PACIFIC NORTHWEST USDA-ARS JOINTED GOATGRASS (*AEGILOPS CYLINDRICA*) RESEARCH AND EXTENSION ACTIVITIES

Frank L. Young*, USDA-ARS, Pullman; Joseph P. Yenish, Laylah S. Sullivan, Washington State University, Pullman; Daniel A. Ball, Oregon State University, Pendleton; Donn C. Thill, and Richard S. Zemetra, University of Idaho, Moscow.

Introduction: The USDA-ARS weed scientists have conducted research and extension activities on six research projects funded by the National Jointed Goatgrass Research Program (NJGGRP). This poster reviews the objectives and major research findings from these federally funded projects. Most of these projects were conducted in cooperation with research scientists and personnel from Washington State University (WSU), University of Idaho (UI), and Oregon State University (OSU). The projects ranged from short-term single component to long-term (>5 yrs) integrated field projects. The overall objective of our Pacific Northwest (PNW) research was to conduct studies that focused on the priorities set forth and data gaps recognized by the NJGGRP. These studies included biology, ecology, integrated weed management systems, and cropping systems to reduce and/or prevent weed resistance. These projects, their abbreviated titles, cooperating agencies, and funding duration included: **(1)** "Integrating seed size, seeding rate, and cultivar plant height to enhance winter wheat competitiveness against JGG" (Wheat Competitive Trait Study), WSU and ARS - 2 years; **(2)** "Integrated management of JGG in PNW dryland cropping systems" (Integrated Weed Management Study), ARS, OSU, UI, and WSU - 5 year; **(3)** "Seed production by spring germinating JGG and yield loss of spring seeded wheat" (Spring Germinating JGG Study), ARS, WSU, and OSU - 2 years; **(4)** "Best crop rotation for effective JGG control using imidazolinone resistant wheat" (Imi-Wheat Study), ARS and WSU - 6 years; **(5)** "Effect of no-till, deep plowing, herbicide-resistant winter wheat and length of absence of winter wheat on JGG population dynamics" (Plow Study), ARS and WSU - 5 years; and **(6)** "Determining and confirming imazamox-resistant JGG" (JGG Resistance Study), ARS, UI, and WSU - presently concluding. Data from these NJGGRP studies were presented at professional regional, state, and international weed conferences; local field days; and in regional JGG bulletins.

Wheat Competitive Trait Study

Conducted in the high rainfall zone (annual cropping region) of WA.

Objective(s): Determine if winter (WW) seed size, seeding rate, plant height, and their interactions will increase the competitiveness and yield of WW grown in JGG infested fields.

Results/Recommendations:
- Tall wheat reduced JGG biomass, spikelets produced, and dockage compared to short wheat (near-isolines).
- Wheat seeding rate, seed size, and height had no effect on JGG plant density.

Integrated Weed Management Study

Conducted in the intermediate rainfall zone (wheat-fallow region) of WA, OR, and ID.

Objective(s): Develop an integrated weed management system for the control of JGG in WW by determining the effects of stubble burning, length of crop rotation, and integrated practices for planting WW on JGG population dynamics and WW yield and quality.

Results/Recommendations:
- Burning stubble reduced JGG seed germination >90% in moderate to high infestations but was not practical in light infestations.
- At the ID site (light weed infestation), burning, crop rotation, and integrated WW planting practices did not improve crop yields; however the rotation of fallow/spring wheat (SW)/fallow/WW reduced dockage compared to WW/fallow.
- At the OR site (heavy weed infestation) the overall best treatment for crop yield, decreased JGG populations, and dockage was a one-time burn, fallow/SW/fallow/WW rotation using integrated WW planting practices.
- The 2nd best rotation was no burn, fallow/SW/fallow/WW using integrated WW planting practices.

Spring Germinating JGG Study

Conducted in the low rainfall zone (wheat-fallow region) of WA, intermediate rainfall zone (wheat-fallow region) of OR, and high rainfall zone (annual cropping region) of WA.

