

**Washington Grain Commission
Wheat and Barley Research Annual Progress Reports and Final Reports**

Project #: 3019-3425

Progress Report Year: 3 of 3

Title: Weed Management in Wheat

Researcher(s): Ian C. Burke and Drew J. Lyon

Cooperators: Derek Appel and Henry Wetzel, Associates in Research

Executive summary: Weed control is one of the major challenges facing wheat growers in the PNW. To address this problem, the Weed Science Program conducts a multi-disciplinary field, greenhouse, and laboratory research project to address the critical issues that Washington wheat growers face. One aspect of this work is the evaluation of herbicides, both registered and nonregistered, for crop tolerance and weed control in wheat production systems. This work is often, but not always, conducted in partnership with agricultural chemical companies. These field studies allow us to make better recommendations to growers, and they provides us the opportunity to work with the various companies to better refine their labels for the benefit of Washington wheat growers. The results from these studies were summarized in the WSU Weed Control Report, which was shared with the Washington Grain Commission and posted on the WSU Extension Small Grains website annually. The Weed Science Program continues to look at the biology and ecology of troublesome weeds including downy brome and Russian-thistle.

Impact: The WSU Weed Science Program impacts wheat and barley production in Washington and the Pacific Northwest by producing timely, accurate, non-biased weed control and weed biology information. That information is most commonly extended to consumers in the form of presentations, extension publications, news releases, and the Internet. In terms of value, herbicide inputs are typically the second costliest a grower faces, and using the most economical and effective treatment will improve the net income and long term durability of any operation

- The project provided data and local insights to BASF and FMC that assisted these companies label their new pyroxasulfone-containing herbicide products for Italian ryegrass and rattail fescue control in wheat. Our work was also critical in getting these companies to label higher use rates and preemergence applications in the PNW, contrary to what is labeled for the rest of the country.
- The results of our research on feral rye and downy brome control in wheat were incorporated into two new PNW Extension publications on these two troublesome weeds. A third Extension publication on prickly lettuce control, currently in review, also incorporates research from this research program. A fourth on mayweed chamomile will likely be submitted before the end of the currently funded project.
- Combined, Drs. Burke and Lyon have presented the results of this research program at ~127 events over the 3 years of this project, including the WSU Weed Science Field Day, the Lind Field Day, the Wheat Academy, and Far West Agricultural Associates meeting, and numerous county meetings.

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Project PI(s): Ian C. Burke and Drew J. Lyon
Project initiation date: July 1, 2013
Project year: 3 of 3

Objective	Deliverable	Progress	Timeline	Communication
Evaluate herbicides	Efficacy and crop injury data to support use recommendations, new labels, and label changes to benefit WA small grain growers.	The 2015 WSU Weed Control Report was published in January of 2016 and distributed to the Washington Grain Commission, County Extension Educators in eastern Washington, and sponsoring chemical companies. The published studies will also be posted on the WSU Extension smallgrains website and discussed at winter Extension meetings.	Annually, in time for winter meetings.	Annual weed control report; articles in Wheat Life, trade magazines and/or posted to WSU smallgrains website; field days; winter Extension meetings; decision support system tools.
		The first year of a field study looking at smooth scouringrush control was completed near Rearden and the second year of the study was initiated. Only one treatment, Glean + MCPA-ester, provided significantly improved control compared to the nontreated check. A field study was initiated in the fall of 2015 near Lacrosse to look at the control of rush skeletonweed in wheat following CRP. Buckwheat seed was spread in the fall of 2015 at a field site near Pasco in preparation for a volunteer buckwheat control study in irrigated spring wheat.	The data from the first year of the scouringrush study will be combined with data from a similar study initiated in 2015 in Oregon. The data from the two sites will be used in a student M.S. thesis and submitted for publication in 2017. We will complete the second year of the scouringrush study in 2017 and initiate a second site near Omak in 2016. We will complete the first year of work on the rush skeletonweed and volunteer buckwheat studies in 2016.	Annual weed control report, extension publications, extension meetings and field days, and refereed journal articles
		Multiple field studies were conducted in association with agricultural companies to investigate efficacy and crop tolerance to a range of grass and broadleaf weed control products. These studies allow us to evaluate new chemistries or new uses of old chemistries and also help us modify company labels to better suit our region.	Field studies were completed in the summer of 2015 and new winter wheat studies initiated in the fall of 2015.	Annual weed control report, extension publications, extension meetings and field days, and refereed journal articles
Evaluate cultivars	Support release of new cultivars with superior tolerance to herbicides that provide effective weed control in WA small grains. Identify traits that confer resistance or susceptibility in wheat or the primary gene pool.	Several 2-gene imi-resistant winter wheat lines were screened in the field and greenhouse for tolerance to Beyond plus sulfonylurea herbicides.	Annually, in time for cultivar release committee meetings.	Journal articles; Supplemental reports for use by the variety release committee; field days; winter Extension meetings.

Evaluate weed biology & ecology	Weed biology and ecology to aid in the design of effective and economic control strategies for troublesome weeds in WA small grain crops; decision support system database development.	A Russian-thistle common garden was grown in Pullman and Central Ferry. Accessions were sprayed with glyphosate and paraquat. No differential responses were observed to paraquat, but some variation in response to glyphosate was observed.	Genetic analysis of the accessions will be completed early in 2016 and these results will be combined with 2015 field results to design a field study to ascertain if genetic differences in herbicide response are evident.	Annual weed control report, extension publications, extension meetings and field days, and refereed journal articles
		Downy brome accessions were collected from across the wheat production region of the PNW. A subset of 96 accessions representing the spatial and climatic range of the PNW were chosen to investigate differences in maturation rate and genetic diversity. Common garden studies were conducted in 2013 and 2014, with an additional ongoing experiment taking place in 2015. The purpose of the common garden experiments were to identify differences in rate of mature downy brome seed set across the PNW. Results indicate downy brome can set mature seed from early May to early July depending on climate and downy brome accessions present. Using next generation sequencing technologies, five distinct downy brome populations were identified from the accessions used in the common garden studies. Ongoing research is being conducted to provide a map of spatial distribution of downy brome populations along with development thresholds for mature seed set and optimal timing of herbicide applications.	Genetic analysis of the accessions were completed in 2015. Work on seed dormancy continues and should be completed in 2016.	Annual weed control report, extension publications, extension meetings and field days, and refereed journal articles.
Evaluate cultural & mechanical management	Data to support recommendations for integrated weed management systems to control troublesome weeds in WA small grains.	Data from two years of field work on windrow burning to control Italian ryegrass were evaluated and a refereed journal article was submitted to Weed Technology. The paper was accepted for publication and will be published in early 2016.	Project completed in 2015.	Journal article and extension presentations. Data will be used to support future grant proposals on harvest weed seed control.