

Research Proposal for the Oklahoma Wheat Research Foundation and Oklahoma
Wheat Commission 04/07/17

TITLE: *Improving Oklahoma Wheat Yield and Quality through Weed Management*

PRINCIPAL INVESTIGATORS:

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COOPERATORS:

Dr. David Marburger – Small Grains Extension Specialist
Dr. Josh Lofton – Cropping Systems Extension Specialist
Dr. Todd Baughman – Professor and IAB Weed Science Program Support Leader

FUNDING HISTORY:

Fiscal year 2016 – \$25,000 requested and funded
Funding for 2014 and 2015 – N/A

ABSTRACT:

Effective weed management is essential to improving the yield and quality of Oklahoma wheat. Grassy weeds such as Italian ryegrass compete with wheat for moisture, nutrients, light, and space. Additionally, dockage associated with cheat and jointed goatgrass and foreign material associated with feral rye affect not only the cash price for the farmer at the elevator but also the marketability and end use quality of their crop. Even a small elevator discount for dockage or foreign material can be the difference between profit or loss for farmers in low-price years.

While grassy weeds have always been difficult-to-control in wheat, the increase in herbicide resistant weeds has made management even more challenging. Most Italian ryegrass in Oklahoma, for example, is resistant to ALS herbicides such as Finesse and Powerflex. Recently, ACCase resistant Italian ryegrass also has been reported within the state, resulting in poor performance of Axial XL. As herbicide resistant cases increase, farmers are forced to make more complicated weed management decisions and need better recommendations for appropriate courses of action. New herbicides such as Zidua will allow us to broaden and strengthen our approach in battling resistant weeds, but there is a critical need for education regarding herbicide selection, application timing, tank-mix partners, and surfactant use in order to ensure success. There also is a continued need to test and confirm the presence of herbicide resistance in farmer submitted samples.

Feral rye has always been a challenging weed to manage in wheat, as current herbicides do not have the selectivity that allows for effective control without injuring wheat. Further complicating the situation is the lack of proper identification which often leads to feral rye being identified as Italian ryegrass and vice versa. Two gene Clearfield varieties such as Doublestop CL Plus now allow us to provide acceptable in-season control of feral rye;

however, there were several reports of ineffective or partial control in 2016. Additional investigation and demonstration are needed to determine the optimal timing, surfactants, and number of passes required to provide consistent control of feral rye using the Clearfield system.

This study will address these problems by conducting research that evaluates how to best manage ALS and ACCase resistant Italian ryegrass and feral rye in Oklahoma wheat. Main factors assessed will include herbicide selection, application timing, surfactant use, and overall weed management systems. Data to be collected will include weed control, crop tolerance ratings, and crop yield. Upon completion of the experiments, data will be distributed through extension publications, presentations, and social media outreach.

OBJECTIVES:

The primary objective of this research will be to evaluate how to best manage ALS and ACCase resistant Italian ryegrass and feral rye through assessments of herbicide selection, application timing, surfactant use, and overall weed management systems.

1. Determine the most effective season-long weed management strategies for controlling herbicide resistant Italian ryegrass using preemergence and postemergence herbicides.
2. Determine how to best use the Clearfield system to provide long-term control of feral rye.
3. Provide herbicide resistance screening services for farmers, extension educators, and industry professionals.
4. Provide current and updated weed management information to Oklahoma farmers through extension publications, presentations, and social media outreach.

PROCEDURES:

Field experiments will be conducted at multiple locations.

1. Weed Management Strategies for Control of Herbicide Resistant Italian ryegrass

Studies will be conducted to determine effective weed management strategies for control of herbicide resistant Italian ryegrass. Weed management systems will include the use of preemergence and postemergence herbicides applied alone and in combination. Herbicides will include pyroxasulfone (Zidua), pyroxasulfone + carfentrazone (Anthem Flex), flufenacet + metribuzin (Axiom), metribuzin, pinoxaden (Axial XL), and mesosulfuron (Osprey).

2. Use of the Clearfield System to Manage Feral Rye

Studies will be conducted to determine how to best use the Clearfield system to manage feral rye. Seed longevity of feral rye also will be evaluated. Research on the longevity of feral rye seed states that typically less than 5% of seed is viable after two years; however, farmer experience suggests that seed may lay dormant for 5 to 10 years. In another study, reports indicated that the use of a crop oil concentrate (COC) or methylated seed oil (MSO) in tank mixture with Beyond on Doublestop

greatly increased control of feral rye and brome species compared to systems where a COC or MSO was not used. Further research on the seed longevity of feral rye and the use of surfactants in Beyond applications needs to be conducted in order to better understand how to manage this weed.

3. Herbicide Resistance Screening

Farmers, extension educators, and industry professionals can send suspected herbicide resistant weeds to the weeds lab to be evaluated. Screening of weeds will follow the criteria used by the International Survey of Herbicide-Resistant Weeds. Confirmed cases will be sent to the organization so that Oklahoma's resistant weeds are listed on their web site for anyone to access.

4. Dissemination of Information

Data to be collected will include weed control and crop tolerance ratings and crop yield. Upon completion of the experiments, data will be distributed through extension publications, presentations, web-based communication, and refereed journal articles.

TIMELINES:

Plots will be planted in September and October of 2017 and data will be collected throughout the 2017-2018 growing season. Results will be published in the summer of 2018 and will continue to be updated as long-term studies are continued.

JUSTIFICATION:

The data collected from this research will help answer weed management questions from the state's farmers, extension educators, and industry professionals. This research also will help the OSU Weed Science Extension Program develop a foundation for future weed control studies.

REPORT OF ACCOMPLISHMENTS:

Objective One: Five trials were established at the Cimarron Valley Research Station in Perkins, OK to examine season-long Italian ryegrass management. Several successful treatments were identified. The greatest level of ryegrass control and the least amount of crop injury followed preemergence applications of Zidua. Anthem Flex applied preemergence also was a competitive treatment.

Objective Two: Clearfield trials to evaluate feral rye were not evaluated in year one as rye populations in planted fields were not adequate to conduct a sound trial. Due to inconsistent populations at Oklahoma Agricultural Experiment Stations, 2017-2018 trials will be on grower fields. Contacts have been made with growers who are battling feral rye populations.

Objective Three: The OSU Weed Science Herbicide Resistance Screening Program has been announced at all weed science presentations to date. The prime weed seed collection period for Oklahoma's troublesome weeds is in the spring and summer. Although some samples have been

sent in that were collected from the 2015-2016 season, most samples will be sent in during the upcoming months. To prepare for this, our greenhouse cooling system is being renovated in order to extend our greenhouse growing season. Greenhouse work is being funded by the Plant and Soil Science Department.

Objective Four: Results collected thus far have been distributed via 16 extension presentations, three academic conferences, and weekly Twitter updates.

BUDGET:

Total budget is \$25,000 divided into the following budget categories.

| | |
|------------------------|----------------|
| One Graduate Student: | \$16,861 |
| Undergraduate Student: | \$3,000 |
| Services and Supplies: | \$3,139 |
| In-State Travel | <u>\$2,000</u> |
| | \$25,000 |

RELATION TO OTHER RESEARCH:

This research supports the overall extension efforts of the wheat extension program at OSU. Weed management is a critical component of a successful wheat production system and it is the responsibility of the OSU Weed Science Extension Program to share effective and economical weed management tools with the state's farmers, extension educators, and industry professionals. Additionally, the support of students in these projects provides learning opportunities for the future of our agricultural industry.

SIGNATURE PAGE

Weed Management Systems in Oklahoma Small Grains

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Proposed funding level: \$25,000



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