Objective(s):
- Determine effects of spring seeding date on the ability of JGG to flower and produce viable seed.
- Determine effects of JGG competition and crop seeding date on SW grain yield.
- Determine quantitative vernalization requirements of JGG cohorts in comparison with WW as measured by vegetative and reproductive growth.

Results/Recommendations:
- Spring germinating JGG can produce viable seed.
- Planting of a spring crop that does not have control methods available for JGG should be delayed past the optimum planting date to ensure viable weed seed is not produced.
- JGG is more of a facultative rather than an obligate winter annual and thus is not as dependent on vernalization for reproduction as is WW.

Technology Transfer:

3 publications in Weed Science; Masters graduate student thesis; 3 presentations (posters/talks) at WSWS; more than a dozen presentations at winter grower meetings; 9 weed science, experiment station, and research farm field days/tours; 2 presentations at the annual Tristate Wheat Grower meeting; 3 presentations at the PNW Direct Seed Association Conference; 3 presentations at the Montana State University Grass Weed Workshop; invited presentation at the 13th Annual Australian Weed Conference; presentation at the Gene Flow and Agriculture Symposium at University of Keele, Staffordshire U.K.

Imi-Wheat Study

Conducted in the high rainfall zone (annual cropping region), and in 2 locations in the low rainfall zone (wheat-fallow region) of WA.

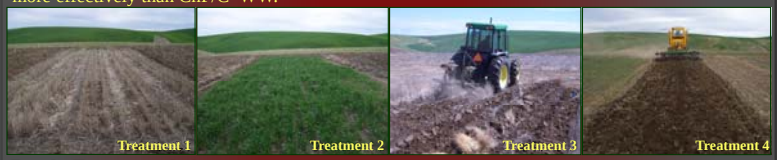
Objective(s): Identify a stable crop production system that reduces JGG infestations based on time and frequency of the introduction of Clearfield® WW (C® WW) technology.

Results/Recommendations:
- Based on crop yield, JGG populations, and spikes produced, a grower does not need to produce C® WW more than twice in either 3 cycles of a 2-year rotation (WW/fallow) or a 3-year rotation (WW/SW/spring grain legume).
- In general, there was no difference in plants or spikes produced at any location with regards to the sequence of growing C® WW twice during three cycles of the rotations.

Plow Study

Conducted in the intermediate rainfall zone (wheat-fallow region) of WA.

Objective(s):
- Determine if a chemical fallow (ChF)/herbicide resistant WW (C®WW) rotation reduces JGG populations more rapidly than 2 years of no-till spring cereals.
- Determine if one-time spring deep plowing followed by no-till spring cereals reduces JGG populations more rapidly than continuous no-till cereals.
- Determine if shallow preplant tillage annually after one-time spring deep plowing for spring cereals reduces JGG populations more rapidly than continuous no-till spring cereals after one-time spring deep plowing.
- Determine if 3 years or 4 years out of WW production eliminates or reduces JGG populations more effectively than ChF/C®WW.



Results/Recommendations:
- No-till spring cereals reduced JGG populations and spikelets more rapidly than a ChF/C®WW rotation.
- One-time spring deep plowing followed by no-till spring cereals reduced JGG populations more rapidly than continuous no-till spring cereals.
- In identical crop sequences, shallow preplant tillage annually after one-time spring deep plowing for spring cereals reduced JGG populations and spikelets compared to no-till crops after one-time spring deep plowing.
- Three and four years out of WW reduced JGG populations more rapidly than two cycles of a ChF/C®WW rotation.

JGG Resistance Study

JGG spikelets were collected from field experiments in the high and low rainfall zones of WA and greenhouse studies were conducted at WSU and UI.

Objective(s): Confirm imazamox resistance in JGG through screenings and herbicide dose-response experiments.

Results/Recommendations: This study has not been concluded therefore our data is PRELIMINARY. There has been a possible development of resistant JGG biotypes, although the manifestation of resistance in these plants is not holding with the typical genetic ratios.