Scientists pit parasitoids against leafhoppers

Researchers at UC Riverside are testing the effectiveness of natural enemies of beet leafhopper, an insect that transmits curly top virus disease to a wide variety of crops, including tomatoes, sugar beets, peppers, melons, spinach and dry beans.

The CDFA Curly Top Virus Control Program controls the disease by spraying malathion on the insect's overwintering and spring breeding grounds in wild vegetation (mostly rangeland). However, the agency, which is funding UC Riverside's parasitoid research, is trying to reduce pesticide use wherever pests can be managed effectively by other methods.

Although only areas harboring large populations of beet leafhopper are sprayed, the total acreage is large — 75,000 to 100,000 acres of rangeland per year. This is a costly strategy. In addition to cost, CDFA is concerned about potential adverse effects on predator-parasite populations and on food sources of endangered species — such as the blunt-nosed leopard lizard. They have already curtailed malathion sprays on some environmentally sensitive rangeland, leaving leafhopper populations in these areas uncontrolled if they stay below certain population thresholds.

Beet leafhopper, *Circulifer tenellus*, is the only known North American vector of curly top virus. The non-native pest, which mostly occurs in arid regions including the Imperial and San Joaquin valleys, is also a vector of a serious citrus plant pathogen — citrus stubborn disease.

UC Riverside entomologists Greg Walker, Imad Bayoun, Nasser Zareh and Serguei Triapitsyn have succeeded in rearing seven parasitoid species imported from Iran and Turkmenistan. The parasitoids have been released at the UCR campus and in rangeland and semidesert habitats at Oildale and Hemet.

So far, one species has been recovered from wild vegetation in Oildale and two species have been recovered from UCR sugar beet fields.

The migratory nature of beet leafhopper makes insecticide treatments on a field-by-field basis ineffective at reducing the spread of curly top virus. "Leafhoppers migrating into the fields from the surrounding wild vegetation can inoculate crops with the virus," Walker explains. "So a regional control strategy is the most efficient way to reduce the incidence of curly top virus."

To find natural enemies, the researchers explored the beet leafhopper's suspected region of origin, the arid regions of central and western Asia. Their trip to Turkmenistan in 1992 yielded several egg parasitoids, but only *Aphelinoidea turanica* survived the quarantine process.

The scientists successfully mass-reared *A. turanica* on beet leafhopper eggs and released them among host plants — Russian thistle, annual saltbush, filaree and mustards — between April 30 and June 11, 1993 near Oildale. They sampled the area for *A. turanica* from July 24 (at least two generation times after the last release date) to Aug. 19, 1993 and again from March through May 1994. The recovery of *A. turanica* from the 1993 and 1994 samples indicates that it successfully established and overwintered at this location.

The researchers' second trip to Turkmenistan in 1994 was not as successful. Only male *A. turanica* emerged from samples collected from drying *Salsola* and *Atriplex* and they died in quarantine.

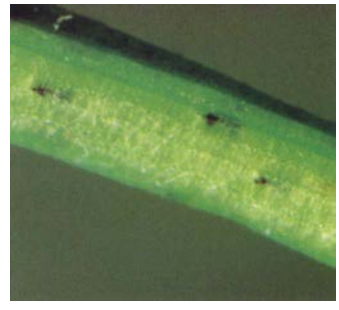
A trip to Iran in 1995 yielded nine egg parasitoid species, seven of which survived the quarantine process. Walker and his colleagues have been releasing the seven surviving species in beet leafhopper–infested sugar beets grown at Agricultural Operations on the UC Riverside campus since December 1995, in wild vegetation of beet leafhopper breeding areas in the San Joaquin Valley since February 1996 and in wild vegetation breeding areas near Hemet since October 1996.

"We have recovered *Oligosita* and one of the *Polynema* species from sugar beets in Riverside," Walker says, "but we haven't recovered any of the other Iranian species from the wild vegetation."

For at least another year, the scientists will continue releasing the Iranian species and sampling to determine the establishment of the beet leafhopper egg parasitoids. — *Editor*

G.P. Walker

Beet leafhopper spreads curly top virus, which infects a wide variety of crops.



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The parasitoid *Oligosita* sp. oviposits in a beet leafhopper host egg that is embedded in a sugar beet leaf.