**WERA077: Managing Invasive Weeds in Wheat**

**Annual Report Date: 4/30/2016**

Annual Meeting Date: 3/10/2016

Reporting Period: 05/2015 through 03/2016

**Participants**:

Barroso, Judit ([judit.barroso@oregonstate.edu](mailto:judit.barroso@oregonstate.edu)) – Oregon State University;

Burke, Ian ([icburke@wsu.edu](mailto:icburke@wsu.edu)) – Washington State University;

Campbell, Joan ([jcampbel@uidaho.edu](mailto:jcampbel@uidaho.edu)) – University of Idaho;

Carl Coburn ([ccoburn2@uwyo.edu](mailto:ccoburn2@uwyo.edu)) – University of Wyoming;

Jugulam, Mithila ([mithila@ksu.edu](mailto:mithila@ksu.edu)) – Kansas State University;

Hulting, Andy ([Andrew.hulting@oregonstate.edu](mailto:Andrew.hulting@oregonstate.edu)) – Oregon State University;

Kniss, Andrew ([akniss@uwyo.edu](mailto:akniss@uwyo.edu)) – University of Wyoming;

Lehnhoff, Erik ([erik.lehnhoff@montana.edu](mailto:erik.lehnhoff@montana.edu)) – Montana State University;

Lyon, Drew ([drew.lyon@wsu.edu](mailto:drew.lyon@wsu.edu)) – Washington State University;

Fabian Menalled ([menalled@montana.edu](mailto:menalled@montana.edu) – Montana State University;

Don Morishita ([don@uidaho.edu](mailto:don@uidaho.edu); –University of Idaho;

Neely, Clark (cbn108@tamu.edu) – Texas A&M University;

Roerig, Kyle ([kyle.roerig@oregonstate.edu) –](mailto:kyle.roerig@oregonstate.edu)%20-) Oregon State University;

Ransom, Corey ([corey.ransom@usu.edu](mailto:corey.ransom@usu.edu)) – Utah State University;

Traci Rauch ([trauch@uidaho.edu](mailto:trauch@uidaho.edu)) – University of Idaho;

Phil Westra ([cows19@comcast.net](mailto:cows19@comcast.net)) – Colorado State University;

**Summary of minutes of annual meeting:**

Don Morishita, chair, called the meeting to order at 12:30 pm. Attendance sheet was passed and attendees introduced themselves. One member participated by telephone. The seeding direction study was the first item of discussion. No one site on its own had statistically significant differences. Andrew Kniss is combining all sites together which may provide useful information. The second item of discussion was on feral rye. Seed was collected from four sites in 2015 and additional sites will be collected in 2016. Seed will be grown in common gardens representing eco-climatic areas from north to south and east to west. The details of the common gardens are to be determined by a sub-committee of Joan Campbell and Ian Burke. Seed not included in the common garden will be included in genotyping. All seed should be sent to Joan Campbell for storage at a single site. Two participants will run germination experiments on a temperature gradient plate to determine optimum germination. The third item of discussion was potential grant proposals. This will continue at the next meeting due to time constraints. Erik Lehnhoff was elected secretary. Joan Campbell will serve as chair. The next meeting will be held March 13, 2017 before the Western Society of Weed Science meeting in Coeur d’Alene, Idaho. Meeting adjourned at 2:30 pm

**Impact statements:**

Zidua (group 15) was registered for annual grass control, including Italian ryegrass and rattail fescue, in winter and spring wheat in spring 2014. Zidua registration will aid in control of group 1 and 2 resistant Italian ryegrass. Very few herbicides control rattail fescue. Zidua and Anthem treatments controlled rattail fescue 82-98% in 2015.Winter wheat was not injured by Zidua under irrigation (worst-case scenario). Wheat had less than 5% injury in six conventional-tilled (chisel plowed/field cultivated) sites and in two direct-seed locations. These studies were instrumental in implementing Zidua label changes including earlier application time and increased use rate. These label changes will aid growers by giving them more options to improve weed efficacy. Anthem Flex also was registered in wheat fall 2014. Anthem Flex studies were useful to FMC when drafting rates and timings for the federal label. All of this information will help growers use these products safely and effectively to control grass weeds with minimal crop injury. These registrations provide needed tools to help control herbicide resistant weeds.

