EFFECTS OF NITROGEN FERTILIZER TIMING AND RATES ON SEED PRODUCTION OF JACKSON-FRAZIER GERMPLASM MEADOW BARLEY (*HORDEUM BRACHYANTHERUM*)

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Introduction

Jackson-Frazier Germplasm meadow barley (*Hordeum brachyantherum* Nevski) is a source identified natural germplasm that was released in 2007 by the USDA-NRCS Corvallis Plant Materials Center. It is a native bunchgrass intended for quick cover in wetland restor-ation plantings, erosion control, and wildlife habitat along streambanks, waterways, shorelines, and ditch bottoms at low elevations in western Oregon, primarily in the Wil-lamette Valley (Darris, 2007). There are currently no published data available on fertilizer recommendations for seed production of this species. The purpose of this study was to determine the optimal timing and rates of nitrogen fertilizer application for seed production of meadow barley.

Materials and Methods

An existing field of Jackson-Frazier Germplasm meadow barley, previously established at OSU's Hyslop Research Farm near Corvallis, OR (accession #9056373) was used for this study. The field was 132 x 62.5 ft, with rows running north-south at 12-inch row spacing. The field was sown in October of 2007 for a carbon banded seeding trial with diuron herbicide applied immediately after sowing. Any residual carryover of diuron is expected to have dissipated by the start of this study in October 2009. The field was fertilized once in March 2008 (the year prior to the study) at a rate of 50 lb N/acre. A standard regime of weed and disease control was used during this experiment. Outlook® herbicide (dimethenamid-p) was applied in the fall for volunteer and annual grass control and Banvel® (dicamba) was applied in the spring for broadleaf weed control. Residue was removed with a flail type forage harvester after seed harvest. Rust was controlled with Quilt® fungicide (azoxystrobin and propiconazole) as needed. No irrigation water or other practices were applied.

Fertilizer was applied to plots according 14 treatments (Table 1) as a granular mixture of urea and ammonium sulfate (33-0-0-12), marketed at "Urea-sul," using an 8-ft wide Gandy type drop spreader. All rates are actual N/acre. Each plot was 8 ft wide and 16 ft long. Seed was hand-harvested from 1-m^2 subplots on July 5-9, 2010 (excessive lodging prevented mechanical harvest). Seed was cleaned and conditioned before recording plot yields. Lodging was scored on July 5, 2010 on a scale from 1 to 10, with 1 being no lodging (plants completely upright) and 10 being the most lodging (plants flat). The experimental design was a randomized complete block with four replications. Data analysis consisted of ANOVA and Tukey HSD means comparisons performed in Statistix 8.1.

Table 1. Nitrogen fertilizer treatments for meadow barley seed production study, Hyslop Farm, Corvallis, 2010.

Treatment	N application rate & timing
1	Control (no fertilizer)
2	25 lb/a 28-Oct-09
3	50 lb/a 24-Feb-10
4	50 lb/a 22-Mar-10
5	50 lb/a 28-Apr-10
6	75 lb/a 24-Feb-10
7	75 lb/a 22-Mar-10
8	75 lb/a 28-Apr-10
9	25 lb/a 28-Oct-09 + 50 lb/a 24-Feb-10
10	25 lb/a 28-Oct-09 + 75 lb/a 24-Feb-10
11	25 lb/a 28-Oct-09 + 50 lb/a 22-Mar-10
12	25 lb/a 28-Oct-09 + 75 lb/a 22-Mar-10
13	25 lb/a 28-Oct-09 + 50 lb/a 28-Apr-10
14	25 lb/a 28-Oct-09 + 75 lb/a 28-Apr-10

Results and Discussion

Mean seed production for each treatment is summarized in Figure 1. ANOVA revealed no significant effect of nitrogen treatments on seed yield. Treatments 3 and 6, February application of 50 and 75 lb N/a, respectively, appeared to have the highest seed yields, but variation was too large to give significant differences. The unfertilized control (Trt. 1), the 25 lb/a October application (Trt. 2), and the 50 lb/a April application (Trt. 5) appeared to have the lowest yields.

