# Increasing Seed Yield in Oregon's Annual Ryegrass Crops

Nicole P. Anderson, David J. Maliszewski,
and Thomas G. Chastain

Oregon State University

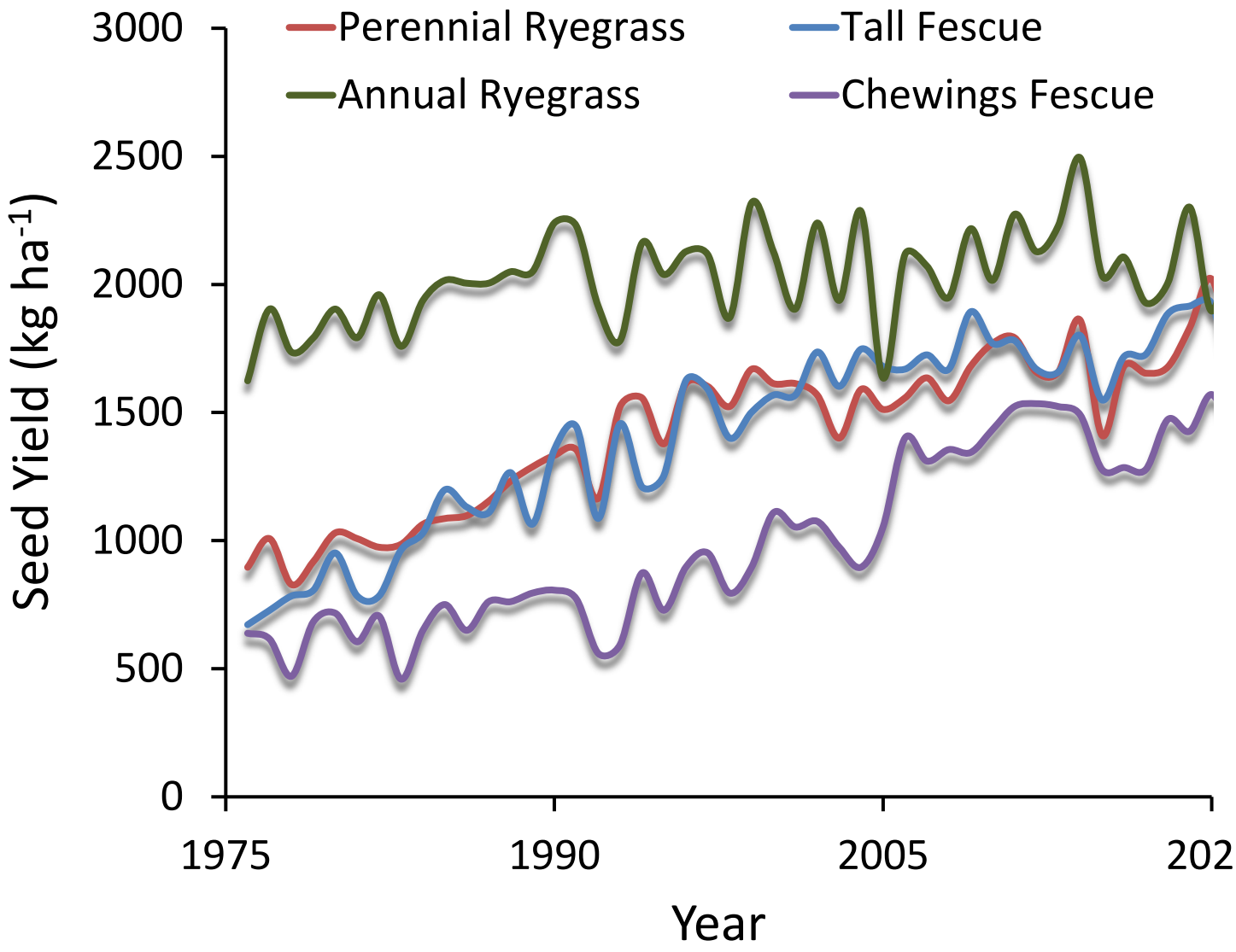
# Introduction

- Annual ryegrass (*Lolium mulitiflorum* L.) is grown for seed on nearly 50,000 hectares in Oregon's Willamette Valley.
- Tolerates poorly drained, low pH soils.
- Agronomic research, including use of defoliation and plant growth regulators (PGRs), is lacking.
- Prior results from Oregon reported only 10% seed yield increase from trinexapac-ethyl (TE) PGR (Mellbye et al., 2007).
- Chlormequat chloride (CCC) PGR has not been previously available in the US.
- Effects of spring grazing evaluated in Oregon in the 1970's (Young et al., 1996), but no work has been done since introduction of PGRs.