Knowledge of cultural controls, crop rotation and tillage is limited for rattail fescue control. Current information is speculative at best. Herbicide usage is the only known research-based tool for rattail fescue control. In 2015 tillage studies, rattail population was highest in no-till and least in chisel treatments. At one location, chisel, disc, and no-till plots yielded 3582, 3137, and 2926 lb/A, respectively. This data will help growers take an integrated weed management approach to reducing rattail fescue and increasing crop yield.

Suspected-resistant weed seed samples collected from research plots and submitted by Idaho growers, fieldmen, and industry representatives were screened in the greenhouse. No sample screened was resistant to pyroxaslufone, metolachlor, flufenacet, clethodim or glyphosate. Samples were resistant to Amber, Osprey, and PowerFlex (group 2) and Poast, Assure II and Axial XL (group 1).Screening weed seed samples enables growers to combat herbicide resistance by adjusting their weed control approach so that it includes rotating chemicals, changing crop rotations, and implementing other cultural practices.

Grower and industry awareness of herbicide resistance in Italian ryegrass, downy brome, and Russian-thistle was increased through a series of winter meeting presentations in Washington, an article in Wheat Life magazine, and Timely Topic posts on the Wheat and Small Grains Website (smallgrains.wsu.edu).

Collaborated with the Richland County Extension Agents to identify two biotypes of *Conyza canadiensis* resistant to glyphosate. This represents a new case of herbicide resistance in Montana.

Collaborated in the publication of three educational videos

*‘Enzyme linked immunosorbent assay video’*. https://vimeo.com/117442610 (password: plantvirus)

*‘Francis the farmer’ animation for WSMV education*. <https://vimeo.com/124056111>.

‘MSU organic farming study finds diverse benefits’ https://www.youtube.com/watch?v=Y5w25UgWMTs&feature=youtu.be

Developed and delivered a total of 29 extension/outreach presentation at 12 locations across Montana. Invited out of state and international extension presentations included one presentation in South Dakota and two presentations in Ontario, Canada. California. Also, presented two webinars organized by eOrganic and National Association of County Agricultural Agents. Over 1,400 participants were directly reached in these presentations.

Studies in western Oregon focus on grass control in winter and spring wheat.  Control of Italian ryegrass, California brome, downy brome and rattail fescue in winter wheat are being evaluated with a range of preemergence, early postemergence and postemergence applications of herbicides in several studies. Data from these trials are used to support labeling of herbicides in diverse wheat-cropping systems in Oregon. Research and experience using recently registered products provides critical information to growers and agri-business consultants that allow them to refine their weed control practices, control invasive weeds efficiently, and avoid wheat injury and yield reductions. The research is also critical to aiding the early adoption of new technologies in wheat production which maintains the competitiveness of Oregon wheat production.

Weed management Extension presentations were made to wheat producers in many Oregon locations including Forest Grove, Albany, Salem, Mt. Angel, Corvallis, Klamath Falls, Pendleton, Condon, Hood River, LaGrande, and Walla Walla, WA, among other locations throughout Oregon and the Pacific Northwest.  Topics covered included precision application of herbicides for weed management, herbicide resistance management, herbicide mode of action, Russian thistle control, carryover potential for Beyond herbicide in wheat, and Italian ryegrass, rattail fescue and downy brome control in winter and spring wheat.  Formal field tours or research results were conducted with industry groups and growers at the Columbia Basin Ag Research Center in Pendleton, the Hyslop Ag Research Farm near Corvallis and in Washington County.  Andrew Hulting continues to serve as Associate Editor for the PNW Weed Management Handbook and edit and update several wheat-related weed management chapters in the handbook on a yearly basis: <http://pnwhandbooks.org/weed/>. 