Nitrogen treatments did, however, have a significant effect on lodging scores (Table 2). Plots that received no fertilizer, October only, and April fertilizer (Trts. 1, 2, 5, 8, 13, 14) had significantly less lodging than all other treatments, presumably because the N was applied too early (Oct) or too late (Apr) to affect tiller growth. Plots that received 75 lb/a N in March (Trts. 7 and 12) tended to have the highest lodging scores, so if direct mechanical harvest is planned (i.e., direct combining or seed stripping), high rates of nitrogen later in the spring should be avoided.

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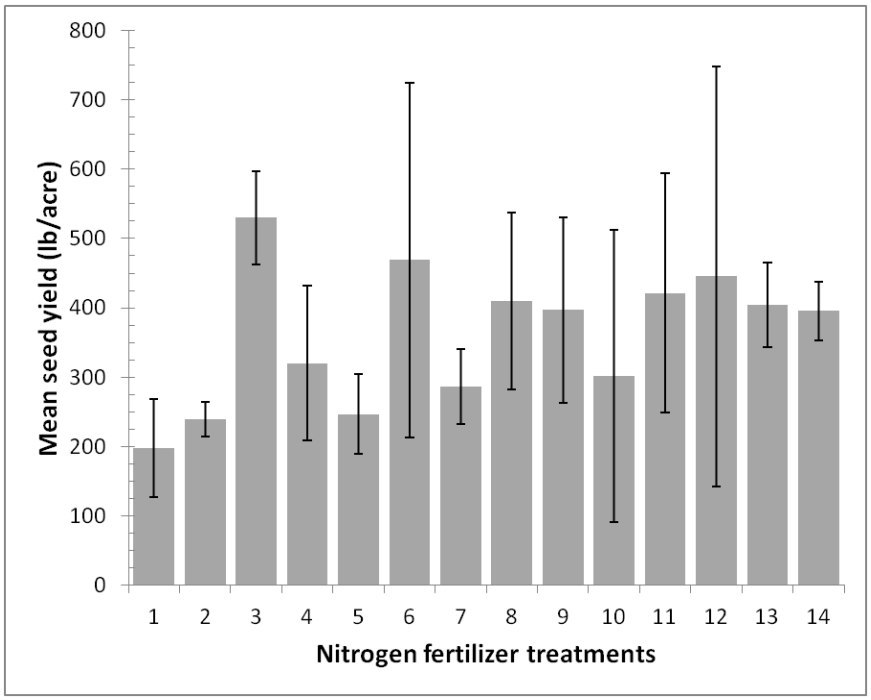

Figure 1. Seed production of Jackson-Frazier Germplasm meadow barley under 14 N fertilizer treatments. Bars represent mean ± 1 SD; ANOVA showed no significant differences among treatments.

Table 2. Tukey HSD comparison of meadow barley lodging scores (1-10 scale, with 10 high) by nitrogen fertilization treatment.

Treatment	Mean	Homogeneous Groups
7	9.50	A
12	9.25	A
10	8.75	AB
11	8.75	AB
6	8.50	AB
9	7.75	AB
4	7.50	AB
3	7.00	B
14	2.75	C
8	2.75	C
5	2.00	C
13	1.75	C
1	1.00	C
2	1.00	C
P < 0.001		

Conclusions

Although variation within and among treatments was too great to give conclusive results, there was a trend toward higher seed yields with February applications of 50-75 lb N/acre, so this is the recommended rate until further tests can be conducted. Split N application in the fall and spring appeared to have similar results to spring-only applications. High N rates (75 lb/a) are not recommended in March if seed is going to be harvested mechanically without swathing, as this can lead to higher rates of lodging and inaccessible seedheads.

References

Darris, D. 2007. Fact sheet: Jackson-Frazier Germplasm meadow barley. Available at http://plant-materials.nrcs.usda.gov/ orpmc/publications.html (accessed 9 Mar. 2012). USDA-NRCS Plant Materials Center, Corvallis, OR.

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