



Area-wide Pest Management for Wheat

Management of greenbug and Russian wheat aphid
<http://www.pswcrl.ars.usda.gov/awpm.htm>

Poster presentation for the Fourth National Integrated Pest Management Symposium, April 8-10, 2003, Indianapolis

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AWPM for Wheat is a five-year project of the USDA Agricultural Research Service. The purpose is to demonstrate pest management practices for the Russian wheat aphid and greenbug.

Wheat is the leading dryland crop in our project area because its winter hardiness and water needs fit well with the area's seasonal climate and rainfall patterns. A significant proportion of the wheat is grown as a dual-purpose crop, providing both cattle forage in the winter and a grain crop from the same planting.

Rotation with summer annual crops is possible in many locations and advantageous for pest management, but also challenging to maintain over long periods due to summer heat, lack of rainfall, and wind. Due to these and other factors, continuous wheat or a wheat-fallow rotation are the predominant dryland cropping systems in the area. However, these systems are problematic for effective IPM.

Program Goals and Objectives

The goal of the AWPM for Wheat program is to provide an IPM package that will greatly reduce yield losses and lower management input costs. The maximum impact of a program based on these technologies will be achieved when it is implemented on a broad geographical scale. We will improve upon the existing system by:

1. Collecting comprehensive and validated data at farm and landscape scales. We will:
 - a. Conduct *intensive field sampling* in a series of demonstration fields distributed throughout the project study area
 - b. Improve the use of *remote sensing* as an area-wide detection tool.
 - c. Conduct *simulation modeling* to explore potential consequences of implementing the program at larger spatial scales.
2. Collaborating with wheat producers and IPM educators to engage existing communities in the program. We will:
 - a. Conduct *focus groups* with wheat producers to learn about their pest management experiences and decision-making.
 - b. Develop a *quarterly newsletter* and a *project website* to keep everyone informed.
 - c. Conduct *extension programs* to disseminate project findings and information.
3. Analyzing costs of production in different types of wheat production systems and geographical locales. We will:
 - a. Conduct *annual cost-of-production interviews* with wheat producers.
 - b. Create *personalized cost-of-production assessments* for participating growers.
 - c. Conduct economic *time-series comparisons* of cropping systems and regions.

Complete contact information for all project team members may be found at our project website:

<http://www.pswcrl.ars.usda.gov/awpm.htm>

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Other related links of interest:

USDA-ARS, Plant Science and Water Conservation Research Laboratory
Stillwater, Oklahoma: <http://www.pswcrl.ars.usda.gov/>

OSU IPM website: <http://entopl.okstate.edu/IPM>

OSU Greenbug Decision Support System: <http://entopl.okstate.edu/greenbug/index.htm>

OSU Entomology and Plant Pathology: <http://entopl.okstate.edu>



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Project Overview

AWPM for Wheat is a five-year project of the USDA Agricultural Research Service. The purpose is to demonstrate pest management practices for the Russian wheat aphid and greenbug.

Wheat is the leading dryland crop in our project area because its winter hardiness and water needs fit well with the area's seasonal climate and rainfall patterns. A significant proportion of the wheat is grown as a dual-purpose crop, providing both cattle forage in the winter and a grain crop from the same planting.

Rotation with summer annual crops is possible in many locations and advantageous for pest management, but also challenging to maintain over long periods due to summer heat, lack of rainfall, and wind. Due to these and other factors, continuous wheat or a wheat-fallow rotation are the predominant dryland cropping systems in the area. However, these systems are problematic for effective IPM.

The Russian wheat aphid and greenbug are significant pests in wheat, and readily disperse over large areas. However, severe outbreaks are sporadic, and typically lead to heavy applications of pesticides in an attempt to control the pest.



Goals & Objectives

The goal of the program is to provide an IPM package that will greatly reduce yield losses and lower management input costs. The maximum impact of a program based on these technologies will be achieved when it is implemented on a broad geographical scale.