**Publications:**

Barroso, J, Miller Z., Lehnhoff, EA, Hatfield, PG, and Menalled, FD. 2015*.*Impacts of cropping system and management practices on the assembly of weed communities. Weed Research, 55:426-435

Young, F. L., D. K. Whaley, N. C. Lawrence, and I. C. Burke. 2016. Feral rye (Secale cereale) control in winter wheat in the Pacific Northwest. Weed Technol. 30:163-170.

Lyon, D.J., D.R. Huggins, and J.F. Spring. 2016. Windrow burning eliminates Italian ryegrass (Lolium perenne ssp. multiflorum) seed viability. Weed Technol. 30:279-283.

Raeder, A. J., D. Lyon, J. Harsh, and I. C. Burke. 2015. How soil pH affects the activity and persistence of herbicides. Washington State University. FS189E.

Lyon, D.J, and I.C. Burke. 2016. Integrated management of prickly lettuce in wheat production systems. Washington State University. PNW 688.

Varanasi VK, Godar AS, Shoup D, Peterson DE and Jugulam M. 2016. A Target-Site Point Mutation in Henbit (*Lamium amplexicaule* L.) Conferring High Level Resistance to ALS-Inhibitors. Weed Science. 64: 231-239. (*KAES # 16-041-J*).

Jugulam M, Ziauddin A, So KKY, Chen S and Hall JC. 2015. Transfer of dicamba tolerance from *Sinapis arvensis* to *Bassica napus* via embryo rescue and recurrent bbackcross breeding. PLoS ONE 10(11): e0141418. doi:10.1371/journal.pone.0141418 (*KAES # 15-098-J*).

Godar AS, Varanasi VK, Betha S, Prasad PVV, Thompson CR and Mithila J. 2015. Physiological, biochemical and molecular mechanisms of differential sensitivity of Palmer amaranth to mesotrione at varying temperatures. PLoS ONE 10(5): e0126731. doi:10.1371/journal. pone.0126731.

Varanasi VK, Godar AS, Currie RS, Dille JA, Thompson CR, Stahlman PW and Jugulam M. 2015. Field evolved resistance to four modes of action of herbicides in a single kochia (*Kochia scoparia* Schrad) population. Pest Management Science. doi: 10.1002/ps.4034.

Chatham LA, Bradley KW, Kruger GR, Martin JR, Micheal JR, Owen DK, Peterson DE, Mithila J and Tranel PJ. 2015. A multi-state study of the association between glyphosate resistance and EPSPS gene amplification in waterhemp (*Amaranthus tuberculatus*). Weed Science 63: 569-577

Godar AS, Stahlman PW, Jugulam M and Dille JA. 2015. Glyphosate-resistant Kochia in Kansas: EPSPS gene copy number in relation to resistance levels. Weed Science: 63: 587-595.

Peterson DE, Thompson CR, Shoup DE and Jugulam M. 2015. Mode of action of herbicides. KSRE Publication #C715 ([http://www.bookstore.ksre.ksu.edu/pubs/C715.pdf).<p](http://www.bookstore.ksre.ksu.edu/pubs/C715.pdf).%3cp)>

Vipan Kumar, Prashant Jha, Darci Giacomini, Eric P. Westra, and Philip Westra (*2015*) Molecular Basis of Evolved Resistance to Glyphosate and Acetolactate Synthase-Inhibitor Herbicides in Kochia (*Kochia scoparia*) Accessions from Montana. Weed Science: October-December 2015, Vol. 63, No. 4, pp. 758-769.

Miller Z and Menalled FD  (2015) Impact of species identity and phylogenetic relatedness on biologically-mediated plant-soil feedbacks in a low and a high intensity agroecosystem*.   Plant and Soil, 389, 171-183.*

Keren I, Menalled FD, Weaver D and Robison-Cox J  (2015) Interacting agricultural pest management practices and their effect on crop yield: Application of a Bayesian decision theory approach to the joint management of *Bromus tectorum* and *Cephus cinctus*. *PLOS ONE, DOI: 10.1371/journal.pone.0118111*