Annual ryegrass seed crop
[JM Hart Photo]

Oregon State University

# Oregon Grass Seed Yield Trends




Oregon State University

# Study Objectives

## Study I – 2018 & 2019

- Determine whether an interaction between TE and spring defoliation will increase seed yield in ‘Gulf’ annual ryegrass.

## Study II – 2021 & 2022

- Evaluate the effect of the CCC PGR with and without TE on seed yield ‘Gulf’ annual ryegrass with and without spring defoliation.

Annual ryegrass TE X spring defoliation plots at OSU’s Hyslop Research Farm [NP Anderson photo]

Oregon State University

# Methods

- ‘Gulf’ seed planted Fall 2017, 2018, 2020, and 2021 at OSU’s Hyslop Research Farm near Corvallis, OR.
- 30 cm row spacing
- Plot size was 3.4 m X 13.7 m
- 145 kg N $ha^{-1}$ applied in spring.
- Defoliation treatments applied with a tractor mounted flail mower.
- PGRs applied with a boom mounted bicycle sprayer powered by $CO^2$.
- Seed yield determined with a modified John Deere swather and Hege small plot combine.

Planting annual ryegrass in Oregon [NP Anderson Photo]

Oregon State University

# Study I - Design and Treatments

Plots were arranged in a randomized complete block with a split plot arrangement and four replications.

**<u>Defoliation</u> (Main Plots)**

Control (no mowing)

Single cutting (BBCH 31)

Triple cutting (BBCH 31 + 2x @ BBCH 32)

**<u>TE Plant Growth Regulator</u> (Subplots)**

Control (no PGR)

