

**AGRICULTURAL RESEARCH FOUNDATION
INTERIM REPORT
FUNDING CYCLE 2016 – 2018**

TITLE: **Spring-Applied Nitrogen and Plant Growth Regulator Effects on Seed Yield in Orchardgrass**

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SUMMARY: Forage grass seed crops, including orchardgrass (*Dactylis glomerata* L.), are a vital part of seed production enterprises in Oregon. Like other cool-season grasses, orchardgrass only produces a fraction of its potential seed yield. Lodging of the crop during flowering is one of the major factors limiting maximum seed yield production.

Two stem shortening plant growth regulators (PGRs), chlormequate chloride (CCC) (Trade name: Cyclocel®) and trinexapac-ethyl (TE) (Trade name: Palisade EC®), enhance seed yield in forage grasses by blocking gibberellic acid (GA) biosynthesis. In comparison with other grass species, orchardgrass is relatively understudied in terms of PGR response. Gingrich and Mellbye (2002) reported seed yield increases ranging between 6 and 19% when TE was applied at flag leaf to early head emergence. A recent study conducted by Rolston et al (2014) in New Zealand indicates that greater orchardgrass seed yield increases, 30-37%, are possible when TE is applied earlier, at the two node stage. In this same study, a mixture of TE plus CCC was more effective at increasing seed yield across four orchardgrass cultivars than either CCC or TE applied alone.

Since lodging is exacerbated in high N environments, additional work is needed to determine possible interactions of PGRs for lodging control with spring-applied N under Oregon conditions. Nitrogen fertilizer rate recommendations have not been revised locally since PGRs have been introduced in Oregon grass seed systems. OSU fertilizer recommendations for orchardgrass seed crops are more than 15 years old and new information is needed to evaluate whether N rate recommendations should be adjusted in current management environments.

OBJECTIVES:

1. Define optimum treatment and timing applications of TE and TE plus CCC plant growth regulator combinations for orchardgrass seed crops.
2. Measure the effects of multiple nitrogen fertilizer rates in the presence and absence of TE and TE plus CCC plant growth regulators.
3. Develop new recommendations for plant growth regulators and nitrogen fertilizer rates in orchardgrass seed production based on research results and disseminate this information to seed growers and industry practitioners.

PROCEDURES: Field pots were established OSU's Hyslop Farm on October 7, 2015, at a seeding rate of 4.5 lbs/acre. Plot size is 11 x 38 feet. Routine fungicide and insecticide sprays were applied to manage pests as needed. Fall N was applied to all plots at a rate of 40 lbs/acre in both 2015 and 2016. The experimental design for the trial is a randomized complete block with a split-plot arrangement of treatments and four replications.

Main plots received spring-applied nitrogen rates of:

1. 0 lbs N/acre
2. 100 lbs N/acre
3. 140 lbs N/acre
4. 180 lbs N/acre

PGR subplots include the following treatments and application rates:

1. Untreated control (No PGR)
2. 1.5 pts/acre TE applied at BBCH 32 (2 nodes)
3. 1.5 lbs/acre TE applied at BBCH 51 (panicles 10% emerged)
4. 0.75 pts/acre TE + 0.67 lbs/acre CCC applied at BBCH 32

SIGNIFICANT ACCOMPLISHMENTS TO DATE: The first year crop was successfully established and managed (Figure 1). PGR and N treatments were applied. Seed was harvested by a small-plot swather and combine however only a partial seed yield was achieved. This is common for fall-planted orchardgrass crops in the western Oregon environment. Dirt yields ranged from 82 to 105 lbs/acre. There was not enough seed to clean or determine thousand seed weights.

The crop is now fully mature (Figure 2) and we expect the crop to have a full yield potential. Seed weight will be determined by counting two, 1000-seed samples with an electronic seed counter and weighing these samples on a laboratory balance. Harvest index, the ratio of seed yield to above-ground biomass, will also be measured. Soil and tissue N measurements will be taken.



Figure 1. Orchardgrass N X PGR trial stand in March, 2016.



Figure 2. Orchardgrass N X PGR trial stand in November, 2016.

ADDITIONAL FUNDING RECEIVED DURING PROJECT TERM: The Oregon Orchardgrass Commission has contributed \$2,500 in additional funding. Syngenta and OHP have donated PGR and pesticide products.

FUTURE FUNDING POSSIBILITIES: We will continue to seek product donations from chemical manufacturers. We will also explore further funding opportunities for the N components of the project if/when a new OSU Extension soil fertility specialist arrives.