



11-06

**PROGRESS REPORT**

**TITLE:** Environmental and genetic effects on seed dormancy and after-ripening in jointed goatgrass

**PERSONNEL:** Carol Mallory-Smith, Weed Scientist, Oregon State University  
Lynn Fandrich, Colorado State University

**COOPERATORS:** Joe Yenish, WSU; Tom Peeper, OK; and Tony White, KS

**TIMELINE:** Initiation date – July 1, 2003; Termination date – June 30, 2005  
The project is on schedule, but due to the experimental design, final results are not yet available. The last germination study was completed in mid-April 2006.

**ORIGINAL HYPOTHESIS:** Differences in seed dormancy may be genetic in origin and/or influenced by environmental conditions during seed development. Cool temperatures at seed development and warm temperatures during after-ripening (AR) may shorten the dormancy period in jointed goatgrass.

**SUMMARY OF PROGRESS:** Germination studies for all seed have been completed. The final data were collected in April 2006. The data sets from both years are being analyzed. A final report will be submitted in 2007. **I am requesting an additional \$5,000 to support Lynn Fandrich to complete the analysis.**

**OBJECTIVE:** To examine the influence of precipitation and temperature during spikelet production on post-harvest seed dormancy and after-ripening. To study the genetic variation in jointed goatgrass seed dormancy.

**EXPERIMENTAL DESIGN:** Four jointed goatgrass populations, two winter and two spring, and two wheat cultivars were planted in six environments with different temperatures and precipitation levels during spikelet production. Oregon State University provided the four jointed goatgrass populations; each study participant included two local wheat varieties and opted to include two additional jointed goatgrass populations for evaluation. Replicated, small plots (approximately 8 X 8 feet) were established at each site for fall and spring plantings.

Jointed goatgrass spikelets were hand-harvested from four replicate plots at each location approximately one to two weeks before crop maturity. Plants were clipped below the inflorescence and shaken inside a paper bag to collect mature spikelets. Winter and spring wheat were harvested at crop maturity. Four replicate samples of each jointed goatgrass population and wheat varieties were shipped after harvest to Oregon State University. Sub-samples of the

remaining spikelets were stored at -30, 10, 20, 30, and 40 C for 12 weeks. Additional after-ripening treatments were added to the protocol (Table 1). Germination tests will be conducted on after-ripened and -30 C stored seed. Primary seed dormancy will be estimated as the difference between -30 C stored and after-ripened germination responses. A treatment was added by returning the after-ripened seed to -30 for 12 weeks to determine if after-ripening can be reversed.

Specific environmental and phenology data were collected from each site. Planting date, approximate heading date, harvest date, mean monthly temperature, and precipitation were required.

**PROGRESS/CONCLUSIONS:** The second year seed production was completed in 2005. Spikes were sent from all cooperators to Oregon State University. Samples were placed in a freezer upon arrival to prevent after-ripening. Samples were cleaned, weighed and spikelet weight calculated. The spikelets were kept at -30 C until treatments were applied. Final germination data will be collected on April 12, 2006.

**PUBLICATIONS:** None to date.

**PLANNED TECHNOLOGY TRANSFER:** Results will be presented at grower meetings, through extension publications and on the jointed goatgrass web page. Final results will be presented as a paper at the 2007 Western Society of Weed Science meeting.

**BUDGET:**

Year 1 - 2003-2004

	Oregon Requested/Received	Washington Req./Rec.	Oklahoma Req./Rec.	Kansas Req./Rec.	Total Req./Rec.
Total	\$13,154	\$1,100	\$1,100	\$1,100	\$16,454

Year 2 - 2004-2005

	Oregon Requested/Received	Washington Req./Rec.	Oklahoma Req./Rec.	Kansas Req./Rec.	Total Req./Rec.
Total	\$13,988	\$1,300	\$1,300	\$1,300	\$17,888

**I am requesting an additional \$5,000 to support Lynn Fandrich to complete the analysis.**

**STATEMENT OF WORK TO BE CONDUCTED:** Germination tests will be completed on seed harvested in 2005 seed. Data will be analyzed using traditional statistical methods, presented at the 2007 WSWS annual meeting, and prepared for submission to a refereed journal.

Table 1. Summary of after-ripening treatments applied to spikelets harvested from all locations.

Treatment no.	Treatment temperature (C)	Duration
1	-30	Continuous, since harvest
2	10	12 weeks
3	20	12 weeks
4	30	12 weeks

5	40	12 weeks
6	40/20	3 weeks/3 weeks
7	40/20	2 weeks/4 weeks
8	40/20	1 week/5 weeks
9	-30	12 weeks post after-ripening*

---

\*treatment added to determine whether after-ripening can be reversed