

Reducing insecticide use by identifying disease-carrying aphids

April 3 2012, By Dennis O'Brien



Greenbug aphid feeding on an oat leaf infected with yellow dwarf disease.
Credit: Kent Loeffler

In work that could cut back on insecticide use, U.S. Department of Agriculture (USDA) scientists have found a way to distinguish aphids that spread plant viruses from those that do not.

The researchers used protein biomarkers to differentiate between virus-spreading and virus-free aphids. The findings mark the first time that [protein biomarkers](#) have been linked to an insect's ability to transmit viruses.

Aphid-transmitted viruses decrease [crop yields](#) and reduce the quality and quantity of fresh foods. Spraying insecticides can control aphids and reduce the incidence of some viruses, but not all aphids transmit viruses, and spraying is expensive and can harm the environment, people and

animals.

Agricultural Research Service (ARS) scientists Michelle Cilia and Stewart Gray have found they can identify disease-carrying aphids by examining the types of proteins in their cells. Cilia and Gray work in the Biological [Integrated Pest Management](#) Unit at the ARS Robert W. Holley Center for Agriculture and Health in Ithaca, N.Y.

ARS is USDA's chief intramural scientific research agency, and this research supports the USDA priorities of improving agricultural sustainability and promoting international food security.

The researchers knew from previous work that for aphids to pick up and transmit viruses, the virus must be able to interact with specific aphid proteins that direct movement of the virus through the insect and back into a plant during feeding. By studying greenbug aphids in the laboratory, they discovered that the lab-raised insects' ability to transmit yellow dwarf viruses was linked to the presence or absence of nine [biomarker](#) proteins found in the [insect cells](#).

They then analyzed greenbug aphids collected from [cereal crops](#) and non-cultivated fields and found the aphids consistently transmitted yellow dwarf virus only when they carried most, if not all, of the nine proteins. Field samples were collected by ARS colleagues John Burd and Melissa Burrows at the agency's Wheat, Peanut and Other Field Crops Research Unit in Stillwater, Okla. The aphid does not need all nine proteins to spread the virus, but there are some that are essential.

The discovery in the lab was published in the [Journal of Virology](#), and the field population study was reported in [Proteomics](#). The findings are expected to lead to development of a test to identify potential disease vectors. Cilia and Gray also are collaborating on an expanded effort to test whether biomarker-predictor proteins can be found in other insects.

More information: [Read more](#) about this research in the April 2012 issue of *Agricultural Research* magazine.

Provided by USDA Agricultural Research Service

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