We will improve upon the existing system by:

1. Collecting comprehensive and validated data at farm and landscape scales. We will:
 - a. Conduct *intensive field sampling*
 - b. Improve the use of *remote sensing* as a detection tool
 - c. Conduct *simulation modeling* to predict consequences of implementing the program at larger scales
2. Collaborating with wheat producers and IPM educators to engage existing communities in the program. We will:
 - a. Conduct *focus groups* with wheat producers to learn about their pest management decisions
 - b. Develop a *newsletter and website*
 - c. Conduct *extension programs* to disseminate information
3. Analyzing costs of production in different types of wheat production systems and geographical locales. We will:
 - a. Conduct annual *cost-of-production interviews* with wheat producers
 - b. Create *cost reports* for producers
 - c. Create economic *time-series comparisons* for cropping systems and regions



Field Data Collection

Eleven pairs of demonstration fields are distributed around three zones of the Great Plains. Zone 1 is an area predominantly affected by Russian wheat aphid. Zone 3 is predominantly affected by greenbug. Zone 2 is affected by both of these aphids.



At each demonstration field, our team will closely monitor aphids and other pests over the next four years, not only in wheat but also rotational crops grown with wheat. We will also collect information on agronomic conditions, weather, and the occurrence of beneficial insects in fields. In some locations, we have provided growers with resistant wheat varieties to plant in these fields.

Working with the Precision Agriculture program at Texas A&M, we will also develop the use of hyperspectral remote sensing imagery to detect aphid infestations.



Project Team



Norm Elliott – Program Coordinator, simulation modeling
 David Porter – Develop and evaluate resistant cultivars
 Dean Kindler – Aphid ecology on non-cultivated hosts
 John Burd – Investigator, aphid ecology
 Kevin Shuffan – Aphid and natural enemy movement among crops and non-crop hosts



Frank Peairs – Colorado site coordinator, education extension, and program evaluation
 Tom Holtzer – Education and technology transfer
 Gary Peterson – Agronomic evaluation, cropping systems



Jerry Michels – Texas site coordinator, remote sensing
 Mustafa Mirik – Remote sensing research scientist



Gary Hein – Nebraska site coordinator, insect-vectored diseases
 Drew Lyon – Weed evaluation, northern study sites
 Paul Burgener – Economic analysis



Gerald Wilde – Kansas site coordinator, insecticide resistance
 Phil Sloderbeck – Education, technology transfer, and evaluation



Kris Giles – Oklahoma site coordinator, host plant resistance and biological control
 Tom Royer – Education, technology transfer, and evaluation
 Gerrit Cuperus – Education, technology transfer, and evaluation
 Tom Peeper – Weed evaluation, southern study sites
 Sean Keenan – Rural sociology and focus groups

Collaboration with Growers

Program success depends on grower participation. In addition to 22 growers who farm our paired demonstration fields, we have identified an additional 16-20 growers at each study area location. Growers will participate over a four-year period, starting in the fall 2002.

Focus Groups

The purpose of focus groups is not only to obtain information about how growers make pest management decisions, but also to involve growers with the process of developing the project.

We conducted our first series of focus groups in each study area location between January and March, 2003. We asked growers to discuss:

- Crops they currently grow
- Production history and outlook
- Agronomic practices
- Decision-making about wheat pests



Some preliminary observations from focus groups are:

- ✓ Growers are concerned about input costs for wheat, and are reluctant to use insecticides.
- ✓ Most have not had severe infestations of greenbug or Russian wheat aphid in recent years.
- ✓ Growers recognize the value of crop rotation to break up pest cycles, but rotations with winter wheat are difficult to maintain, particularly with recent drought conditions in many areas.
- ✓ Successful growers vary greatly in their farming practices and economic decision-making. This suggests that there is a need to provide a suite of IPM techniques rather than a single model.

We will also conduct focus groups at the end of the project so that growers may evaluate the program and suggest methods of implementation at a broader scale.

Cost of Production Evaluations

After focus groups, we conducted follow-up in-person interviews with each producer. The purpose of interviews was to obtain cost of production data on each farm for the 2002 production year. In the subsequent three years of the project, we will conduct annual cost of production interviews with each producer.

Data from interviews will allow us to evaluate costs of pest control relative to overall operating expenses, as well as any changes observed over the period of study.

Acknowledgements



Diane Varner – graphic design, newsletter, and web page.
 Dave Christian – assistant moderator of focus groups and interviewing.
 Mustafa Mirik – photos, information on remote sensing applications.

Fourth National Integrated Pest Management Symposium, April 8-10, 2003, Indianapolis. Poster presenters are:



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