



Figure 1. Brown lacewing adult (A) and larva feeding on an Asian citrus psyllid nymph (B)

# Preying on Asian citrus psyllids and other pests

By Jawwad A. Qureshi and Azhar A. Khan

**T**he Asian citrus psyllid (ACP), *Diaphorina citri*, invaded Florida over two decades ago. The need to consistently suppress it became apparent soon after detection and particularly after discovering huanglongbing (HLB) disease, which it spreads.

Managing HLB depends strongly on vector control to either reduce disease transmission of healthy trees or reinoculation. Single tactics of vector control are insufficient for effectively managing this pest-disease complex.

Biological control reconstructs specific elements of natural enemy complexes and is useful for the long-term and sustainable management of many insect pests. Predaceous insects such as ladybeetles, lacewings, spiders, etc. are present in most locations and contribute to the consistent natural suppression of ACP in commercial and urban environments. These predators are also generalists, meaning they can feed on more than one prey species and can therefore provide service against several pests in multiple habitats.

## ACP ENEMIES

### Ladybeetles

Predators that use prey for their development and reproduction are most likely to respond and contribute to the suppression of ACP populations. ACP immatures were found to be a suitable diet for several naturally occurring species of ladybeetles in Florida such as *Olla v-nigrum*, *Harmonia axyridis*, *Curinus coeruleus*, *Exochomus childreni*, *Coleomegilla maculata fuscilabris* and *Coelophora inaequalis*. *Cycloneda sanguinea* (L.) developed but did not reproduce on a diet of ACP. These species, particularly *O. v-nigrum*, *H. axyridis*, *C. coeruleus* and *C. sanguinea*, are common in citrus groves during the growing season when the flush and prey they need for development and reproduction are present.

Studies showed these species reduced ACP populations by greater than 90% in citrus groves. However, over the years, there has been a significant decline in the natural populations of these

ladybeetle species due to increased use of insecticides to control ACP. Therefore, efforts are warranted to conserve their populations.

### Lacewings

Lacewings are another important group of predators that contributed to the huge reductions in ACP populations observed during the initial years of HLB. They are still one of the dominant groups seen in the citrus groves. *Ceraeochrysa cubana* is the most abundant species.

### Other Predators

Spiders were observed in initial studies and continue to be an abundant and dominant predatory group. Several species of spiders have been observed attacking ACP. However, the expected reduction from this predatory group has not been assessed yet. The immatures of hover flies and assassin bugs have also been observed feeding on ACP nymphal colonies.

## COMMERCIALY AVAILABLE OPTIONS

Most of the naturally occurring species of ladybeetles and lacewings are not available commercially, so the University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) is also evaluating commercially available predators for ACP.

The two-spotted ladybeetle (*Adalia bipunctata*) is available commercially and found in some crop and forest ecosystems of Asia, Europe and North America. It developed and reproduced on a diet of ACP immatures. Its impact has been evaluated on developing colonies of ACP nymphs in the field by caging the infested shoots with beetles on citrus trees. Reductions in the nymphal populations averaged 54%.

