Results

Table 1. Analysis of variance (ANOVA) summarizing the effects of plant growth regulators (PGR) applied at oat growth stage BBCH 31, and two seeding rates (SR) on agronomic traits of four oat (*Avena sativa* L.) varieties evaluated across three sites in 2024.

Source of Variation	Plant count	Plant height	Productive tillers	Days to Maturity	Lodging	Yield
PGR	ns	ns	ns	ns	ns	ns
Seeding Rate (SR)	ns	ns	ns	ns	ns	ns
Variety	ns	***	ns	ns	ns	ns
Site	***	***	***	***	**	ns
PGR × SR	ns	ns	ns	ns	ns	ns
PGR × Variety	ns	ns	ns	ns	ns	ns
SR × Variety	ns	ns	ns	ns	ns	ns
PGR × Site	ns	ns	**	ns	**	ns
SR × Site	ns	ns	ns	ns	ns	ns
Variety × Site	ns	*	ns	ns	***	ns
PGR × SR × Variety	ns	ns	ns	ns	ns	ns
PGR × SR × Site	ns	ns	*	ns	ns	ns
PGR × Variety × Site	ns	ns	ns	ns	ns	ns
SR × Variety × Site	ns	ns	ns	ns	ns	ns
PGR × SR × Variety × Site	ns	ns	ns	ns	ns	ns

*, **, and *** represent significance at $p<0.05$, $p<0.01$, $p<0.001$, respectively. "ns" denotes no significant effect.

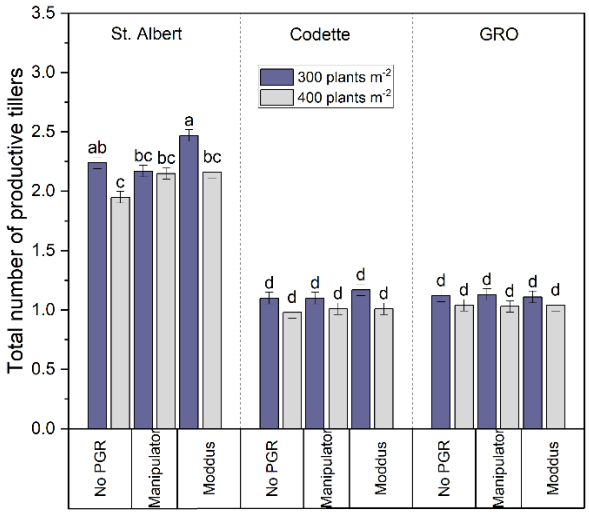

Figure 1. The interaction between sites (St. Albert, AB; Codette, SK; and GRO, AB), PGRs (No PGR, Manipulator, and Moddus), and seeding rates (300 and 400 plants m^{-2}) for the total number of productive tillers. Different letters indicate significant differences at $\alpha = 0.05$ (Tukey HSD test). Error bars indicate standard error.

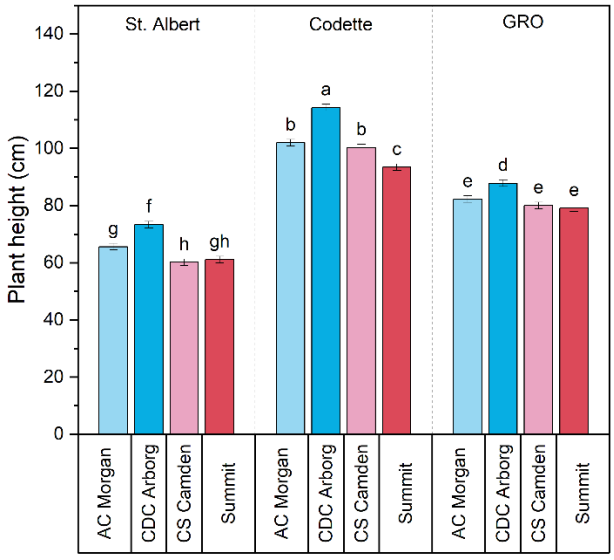

Figure 2. The interaction between sites and oat varieties (Tall: AC Morgan and CDC Arborg; Short: CS Camden and Summit) for mean plant height. Different letters indicate significant differences at $\alpha = 0.05$ (Tukey HSD test). Error bars indicate standard error.