200 g TE $ha^{-1}$ @ BBCH 32

400 g TE $ha^{-1}$ @ BBCH 32

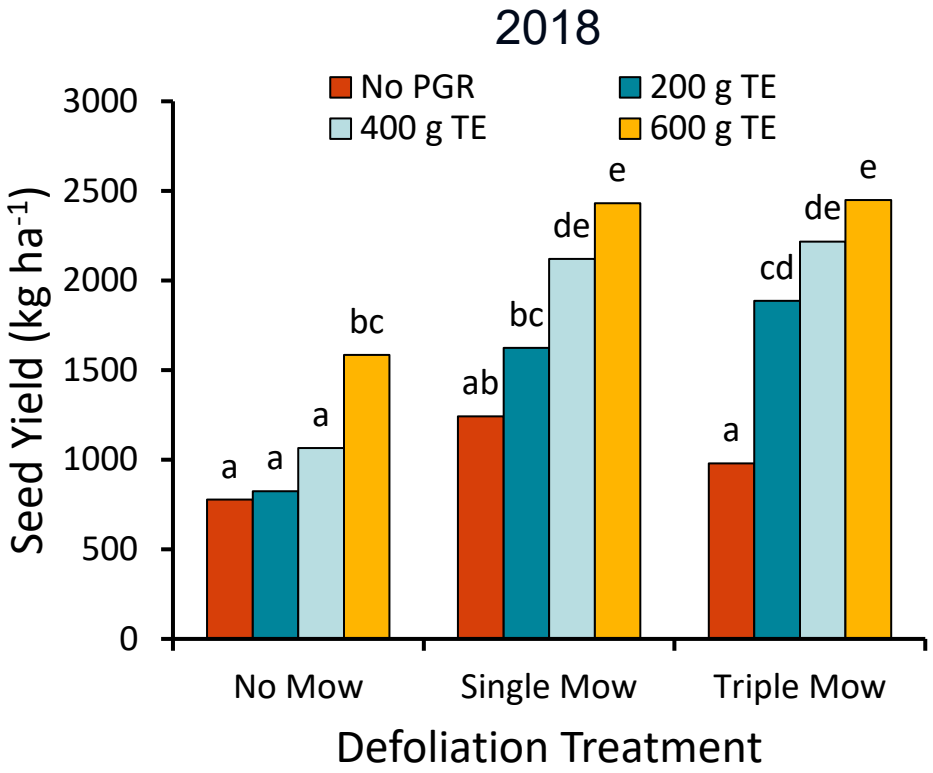
600 ai TE $ha^{-1}$ @ BBCH 32

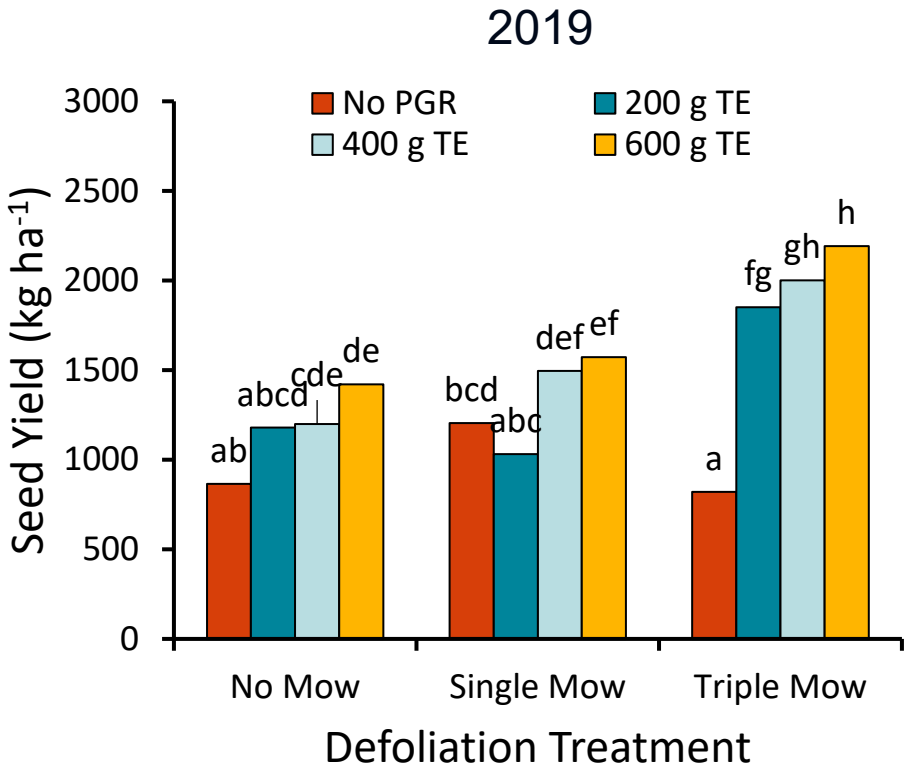
Spring defoliation of annual ryegrass (NP Anderson photos)


200 g TE
No PGR
400 g TE
May 11, 2019

# Results – Seed Yield

Significant seed yield interactions between TE + defoliation in both 2018 (P=0.0497) and 2019 (P=0.0002).