Brown lacewings, *Symphorobius*

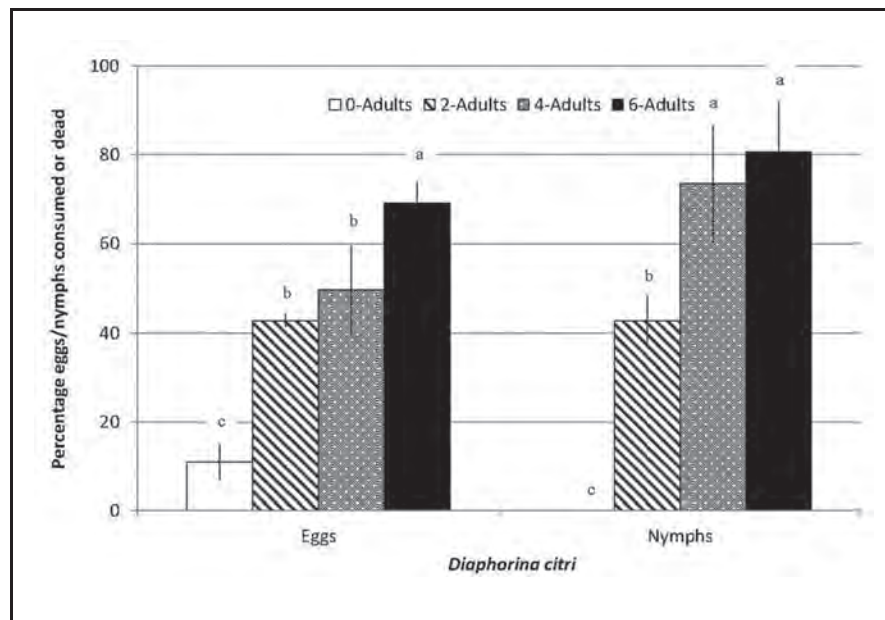


Figure 2. Impact of three release rates of brown lacewing adults on eggs/nymphal colonies of Asian citrus psyllids developing on orange jasmine plants. Significant reduction in ACP, averaging 43% to 81%, was seen across the three release rates.

*barberi* (Figure 1, page 12), are another commercially available predator that developed and reproduced on a diet of ACP nymphs. Brown lacewings reduced the nymphal populations of ACP by 35% when caged with developing colonies of nymphs on citrus trees under field conditions. Greenhouse experiments were conducted to assess different release rates of this predator using orange jasmine plants infested with ACP immatures. Increasing the predator density to two, four and six adults per plant reduced ACP populations by an average of 41% to 83% (Figure 2), which was a significant impact. These predators are good potential candidates for field release and testing, some of which is now underway.

## ATTACKING APHIDS AND MORE

All the mentioned species of ladybeetles and lacewings that are predators of ACP also attack several other citrus pests.

The blood-red ladybeetle (*C. sanguinea*), which is a native species, and the multi-color Asian ladybeetle (*H. axyridis*), which is an introduced species, are the dominant aphid feeding predators. Studies have shown that these species are the most efficient predators of the brown citrus aphid (*Toxoptera citricida*). This pest is

economically important and a serious threat to the citrus industry due to its efficiency in vectoring citrus tristeza virus. It is probably because of these and other predators that the brown citrus aphid has rarely been found in Florida over the past several years.

*Hippodamia convergence*, the convergent ladybeetle, is a species found in Florida vegetables and at low levels in citrus. It performed well on diets of ACP, brown citrus aphid and green citrus aphid (*Aphis spiraecola*).

In addition to performing well on an ACP diet, the commercially available *A. bipunctata* also developed and reproduced on the diet of corn leaf aphid (*Rhopalosiphum maidis*) but was not evaluated against citrus aphids.

Besides aphids, many other important citrus pests are also targets of ladybeetles. For example, the metallic blue ladybeetle (*C. coeruleus*), originally imported from Mexico in the 1950s, is a great predator of several species of scale insects, including Florida red scale. The activity of several ladybeetle species has been observed against other pests such as mites, mealybugs and citrus leafminers.

## PREDATOR CONSERVATION

The impact of several predators naturally occurring or commercially available becomes apparent over time and with studies conducted against

multiple pests. For example, *O. v-nigrum*, which is a native species and was less common in Florida citrus before ACP, demonstrated a remarkable functional and numerical response against ACP, which was found to be suitable prey for this species. However, there has been a significant decline in the naturally occurring populations of ladybeetles, which are the most effective predators of ACP, aphids and several other pests. Efforts are warranted to conserve these and other predators.

ACP and other pests are abundant in citrus groves during the growing season. This is mainly because most

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pests, particularly ACP, require newly developing buds and shoots to develop and reproduce. Mature citrus trees in Florida produce new growth during the growing season with a major flush in the spring. The prey, new growth and availability of pollen during the growing season all attract predators to colonize groves.

The lack of these factors in winter makes groves less attractive to the predators because only the adult ACP are surviving while waiting for new growth in the spring to begin reproducing. Targeting overwintering ACP adults with broad-spectrum insecticides in winter significantly reduces pest populations in spring and the rest of the year. Selective insecticides during the growing season provide opportunities to enhance the role of predators and biotic mortality in citrus pest management. 🍊

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