

Reducing Threat of Insect Pests in Wheat

Yield losses to wheat insect pests have steadily increased with increasing virulence of Hessian fly, Russian wheat aphid, greenbug, and wheat stem sawfly. At the same time, declining funds and increasing operating costs have significantly reduced the scope of USDA-ARS insect research and associated germplasm development. An infusion of funds is needed to combat new insect pests and biotypes, to develop and deploy resistant varieties, reduce production losses, and reduce use of pesticides to control these damaging insects

Reducing damage from insect pests requires integrated approaches and collaborative research specific to each major production region. Genetic resistance remains the most environmentally responsible and effective strategy to control insects such as Hessian fly, Russian wheat aphid, greenbug, and wheat stem sawfly. However, new genetic sources of resistance and more rapid, effective screening methods are needed to achieve durable resistance. Also needed is a greater understanding of insect biotypes, their evolution, and the mechanistic basis of insect virulence and host resistance. Long-term solutions may involve biological control agents or changes in cropping systems.



Greenbug and Russian Wheat Aphid

- Since 1986, the Russian Wheat Aphid (RWA) has caused over \$1.5 billion in losses to the wheat industry.
- Millions of acres of wheat in Texas, Oklahoma, Colorado, Nebraska, and western Kansas have been treated with costly insecticides.
- Production losses to RWA in Oklahoma alone range from \$0.5 to \$135 million each year.
- Annual losses to the greenbug are highly variable, but estimated at up to \$405 million per year in the Great Plains.

Hessian Fly

- 70% of fields in southern Kansas, Oklahoma, and northern Texas are infested with Hessian fly each year. Approximately 3 to 5% of these fields have over 50% infested plants.
- In 2006, 38% of wheat fields in the Northern Plains region were found infested with Hessian fly. Insect damage ratings ranged from 3 to 12%, as nearly all cultivars grown in this region are susceptible to the insect.
- Resurgence of Hessian Fly can be attributed to increasing adoption of reduced tillage management practices, increased insect virulence, and warmer fall weather conditions.
- In the S. Plains, only 2 out of 22 known plant resistance genes are continuing to provide a high level of resistance to the Hessian fly. It is unlikely that these will remain effective.



Wheat Stem Sawfly

- Production losses total \$100's of millions in Northern Plains states.
- Losses in MT alone are estimated at \$75 million each of the last two years.
- The Sawfly threat is increasing, causing production losses in ND, WY, and SD. Field losses of up to 80% are possible.
- Sawfly cannot be controlled with insecticides or cultural management.
- The solid stem trait is only partially effective. Improving genetic resistance is critical for control.

APPROPRIATIONS REQUEST FOR FY 2011

Reducing Threats of Insect Pests in Wheat - \$750,000 Sawfly;
\$500,000 Greenbug/RWA; \$750,000 – Hessian Fly

Reducing Threat of Insect Pests in Wheat

Appropriations Bill	Agriculture
Agency	US Department of Agriculture
Account	Agricultural Research Service
Program Name	Salaries and Expenses



Requested amount: \$500,000 Greenbug/RWA; \$750,000 Sawfly; \$750,000 – Hessian Fly

Authorization

- Department of Agriculture Organic Act of 1862

Description – Facilities and Program Requests

- Hessian Fly Research - \$250,000 per Research Unit (technical support, supplies, operations)
 - Plant Science and Entomology Research Unit, GMPRC, Manhattan, KS
 - Crop Protection, Pest Reduction Research Unit, West Lafayette, IN
 - Cereal Crops Research Unit, Northern Crop Science Lab, Fargo, ND
- Russian Wheat Aphid and Greenbug - \$500,000 (Cat1 Scientist, technical support, supplies, operations)
 - Wheat, Peanut, and other Field Crops Research Unit, Stillwater, OK
- Wheat Stem Sawfly – \$750,000 (technical support, supplies, operations; Specific Cooperative Agreements)
 - Pest Management Research Unit, Northern Plains Agricultural Research Laboratory, Sidney, MT
 - SCA's with Montana State University and North Dakota State University (\$500,000)

Justification

- Declining funds and increasing operating costs have forced each of these Research Units to eliminate or downgrade scientific positions, and to significantly reduce the scope of insect research and germplasm development. Without a significant infusion of funds, our ability to develop and deploy resistant varieties and reduce production losses to these damaging insects will be seriously compromised. Production losses and pesticide use will only increase as these pests continue to evolve, become increasingly virulent, and spread throughout the US. The expertise needed to combat new invasive insect pests and biotypes will be lost.
- Genetic resistance remains the most environmentally responsible and effective strategy to control insects such as Hessian fly, Russian wheat aphid, greenbug, and wheat stem sawfly. However, new genetic sources of resistance and more rapid, effective screening methods are needed to achieve durable resistance. Also needed is a greater understanding of insect biotypes, their evolution, and the mechanistic basis of insect virulence and host resistance.
- Specific goals include:
 - Increase capacity to screen germplasm and develop resistant varieties in collaboration with public and private breeding programs. Accelerate incorporation of new genes for resistance using molecular markers.
 - Monitor changes in insect biotypes and virulence by conducting surveys of insect populations in collaboration with entomologists from federal, state, and Land-Grant programs.
 - Determine molecular mechanisms for insect virulence and host plant resistance. Identify means to increase effectiveness and durability of plant resistance genes.
 - Identify and deploy viable biocontrol agents, such as parasitoid wasps for sawfly.
- Reducing the threat of wheat insect pests requires scientific partnerships and innovative, multidisciplinary approaches. Cooperation between ARS and Land-Grant Universities will be established and strengthened to ensure that all necessary disciplines of the US research community contribute to solving these critical problems. Collaborations with Montana State University and North Dakota State Universities will address the Sawfly threat; collaborations with the University of Idaho will address Hessian Fly in the Pacific Northwest.

Funding History

FY 2011 (President's Budget	FY2010	FY 2009	FY 2008	FY2007	FY2006
Unknown	0	0	0	0	0

Additional Information: www.wheatworld.org/issues/research