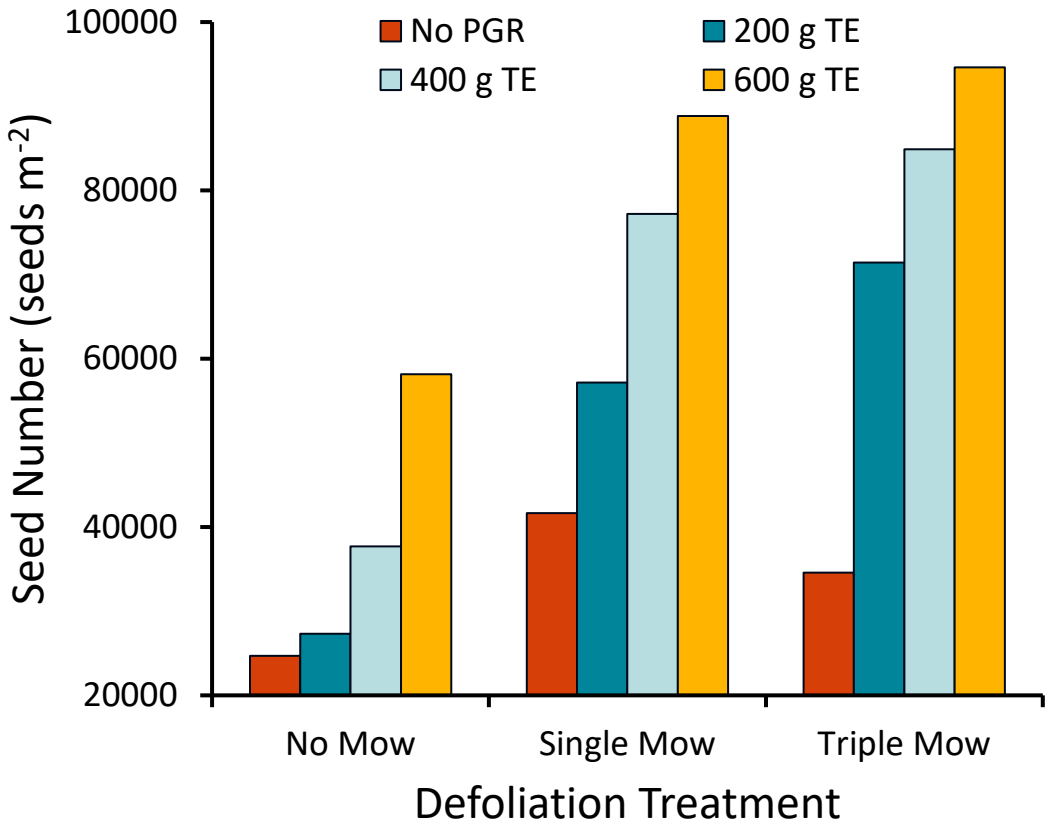



Oregon State University

# Results – Seed Number and Seed Weight

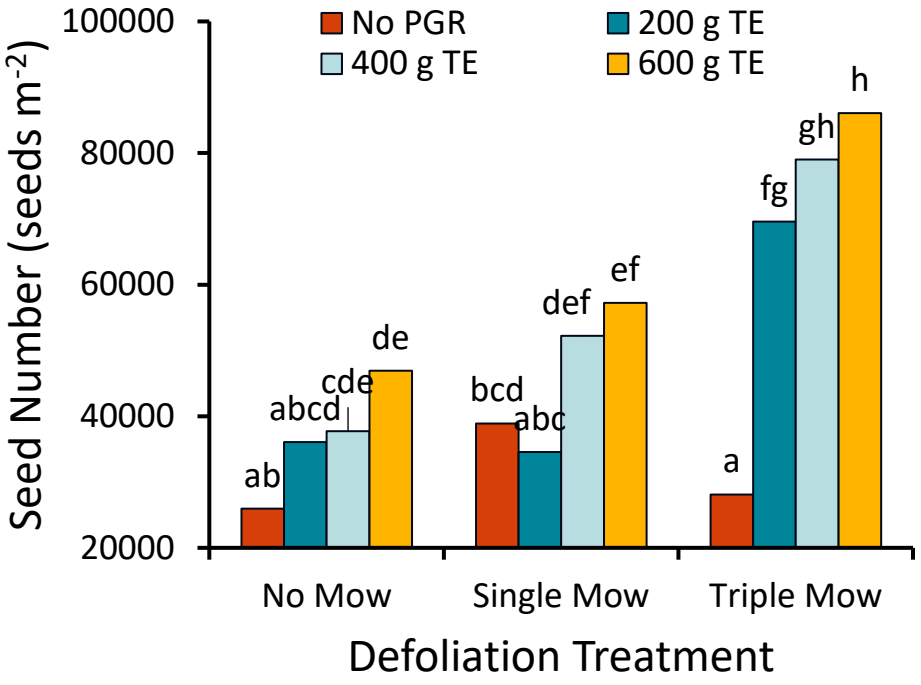
In 2018, there was an interaction effect on seed number (P=0.0296) but not seed weight (P=0.1468).

