

# Biologically-Based Management of Citrus Pests

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Fig. 1: *Olla v-nigrum* larva attacking ACP nymph (A) and CLM (B) larva.

Management of citrus pests, particularly Asian citrus psyllid (ACP) the vector of huanglongbing, or citrus greening disease, is essential to reduce the spread and severity of the disease. Other pests also warrant control, such as brown citrus aphid vector of citrus tristeza virus and citrus leafminer (CLM), which exacerbate citrus canker disease. Biological control by naturally occurring predators, parasitoids, and pathogens is critical in reducing populations of ACP and several other pests. Our initial finding on natural mortality of ACP several years ago reported 90-100% reduction in its populations, which mainly resulted from predators, including ladybeetles, lacewings,

and spiders. These predators have also been shown to kill and reduce populations of other pests. An example of a ladybeetle *Olla v-nigrum* larva attacking ACP nymph (A) and CLM (B) larva is shown. After increased use of insecticides for several years to control ACP, the incidence of those predators has reduced over time. However, we still see significant biological control activity in the groves. In recent years, we have observed several species of ladybeetles, lacewings, and spiders in the commercial groves and natural mortality averaging 43-84%. These predators are more active between spring and fall and, therefore, efforts are warranted to conserve their populations. Targeting ACP adults in winter with hard insecticide sprays is highly effective in reducing their

populations moving into the growing season and less damaging to beneficial organisms, which are rare in winter because of fewer prey. From spring onward, using selective insecticides for pest control, which are less harmful to beneficial organisms, help conserve their populations. Besides predators, several species of parasitoids and fungus specific to killing different pests also benefit from the reduced use of insecticides. For example, parasitoid *Tamarixia radiata* attacking nymphs of ACP have mortality rates averaging 30-40% in some locations, and naturally occurring entomopathogenic fungus *Hirsutella citrififormis* has been observed to kill an average of 23% and a maximum of 75% of ACP adults.

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