

Seed Production research on native grasses: Examples of diuron herbicide and nitrogen fertilization experiments on Roemers fescue and meadow barley

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Introduction: Native grasses continue to be a small but important niche market in the United States, including the Pacific Northwest. Widely utilized for rangeland improvement and pasture in other regions of the US, their use west of the Cascades in Oregon and Washington is primarily limited to restoration and revegetation of upland prairie, wetland, riparian, and understory woodland plant communities. They function to create, sustain, or improve habitat for wildlife and other essential endemic organisms, and control erosion. Minor uses include naturalized landscaping, roadside stabilization, cover crop, and low maintenance turf. Adaptation, genetic diversity, natural origin, and safe distances for seed (population) movement are key issues among the major end users of native grasses which are Federal land management agencies and to a lesser degree state, local, and city governments. Inherent low seed yields and challenges in harvesting some species, combined with strict genetic guidelines, complicate matters and drives up the cost. The Corvallis Plant Materials Center is producing seed for other agencies and/or conducting research on about a dozen native grass species. Seed production technology is just one of the aspects of native grasses (and forbs) we evaluate in cooperation with other agencies, besides genetics, site adaptation, establishment techniques, multiple use, and germplasm development. Our service area is limited to the west sides of Oregon and Washington and northwest CA.

Basic information is still lacking for many of our local native grasses on how best to produce seed and maximize yields while managing genetic diversity issues. As with tame grasses, modifying simple agronomic practices alone can make a substantial difference in yield, including the effects of row spacing, residue management, weed control/herbicide use, and fertility management. Results of herbicide studies may help achieve special local needs (24C) labeling (diuron first).

Fertilization Studies: Effect of timing and rate of nitrogen fertilization on seed yield of

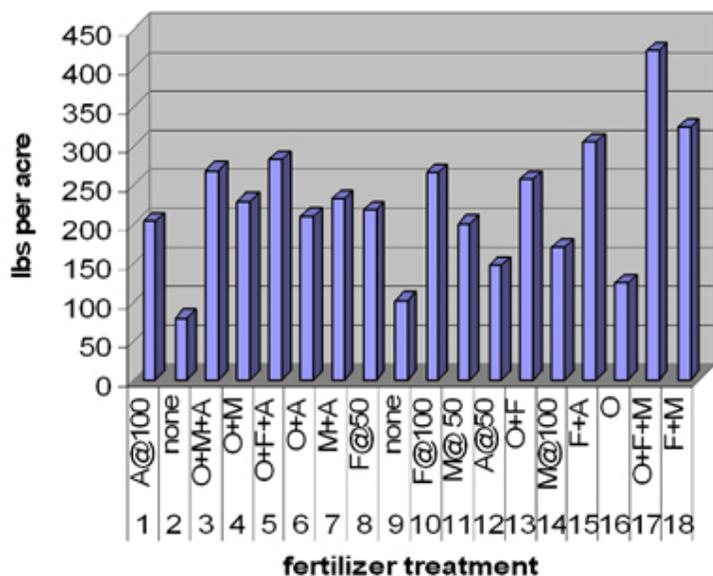
1) meadow barley (*Hordeum brachyantherum*) (OSU Hyslop Farm, field 5-1)

2) Roemers fescue (*Festuca roemeri*) (OSU Hyslop Farm, field 5-11)

Experimental methods: Broadcast application of nitrogen fertilizer (33-0-0-12) on 4 different dates (October, February, March, April) and at 2 different rates (50 vs. 75 lbs N/ac, with and without fall fertilization). Design is a randomized complete block with 4 replications of each treatment.

Results: None yet for either species. This is the first year of the experiment. However, see below for example of results on fertilization of tufted hairgrass. Best rate and best timing approximates that for certain tame grasses.

Effect of N Fertilization on Seed Yields of Tufted Hairgrass (4 reps, 3 yrs)



For "fertilizer treatment" (horizontal axis), letters represent month of the year: A = April, F= February, M=March @ 50 lbs N/ac unless otherwise indicated to be @ 100 lbs N/ac. O=October @ 25 lbs N/ac.