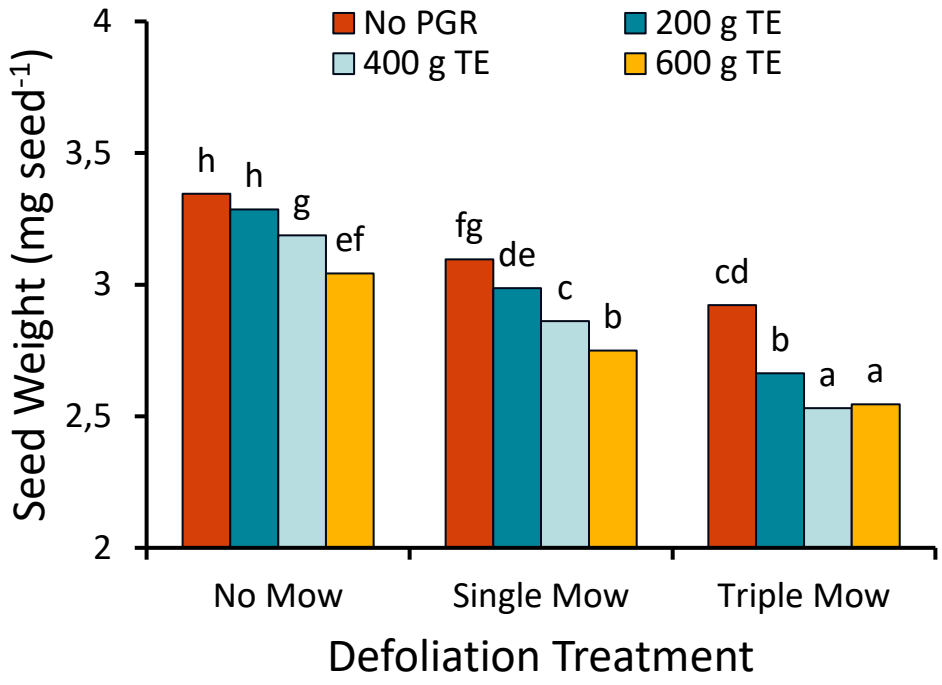



Oregon State University

# Results – Seed Number and Seed Weight

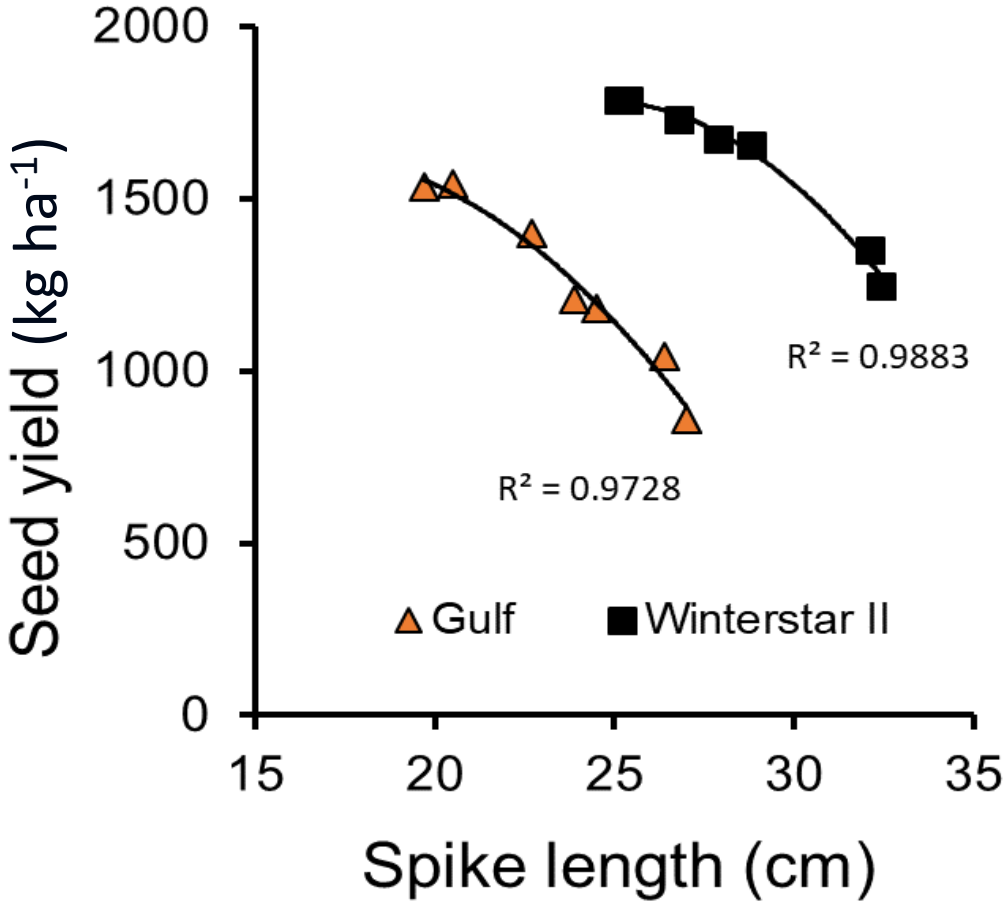
In 2019, there was an interaction effect on seed number (P=0.0202) and seed weight (P=0.0000).




Oregon State University

# Results




Oregon State University

# Study II - Design and Treatments

Plots were arranged in a randomized complete block with a split plot arrangement and four replications.

