

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

Project #: 3019-3155

Progress Report Year: 3 of 3

Title: Weed Management in Wheat

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

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 are summarized in the WSU Weed Control Report, which is 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, Russian-thistle, and mayweed chamomile.

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 stakeholders in the form of presentations, extension publications, news releases, and the Internet (wsu.smallgrains.edu). In terms of value, herbicide inputs are typically among costliest a grower faces, and using the most economical and effective treatment will improve the net income and long term sustainability of any operation

- The project continues to generate data and local insights for various agrichemical companies to assist them in labeling their new herbicide products for weed control in wheat. We have been working with bicylopyrone, a new broadleaf herbicide from Syngenta, as well as new herbicides from Corteva, Bayer, FMC, and old herbicides from Albaugh and Gowan.
- A number of grower driven projects were continued in the new cycle, including management of rush skeletonweed and other troublesome weeds in fallow, management of scouringrushes in wheat, use of weed sensing sprayers in fallow, spring wheat preemergence herbicides for Italian ryegrass control, harvest weed seed control, and management of brome species with preemergence herbicides.
- Extending the outputs of the project was a challenge during the pandemic. Dr. Lyon continued to publish extension output in the form of webcasts and extension bulletins based on our research, and several presentations were created in active field trials. We look forward to resuming our active extension grower engagement in 2022.

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WGC project title: Weed Management in Wheat
Project PI(s): Ian C. Burke and Drew J. Lyon
Project initiation date: July 1, 2019
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 WSU Weed Control Report was published annually and distributed to the Washington Grain Commission, County Extension Educators in eastern Washington, and sponsoring chemical companies. The published studies are 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 Small Grains website now hosts an outlet for our efficacy results see https://herbicideefficacy.cahnr.wsu.edu/
		A 5-year field study near Omak to look at how frequently Finesse and Amber herbicides must be used to maintain control of smooth scouringrush in winter wheat-fallow production systems was completed in 2021. Two 6-year field studies were initiated in 2019 in the intermediate rainfall zone (Edwall and Steptoe) to determine the same thing in winter wheat-spring wheat-fallow production systems. Studies were also initiated in 2019 and 2020 to look at the impact of various surfactants on the efficacy of glyphosate for smooth scouringrush control in fallow.	Results from the Omak study will be reported in Wheat Life and at various winter Extension meetings. Publication of the results in a scientific journal will have to wait until the completion in 2025 of the two 6-year studies from the intermediate rainfall zone. We will continue the glyphosate plus surfactant studies in 2022 with the expectation of submitting a manuscript for publication in 2023.	Annual weed control report, Wheat Life magazine, extension publications, extension meetings and field days, and refereed journal articles.
		Field studies were completed in 2020 near Lacrosse and Hay addressing control of rush skeletonweed in fallow. A manuscript describing this work has been accepted in Weed Technology and will be published in 2022. Field studies comparing various rates of picloram (Tordon 22K) applied broadcast or with a weed-sensing sprayer for the control of rush skeletonweed in fallow were initiated in 2019 and 2020 near Lacrosse and Hay. The subsequent winter wheat crop planted in the fall of 2021 will be harvested in 2022 to complete the study.	The picloram study should be completed after the 2022 wheat harvest. A manuscript will be submitted to a scientific journal in 2022 or 2023.	Annual weed control report, extension publications, extension meetings and field days, and refereed journal articles

		Multiple field studies were conducted in association with agrichemical 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 will be conducted every year during this project.	Annual weed control report, extension publications, extension meetings and field days, and refereed journal articles
		A WEED-It sensor sprayer system was acquired in the spring of 2018 using Camp Endowment funds, and multiple experiments were initiated to evaluate efficacy of various fallow herbicides using the sensor system.	Additional trials were installed in the spring of 2020. New trials will be designed based on the trial experiments to evaluate the sensor sprayer when used season long in fallow as well as in crop, and emphasize economics and use of alternate herbicide modes of action.	Annual weed control report, extension publications, extension meetings and field days, and refereed journal articles
		A field study was completed in 2021 to assess the efficacy of gibberelic acid on Italian Ryegrass germination and control in combination with Zidua, Fierce, and Fierce MTZ. Results indicated that gibberelic acid had no effect on Italian ryegrass control.	This project will be completed in the year of 2022.	Annual weed control report, extension publications, extension meetings and field days, and refereed journal articles
		A field study assessed Anthem Flex and Talinor alone and in combination for tumble mustard and mayweed chamomile control in winter wheat.	Field studies are completeThis project will be completed in the year of 2022.	Annual weed control report, extension publications, extension meetings and field days, and refereed journal articles
		Indaziflam was tested for preemergence control of Italian ryegrass in wheat cropping systems in 2020 and 2021. Results indicated that no additional control of IR was achieved via applications of Indaziflam in 2021. This was likely due to abnormal drought conditions for the region, which negatively impacted weed germination and establishment.	This project will be completed in the year of 2022.	Annual weed control report, extension publications, extension meetings and field days, and refereed journal articles

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.	Common garden and greenhouse experiments using the downy brome PNW core collection have started to identify variation in flowering time. Flowering time genes strongly coordinate with vernalization genes to regulate when flowering occurs in downy brome. In previous work, vernalization regulated if flowering occurred, but it was evident that, when place in different environments, flowering time was plastic.	A large downy brome panel was phenotyped for flowering time. Initial analyses indicate that flowering time is highly heritable, unlike growth or tillering. Highly heritable traits may facilitate ecological approaches to management of downy brome by field, and indicates that movement between fields should be minimized.	Annual weed control report, extension publications, extension meetings and field days, and refereed journal articles.
		We have identified a new and potentially troublesome pest in the inland Pacific Northwest. Discovered while conducting field trials near Asotin and Ewan, sterile brome does not appear to respond to postemergence herbicides. The weed has a very similar appearance to downy brome except while flowering, and thus is usually identified as downy brome.	We are preparing an identification guide for Bromus species and will produce an extension bulletin in spring 2021 - the pandemic derailed plans to produce a document in 2022.	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.	As part of our work to understand seed dormancy in downy brome, we have discovered that gibberillic acid can be used to stimulate germination in the field. Current work has focused on identification of the duration of the effect as well as on additional weed species that may respond to such an input. Recent greenhouse work indicates that soil temperature may play a role in the effect we have observed.	Field studies will be conducted every year during this project.	Annual weed control report, extension publications, extension meetings and field days, and refereed journal articles.
		A current greenhouse project is underway to assess the effects of temperature and GA applications on germination rates in annual grass weeds. The current studies are investigating how environmental conditions during and shortly after application of GA could impact germination rates of dormant annual grass seeds. Previous greenhouse studies have indicated that applications of GA have an effect on germination rates of annual grass weeds that were several years old. Environmental conditions such as light and temperature may play a role in the efficacy of GA on newly produced annual grass weed seed.	Field studies are complete, and greenhouse trials are in the final stage. This project will be completed in the year of 2022.	Annual weed control report, extension publications, extension meetings and field days, and refereed journal articles.

		<p>We conducted field studies to ascertain seed shattering in Italian ryegrass by harvest time in winter and spring wheat. In 2020, we initiated a field study to evaluate chaff lining for the management of Italian ryegrass in winter wheat.</p>	<p>Italian ryegrass samples were collected in 2017 and 2018 in winter wheat and from spring wheat in 2019 and 2020. The samples have been evaluated for seed shatter and seed germination. A manuscript will be prepared for journal submission in 2022. Chaff lining experiments will be repeated in 2022.</p>	<p>Annual weed control report, extension publications, extension meetings and field days, and refereed journal articles.</p>
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