four predators of red scale and four predators of black scale (*Saissetia oleae*). *An. itinerans* is the most common ant associated with black scale and other soft scales on citrus in this region. Detrimental impacts of ants on natural enemies of red scale have been widely recognised for several decades, but never quantified in Australia where the scale is the most important citrus pest. A preliminary experiment in autumn 2010 indicated that high activity of *An. itinerans* markedly reduced levels of parasitism by *Aphytis chrysomphali*, *Ap. lingnanensis*, *Comperiella bifasciata*, *Encarsia citrina*, and *E. perniciosi*, and predation by *Orcus australasiae*, *Halmus chalybeus*, *Rhyzobius hirtellus* and *R. lophanthae*. In a comprehensive experiment involving use of polybutene bands to exclude *An. itinerans* from red scale and black scale-infested tree canopies from July 2010 to June 2011, it was confirmed that the ant significantly reduced the incidence of *H. chalybeus*, *R. hirtellus* and *R. lophanthae* and predation by these species on red scale. In contrast, the incidence of *O. australasiae* and predation by it on red scale was not affected. Incidence of the scale-eating caterpillar, *Mataeomera dubia*, a predator of black scale, was not affected. Parasitism of red scale by the *Encarsia* species was also significantly reduced. Asphyxiation by honeydew produced by black scale led to collapse of its populations on banded trees within four months of the trees being banded because *An. itinerans* was absent.

