Due Date

04/30/2025

Project Overview

Project number:	2024F2686R
Project title:	Different oat varieties, PGRs, seeding rates and their interactions on lodging and shattering.
Project start date:	2024-04-01
Project completion date:	2027-03-31
This is a report for the reporting period to	

Research Team

Principal Investigator:	
Name:	**Institution:**
Linda Gorim	University of Alberta

Research team members:

Name	Organization	Role
Dr. Linda Gorim	University of Alberta	Agronomy and Sustainable Ag
Kabal Singh, P.Ag	Gateway Research Association	Coordinator, Westlock site
Aaron Baxter	Discovery Ag, Saskatchewan	Coordinator, Saskatchewan site

Project details

Review the following from your original proposal:

a. **Background**
b. **Objectives**
c. **Anticipated Results to Industry**
d. **Methodology**

Are there any changes to your original proposal?

Clearly indicate any changes made to the project and how they will affect the successful achievement of approved outcomes. Please note that making significant changes to the project without prior consent from the funder(s) could constitute sufficient grounds for termination of funding.

No changes to the original proposal.
We included an additional PGR timing (BBCH 37) for AC Morgan at two sites last season. Oat grains were also sent to the Canadian Grain Commission to assess PGR residues, considering recent media buzz about residues and their impact.

a. Oat acreage in the prairies has expanded due to high-yielding varieties, but challenges like lodging, shattering, and optimal seeding rates persist. Studies have linked increased seeding rates to weed competition and yields, with PGRs showing promise in addressing lodging. However, the interaction between PGRs, seeding rates, and their effect on shattering remains unclear. While genetics plays a role in shattering, factors like palea and lemma morphology, management, and environmental conditions also contribute significantly. Most studies have focused on barley and wheat, with limited information on oats.
b. The overall objective is to assess the interaction between two PGRs, increased seeding rates, and shattering in tall and short oats varieties.

c. This project aims to identify the best PGR and oat variety combinations to improve yield, reduce lodging, and manage shattering, providing guidance for prairie producers. It will study the effects of increased seeding rates and PGRs under both field and drought conditions, offering insights for optimizing production and profitability. Additionally, microscopic analysis of palea and lemma morphology may reveal traits linked to shattering, aiding breeders in developing more resilient varieties. The findings will support producers and the oat industry in adapting to challenges like drought and improving crop performance.

d. Field trials were conducted in 2024 using a factorial design with four replicates at three sites: St. Albert and GRO in Alberta, and Codette in Saskatchewan. The study evaluated four oat varieties—two tall (AC Morgan, CDC Arborg) and two short (CS Camden, Summit)—at two seeding rates: standard (300 plants/m²) and increased (400 plants/m²). Plant growth regulator (PGR) treatments, including Moddus, Manipulator, and an untreated control, were applied at growth stages 31–32. Agronomic data collected included plant count, plant height, lodging, number of productive tillers, yield, and shattering.

New: Another experiment was conducted with both PGRs applied at oats growth stage BBCH 37 at two sites St Albert and Codette for AC Morgan only last season.

Models selected for the analysis on R:
```
DS_Yield <- lmer(Yield ~ PGR*SR*Variety*Site + (1 | Rep), data = Data , na.action = na.omit)
DF_Yield <- lmer(Yield ~ PGR*Site + (1 | Rep), data = Data , na.action = na.omit)
DF_Trinex <- lmer(Trinexapac.ethyl ~ Timing*Site + (1 | Rep), data = Data , na.action = na.omit)
```

Research Progress

> Please indicate overall project progress since its initiation by providing preliminary data (Attach e.g. laboratory, growth chamber, greenhouse, and field experiments; chemical analysis; data analysis; model development, etc.)

An Analysis of variance table (Table 1) indicates significant effects of PGR, seeding rates, oat varieties, and sites, and their interactions, on several agronomic parameters. A significant three-way interaction between PGR, seeding rate, and site was observed for the number of productive tillers. Variety × site interactions significantly influenced plant height and lodging, while lodging was also affected by PGR × site interactions. Oat varieties varied significantly in height; site had a significant effect on all parameters except grain yield. Grain yield was unaffected by any individual factor or their interactions assessed.

Increased seeding rates did not result in more oat plants in the field at all sites; no increase in oat yields was observed.
Current seeding rate (300 plants m^{-2}) with NO PGR at St. Albert resulted in more productive tillers than the higher rate (Figure 1). Applying Moddus to 300 plants m^{-2} resulted in significantly more productive tillers compared to Manipulator at both seeding rates.

Plant height was not significantly influenced by PGR or seeding rate but was significantly affected by variety and site. The tallest plants were recorded at Codette, followed by GRO, with the shortest plants at St. Albert (Figure 2). Lodging was significantly affected by PGR × site interactions (Figure 3A). At St. Albert, Manipulator-treated and untreated plots exhibited the highest lodging, while Moddus application significantly reduced lodging. No significant effects of PGR on lodging were observed at Codette or GRO. Additionally, lodging was influenced by variety × site interactions (Figure 3B), with the short-statured variety Summit exhibiting the highest lodging at St. Albert and GRO. Both tall varieties (AC Morgan and CDC Arborg) had significantly lower lodging across sites. St. Albert also recorded the highest plant count and the shortest time to maturity compared to other sites (Figure 4).

Site-specific ANOVA for the tall variety AC Morgan indicated that PGR × site interaction was significant only for plant height (Table 2). Site had a significant effect on all parameters except lodging. Codette produced significantly taller plants, especially in Manipulator-treated plots, followed by Moddus (Figure 6). In contrast, both PGRs produced similar plant heights at St. Albert. Codette also had significantly higher plant counts and grain yield than St. Albert, despite St. Albert having a greater number of productive tillers (Figure 7).

Residue analysis (Table 3) of active ingredients indicate no significant effect of timing or site on Trinexapac-ethyl (Moddus). However, both timing and site influenced Chlormequat chloride residue levels. The highest Chlormequat chloride residue levels were observed at St Albert site; applications at BBCH 37 resulted in significantly higher residue levels compared to BBCH 31-32 (Figure 9).

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Research challenges and project risks

> **Describe the challenges you have encountered in the project** (environmental impacts, availability of materials, qualified personnel, financing etc.) that may affect the successful completion of the project.

No challenges have been identified at this stage.

Research and action plans for upcoming reporting periods

> Indicate the expected milestones and activities for the remaining reporting period(s) in the project.

- The experiments will be repeated at all sites as described in the protocol
- The greenhouse phase of the experiments has commenced and is expected to be completed within the next year.
-We intend to add a drought site at Lethbridge to assess the interaction of PGRs with drought under field conditions.

Technology transfer activities

> Indicate all completed and future activities relating to the technology transfer plan for this project.

This was the first season of this project. Now that data has been summarized, we expect to proceed with presentation of data generated in conferences and local producers' meetings.
- Student presentation: University of Alberta Crop Science Field Day, July 18, 2024.

Project budget

> Attach a signed financial statement for expenses during reporting period.

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Total Files: 1

I confirm I have attached a signed financial statement

☑ Yes