**Defoliation (Main Plots)**

Control (no defoliation)

Double cutting (BBCH 31 + BBCH 32-33)

**Plant Growth Regulator (Subplots)**

Control (no PGR)

400 g TE $ha^{-1}$ @ BBCH 32

600, 1200, 1800 g CCC $ha^{-1}$ @ BBCH 32

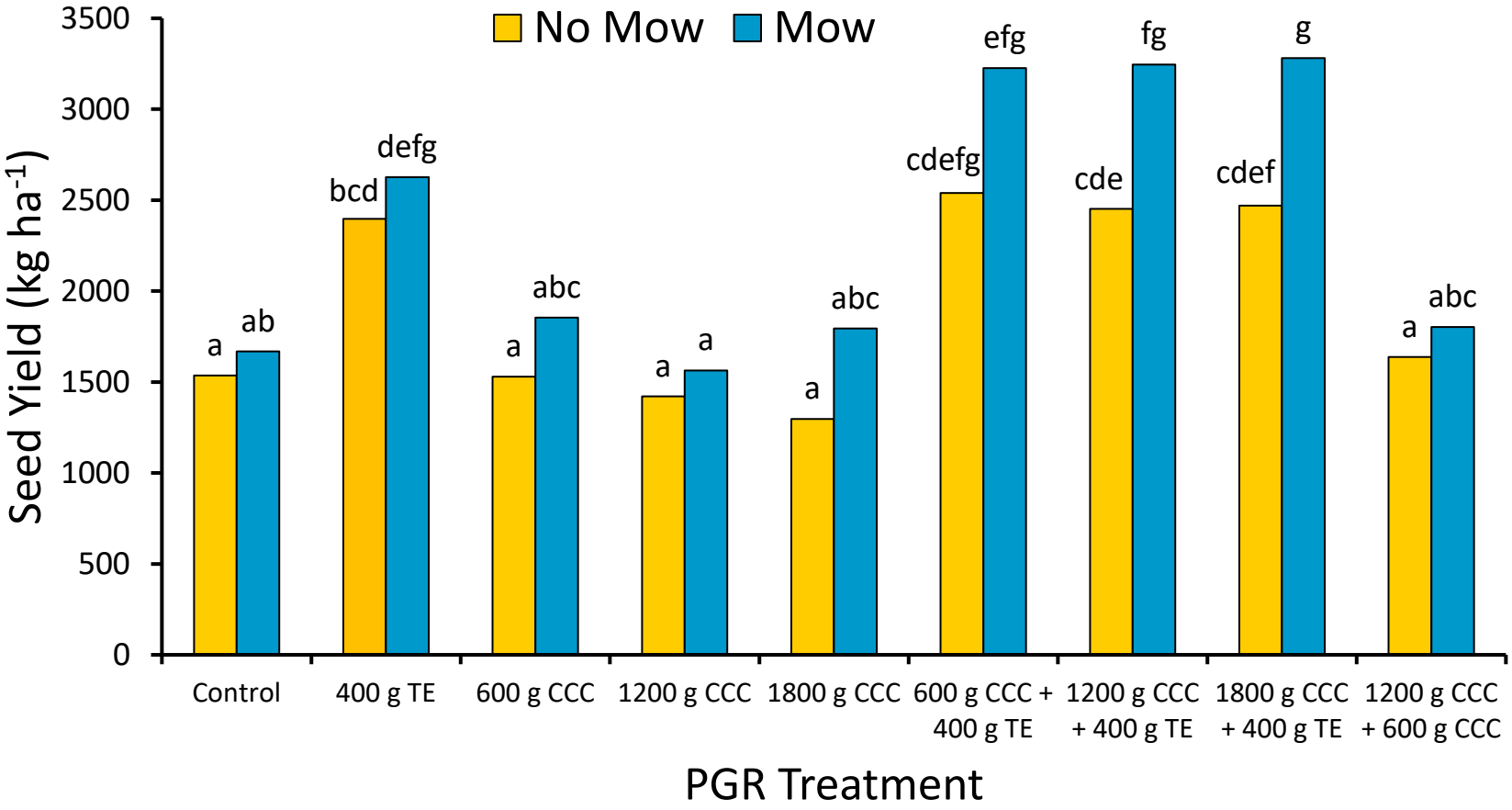
600, 1200, 1800 g CCC $ha^{-1}$ + 400 g TE $ha^{-1}$@ BBCH 32

