Scientists pit natural enemies against giant whitefly

The giant whitefly has made a comfortable life in back yards throughout coastal Southern California and given grief to gardeners who must cope with dying landscape plants and masses of fine, threadlike filaments hanging from leaves. But the insect shouldn't get too comfortable. UC Riverside entomologists are testing two tiny, stingless wasp species against it.

In laboratory tests, the parasitic wasps have shown promise as effective natural enemies of the giant whitefly *(Aleurodicus dugesii)*, which first appeared in San Diego County in October 1992. Each wasp lays a single egg inside a whitefly nymph — an immature insect that clings to the underside of a leaf, feeding until it reaches adulthood. The tiny wasp larva hatches from its egg and spends its 2-week life feeding on the insides of the whitefly nymph and, in doing so, kills it. A few days later, an adult wasp emerges from the dead whitefly to start the cycle again.

The entomologists recently released the wasps in several locations in San Diego and Orange counties to see if they can survive and reproduce. If the wasps prove effective in the field, they may be a long-term solution to the giant whitefly problem, according to UC Riverside entomologist Tom Bellows.

Biological control programs — which employ natural predator or parasitic insects to suppress populations of insect pests — have become more common as scientists seek to reduce the use of chemical pesticides. Once natural enemies become established, both the pest insects and their enemies coexist below noticeable levels. In 1991 and 1992, UC Riverside scientists stemmed ash whitefly infestations in California and several other states using another species of stingless wasp. Masses of swarming ash whiteflies had forced some urban dwellers to give up backyard barbecues.

Since the giant whitefly was first detected in San Diego County, its population has grown exponentially and spread to infest ornamentals in coastal Southern California as far north as San Luis Obispo.

"I have not seen such a hysterical response from homeowners, retail nurseries and landscape maintenance personnel (public and private) since the ash whitefly [infestation] several years ago," says Orange County farm advisor John Kabashima. "This is definitely a pest which will cause extensive damage and potential and current market-share loss to nursery growers, especially small growers in infested areas."

UC Riverside scientists have found that gian whitefly prefers hibiscus, giant bird-of-paradise, banana, orchid trees and aralia, but it also feeds on bougainvillea, guava, citrus, liquidambar, ornamental plums, acacias, ficus, fruitless mulberry, nasturtium and philodendron, among other landscape plants.

The insects suck sap from the leaves, weakening the plants. Whitefly populations can become extraordinarily high on a single plant, so much so that the waxy substance secreted by the nymphs can form masses of long, threadlike filaments that hang as far as 4 inches from the undersides of leaves. And, the honeydew substance excreted by the adult insects and nymphs promotes growth of a black sooty mold fungus.

John Kabashima

The giant whitefly is so named because it is larger than other whitefly species, about the length of a grain of rice from its head to the tips of its spotted, translucent wings.

Pesticides are largely ineffective, partly because the waxy substance secreted by the nymphs tends to protect them from water-based insecticides.

The two parasitic wasps *(Idioporus affinis* and *Encarsiella noyesi)* were found by former UC Riverside postdoctoral scientist David Headrick, while searching for natural enemies of the giant whitefly in Mexico — its presumed native country. The wasps he collected were held in quarantine in Riverside for study and to insure that they themselves would not become pests in the United States. Both species of wasp — unrelated to common stinging wasps — measure about 2 millimeters long.

John Kabashima

The waxy substance secreted by giant whitefly nymphs can hang as far as 4 inches from the undersides of leaves.

UC Riverside has been granted release permits by state and federal agencies to test the wasps in the field. Each release site is being monitored weekly to determine if the wasps are

becoming established. Later, the scientists will visit the sites monthly to check the wasps' impact on the whitefly population. Bellows says that in about a year scientists will know the wasps' long-term prospects for success.

In the meantime, gardeners can remove infested leaves from plants. Infested plant material should be sealed in plastic bags and removed to prevent migration of the whiteflies to other plants, Bellows says.

San Diego farm advisor Karen Robb also recommends "syringing," blasting the undersides of infested leaves with a stream of water. It improves the plant's appearance and, unlike insecticides, doesn't disrupt biocontrol programs, she says. — *Kathy Barton*

Replacing vegetation may remedy Pierce's disease

Jack Kelly Clark

The 1/4-inch long blue-green sharpshooter *(above)* transmits Pierce's disease to grapevines. The bacterial disease *(below)* is ravaging some vineyards in Napa and Sonoma counties.

Jack Kelly Clark

Early results in a 5-year study suggest that managing riverbank vegetation near vineyards may be a potent control of Pierce's disease, a bacterial scourge of grapevines now ravaging some prized vineyards in Napa and Sonoma counties.

Transmitted by the blue-green sharpshooter, the bacteria *(Xylelle fastidiosa)* multiply in the plant xylem, blocking this vital water conducting system and causing leaves and fruit clusters to dry up and die, often within 2 years. There are no effective treatments or resistant rootstocks.

The sharpshooter overwinters and breeds in riparian (river bank) areas; it transmits the bacteria to grapevines from a wide array of wild plants, all symptomless carriers. UC Berkeley entomologist Alexander Purcell and forest ecologist Joe McBride are running experiments in Napa Valley to see if they can reduce sharpshooter by changing riparian habitat.

"The early results are very encouraging: we have seen a 70% to 99% reduction in insect activity," says Purcell, who is an international authority on Pierce's disease. "We have removed the main breeding hosts of the insect such as blackberry, elderberry and wild grape, and replaced them with native riparian species that are not breeding hosts — such as California bay, black walnut and ash. In most cases we are increasing plant diversity."

The investigators have planted saplings in two locations and recorded sharpshooter activity for 1 and 2 years; a third location was added this year.

"The results are still preliminary," Purcell cautions. "Before we could recommend this as a control method, we would need to determine if reductions can be maintained over several years as the planted trees mature, and if there will be any adverse effects on wildlife and stream ecology. Wildlife effects are now under study by UC Berkeley entomologist Don Dahlsten."

While the removal and replanting of riparian vegetation is expensive, it is less costly than Pierce's disease losses in many North Coast vineyards near riparian habitats, says Purcell.

"A UC Berkeley study of the economics of Pierce's disease showed that growers were losing money trying to grow grapes within 150 to 200 feet of riparian woodlands," Purcell notes. "This raises the possibility that buffer planting of other crops might be used to protect grapes in extremely high risk areas."

In a related study by Purcell, McBride and UC Davis scientists Bruce Kirkpatrick and Roy Sachs, conifers and hardwoods are being planted to create 20-foot-wide buffers between the riparian habitat and vineyards. Earlier studies in the Santa Cruz Mountains showed sharpshooters didn't feed in or penetrate conifer stands.

Pierce's disease has damaged the state's vineyards since 1880, decimating Southern California vineyards in the 1880s, and Central Valley vineyards in the 1930s. In more recent decades it has been a "quiet" disease, causing occasional outbreaks across the state. However, since 1991 its incidence has been rising rapidly in the North Bay counties. It has recently spread at an epidemic rate in Napa Valley and has appeared for the first time in Mendocino County and parts of Sonoma County.

"Conservatively, it took a $24 million toll in Napa County in 1996, based on a grower survey by the Pierce's Disease Task Force," says Purcell. The task force was organized by the wine industry and provides research funding and educational efforts.

"Pierce's disease has always occurred at hot spots close to riparian areas," says Ed Weber, viticulture farm advisor in Napa County. "The news is that we are seeing the disease striking farther and farther away from riparian areas. Usually the disease goes through epidemic