Integrated Management of Cereal Arthropod Pests

This project developed new or enhanced tools and techniques for managing arthropod pests that damage cereal crop, helping farmers and cereal breeders confront the challenges presented by evolution within pest species and by the establishment of new pest species.

Who cares and why?

Insect pests, including Russian wheat aphid, greenbug, and Hessian fly, are serious pests of cereal crops in the U.S. Since its introduction into Texas in 1986, Russian wheat aphid (RWA) has spread throughout the western Great Plains cereal production area, the Pacific Northwest, and the desert Southwest. Since 1986, the total economic damage in the U.S. caused by RWA has exceeded $1 billion, considering crop loss, cost of pest control, and lost revenue to rural economies. Severe economic damage from greenbug and Hessian fly (HF) occurs throughout the West, and several other arthropods can also seriously impact wheat, barley, and oat production in the region. A primary goal of this group is to share the research needed to comprehensively manage these pests in small grain cropping systems in the West and to shorten the time from initial research activity to adoption by the end user.

Russian wheat aphid damage. Photo courtesy of Tom Royer/Oklahoma State University.

What has the project done so far?

WERA-066 has focused on characterizing differences among RWA biotypes and has developed a naming protocol that has been widely adopted beyond the committee. WERA-066 has facilitated coordination among cereal breeders who have developed wheat and barley varieties that are resistant to RWA. Even though some RWA biotypes have the ability to overcome resistance, resistant crop varieties have been widely planted. For example, in Colorado, more than 50 percent of all acres are planted with resistant cereal lines. Resistant cereal lines are being researched for HF, wheat stem sawfly, and wheat midge. Understanding the nature of damage caused by various biotypes of RWA, HF, and other cereal arthropod pests is a key factor in developing resistance in cereal varieties that is not rapidly overcome by the pests. Ongoing studies have yielded important results regarding gene expression in wheat when fed upon by different biotypes of RWA and HF. Molecular and population genetics studies of several pest species have shed new light on the formation of biotypes. In 2010, several WERA-066 members joined a USDA-National Institute of Food and Agriculture Risk Avoidance and Mitigation Program (RAMP) grant. The WERA-066 members have helped the RAMP project meet their goals, including

pest, disease, and weed surveillance; surveys of regional IPM practices in wheat; and the development of a website (iWheat) designed to provide real-time regional pest, disease, and weed survey and management information. This has greatly enhanced the ability of WERA-066 members to engage with the wheat industry.

Impact Statements

Improved knowledge of cereal arthropod pests among scientists, farmers, and other interested clientele.

Monitored for newly introduced pests and the development and spread of more damaging biotypes.

Developed new or improved ways to manage cereal pests, including resistant crop varieties and biological control options. These practices can be integrated into reasonably effective pest management systems for most cereal pests.

What research is needed?

New pest management systems are far from ideal, and new challenges continue to develop through evolution within species and establishment of new species. To develop more effective management systems, scientists must coordinate additional research on host plant resistance and susceptibility and farming practices. In addition, continued research on the genetics and ecology of pests and their natural enemies is needed to develop control tactics that are effective and sustainable in a wide variety of agricultural settings.

Want to know more?

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Colorado State University researcher Scott Merrill mixes aphids with Cream of Wheat to immobilize them. He will apply this mixture to fields in early winter and re-sample in the spring to see how well the aphids survived the winter. Photo courtesy of Scott Merrill.

"Hatcher" winter wheat, a high-yielding, stress-tolerant wheat variety, is resistant to some Russian wheat aphid biotypes. Photo courtesy of Colorado State University.

This project was supported by the Multistate Research Fund (MRF) established in 1998 by the Agricultural Research, Extension, and Education Reform Act (an amendment to the Hatch Act of 1888) to encourage and enhance multistate, multidisciplinary research on critical issues that have a national or regional priority. For more information, visit *http://www.waaesd.org/*.

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