Annual ryegrass defoliation plots (NP Anderson photo)

Oregon State University

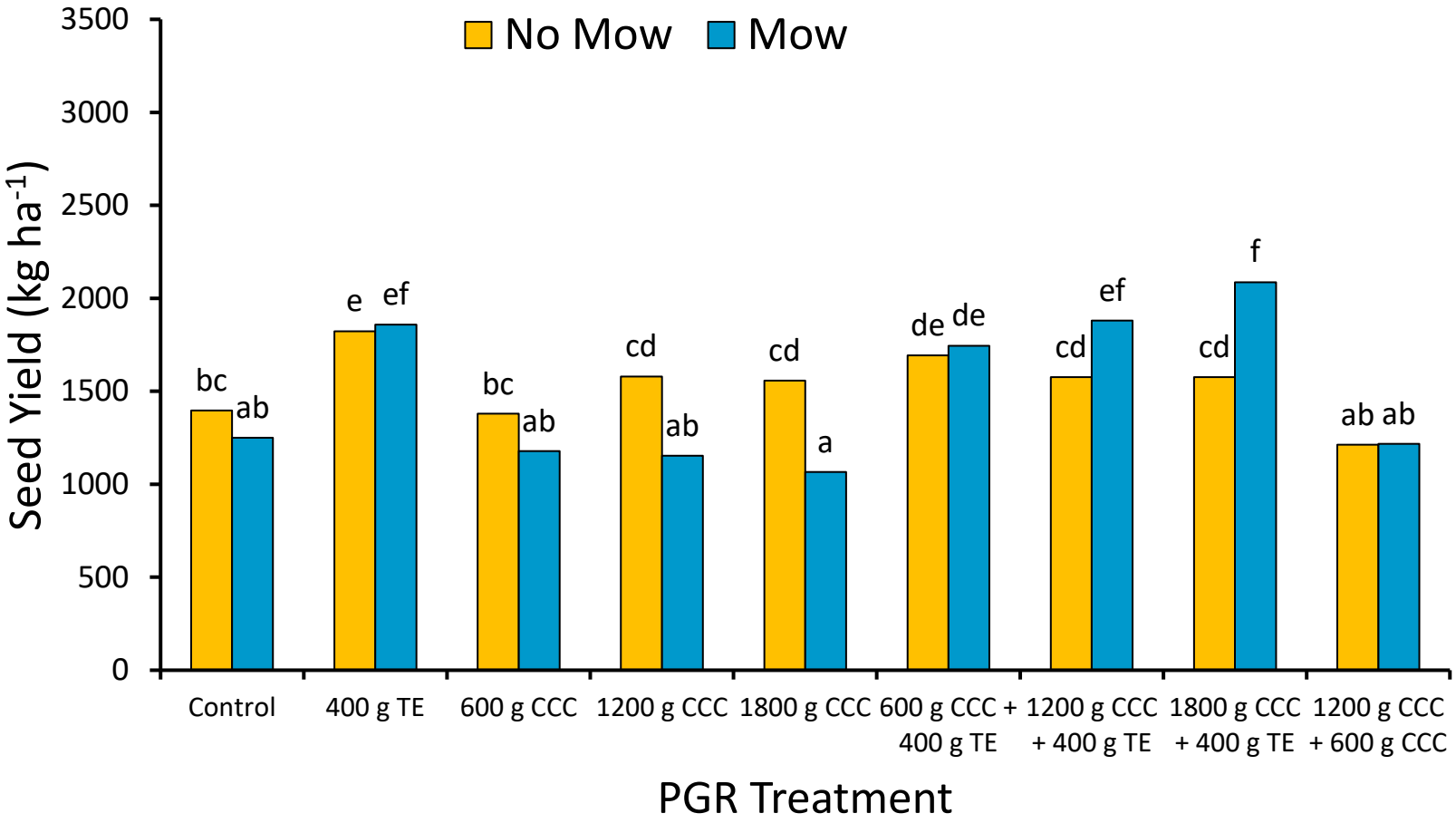
# Results – Seed Yield (2021)

Significant interaction of TE + defoliation for seed yield of ‘Gulf’ annual ryegrass, 2020 (P=0.0294).



# Results – Seed Yield (2022)

Significant interaction of TE + defoliation for seed yield of ‘Gulf’ annual ryegrass, 2022 (P=0.0000).