- 6 of the 7 top treatments had a February component of N fertilizer
- Overall, 100 lb N/ac treatments (single or split) were superior to 50 lbs N/ac treatments.
- There was no consistent benefit to fertilizing in October.
- Without a February application, April applications of N generally produced lower seed yields.
- Recommendation: 100 lbs N/ac as either a single application in February or split 50/50 in Feb-March.

Herbicide Studies Cooperative with OSU Crop and Soil Science: (Barbara Hinds-Cook, Daniel Curtis, Andrew Hulting, Carol Mallory-Smith, Bill Brewster)

1) Carbon seeded Roemers fescue tolerance of pre-emergence applied diuron

Experimental methods: Broadcast application of diuron (Direx®) at 0, 0.8, 1.2, 2.4, and 4.8 lbs ai/ac after carbon band seeding of Roemers fescue in October 2006 and 2008. Injury was recorded in winter and spring of 2007 and 2009.

Results: Significant Injury to Roemers fescue only occurred at the highest rate 2009. Seed yields were lowest in the check (control) and highest rate (4.8 lbs ai/ac) plots. Best control of annual ryegrass and annual bluegrass was at the label rate and highest rate. Crop tolerance appears good. Seed yield will be determined again in 2010.

Treatment	2006-2008 Experiment ¹			2008-2010 Experiment ²				
	Fescue injury%	Fescue injury%	Seed yield lb/ac	Fescue injury%	Fescue injury%	Speedwell control%	A. ryegrass control%	A. bluegrass control%
Check (control)	0.0 a	0.0 a	306 bc	0.0 a	0.0 b	0.0 b	.0.0 c	0.0 d
diuron@0.8 lbs/ac	0.0 a	0.0 a	413 a	0.0 a	0.0 b	12.5 b	42.5 b	80.0 c
diuron@1.2 lbs/ac	0.0 a	2.5 a	401 ab	0.0 a	0.0 b	0.0 b	62.5 ab	87.6 b
diuron@2.4 lbs/ac	5.0 a	0.0 a	400 ab	1.3 a	0.0 b	7.5 b	90.0 a	90.0 ab
diuron@4.8 lbs/ac	7.5 a	0.0 a	291 c	3.8 a	6.3 a	57.5 a	87.6 a	92.5 a
LSD (P=.05)	12.9	3.5	91	2.7	1.7	22.7	22.7	3.7
CV	335	447	16	177	89	95	26	3.4

Means followed by same letter do not significantly differ (P=.05, Duncan's New Multiple Range Test¹ or Student-Newman-Keuls²)



Carbon seeded/diuron experiment in 2007: Roemers fescue showing injury at highest rate of diuron (left) vs. untreated plot (center) with annual bluegrass weeds, vs. plot with intermediate rate of diuron (right)

2) Carbon seeded meadow barley tolerance of pre-emergence applied diuron

Experimental methods: Broadcast application of diuron (Direx®) at 0, 0.8, 1.2, 2.4, and 4.8 lbs ai/ac after carbon band seeding of meadow barley in October 2006 and October 2007. Experiment was conducted twice.

Results: Stunting of meadow barley occurred in the highest rate (4.8 lbs ai/ac) in the 2008 experiment but seed yield was not reduced in either year. Meadow barley tolerance to diuron in carbon seedings appears comparable to that of other grass species that are currently established with this technique. These data may allow the addition of this and several other native grass species (blue wildrye, tufted hairgrass, and lupine species) to a diuron label.

Treatment	Meadow barley injury %		Seed yield (lbs/ac) ¹	
	2007	2008	2007	2008
Check (control)	0	0	41 c	380 b
diuron@0.8 lbs/ac	0	0	60 b	481 a
diuron@1.2 lbs/ac	0	1	76 a	519 a
diuron@2.4 lbs/ac	0	4	80 a	532 a
diuron@4.8 lbs/ac	0	30	86 a	545 a
LSD (P=.10)			15	69

¹Means followed by the letter do not significantly differ (P=.10, LSD)