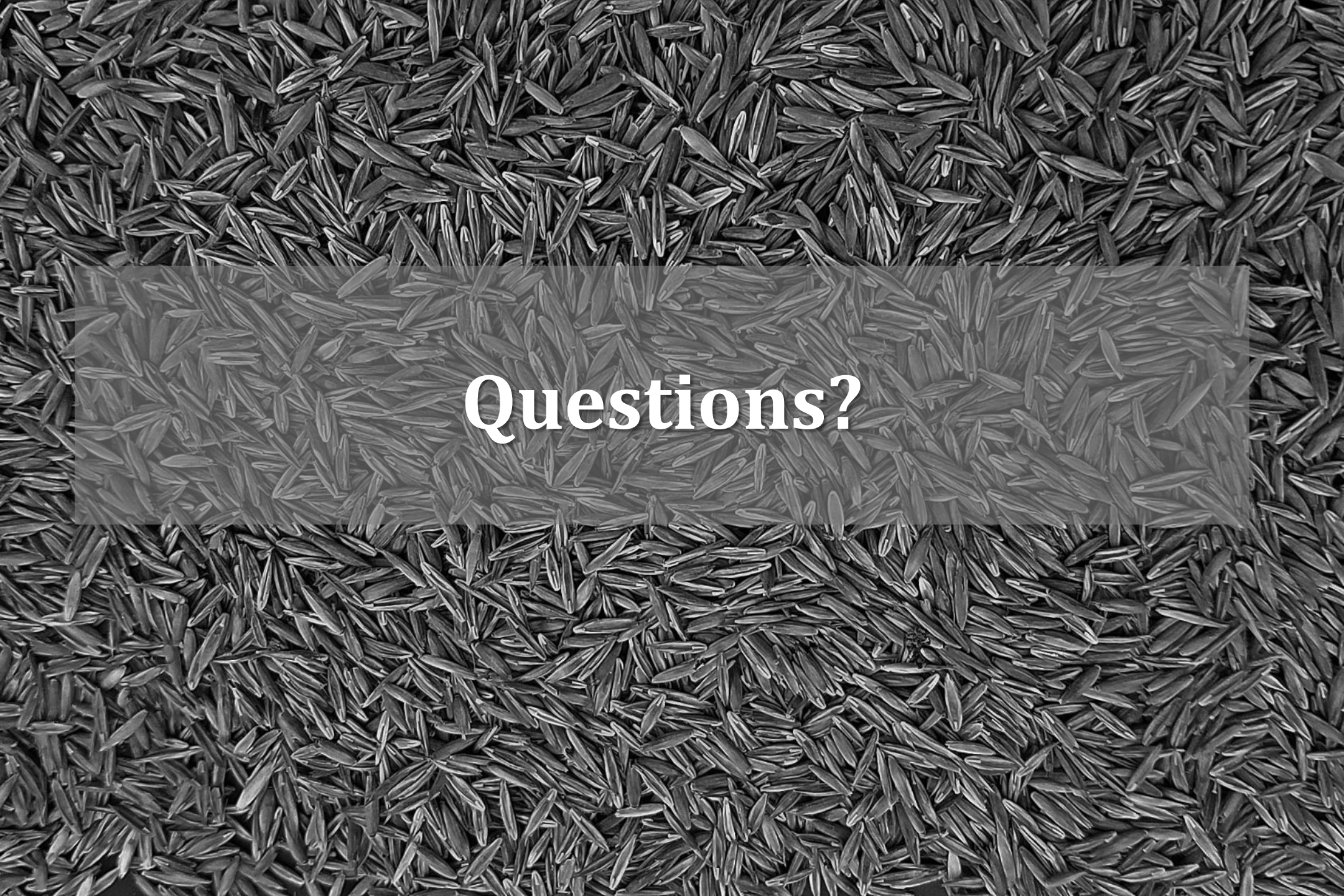


# Conclusions

- Oregon's annual ryegrass seed yields can be increased with increased agronomic management.
- The interaction between spring defoliation and 400-600 g TE $ha^{-1}$ significantly increased seed yield by increasing seed number.
- CCC does not appear to provide enough of an advantage.
- Changing the partitioning of carbon in the spike by reducing spike length. More C put towards seed production and fill?
- Shattering differences could be involved. Small compact spikes are less likely to shatter compared to large spikes with large spaces between spikelets.

Annual ryegrass PGR plots
(DJ Maliszewski photo)

Oregon State University


Questions?