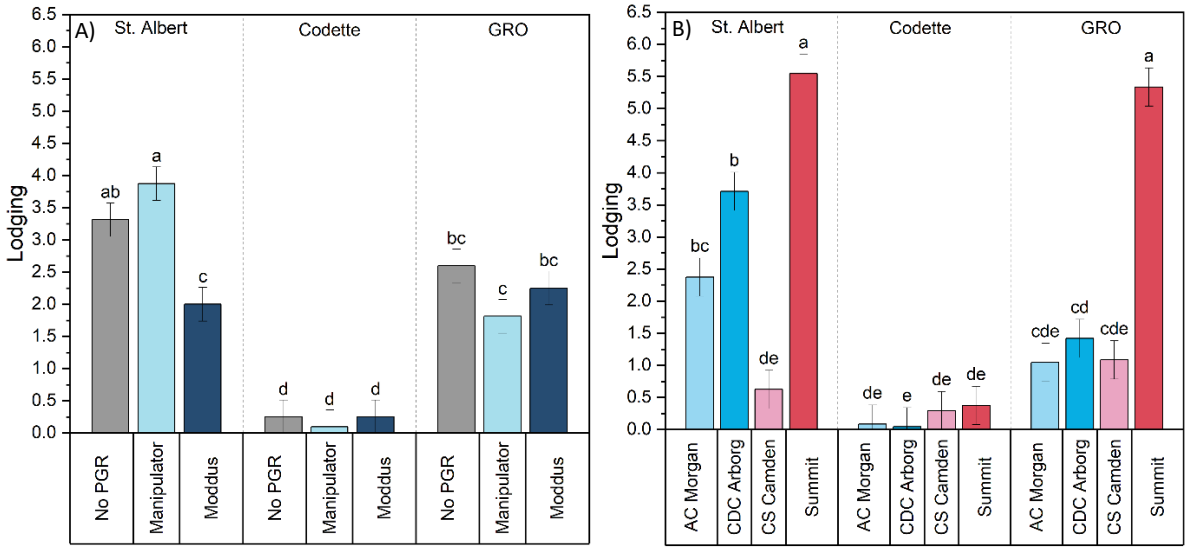

Figure 3. The interaction between sites and PGRs (A), and sites and oat varieties (B) for lodging. Different letters indicate significant differences at $\alpha = 0.05$ (Tukey HSD test). Error bars indicate standard error.

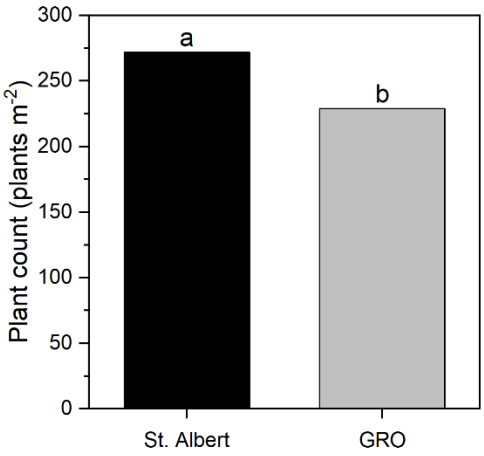

Figure 4. Mean plant count at different sites. Different letters indicate significant differences at α = 0.05 (Tukey HSD test). Error bars indicate standard error.

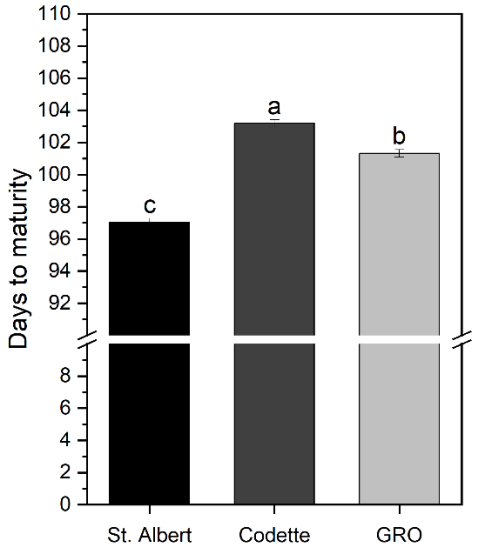

Figure 5. Mean days to maturity at different sites. Different letters indicate significant differences at α = 0.05 (Tukey HSD test). Error bars indicate standard error.

Table 2. Analysis of variance (ANOVA) summarizing the effects of plant growth regulators applied at growth stage BBCH 37 on agronomic traits of oat variety, AC Morgan, evaluated at two sites in 2024.

Source of Variation	Plant count	Plant height	Productive Tillers	Lodging	Yield
PGR	ns	***	ns	ns	ns
Site	***	***	***	ns	**
PGR × Site	ns	**	ns	ns	ns

*, **, and *** represent significance at $p<0.05$, $p<0.01$, $p<0.001$, respectively. "ns" denotes no significant effect.

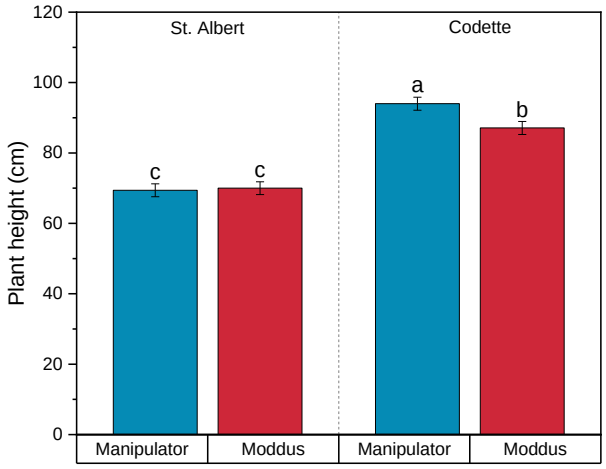

Figure 6. The interaction between sites and PGRs for oat height. Different letters indicate significant differences at $\alpha = 0.05$ (Tukey's HSD test). Error bars indicate standard error.

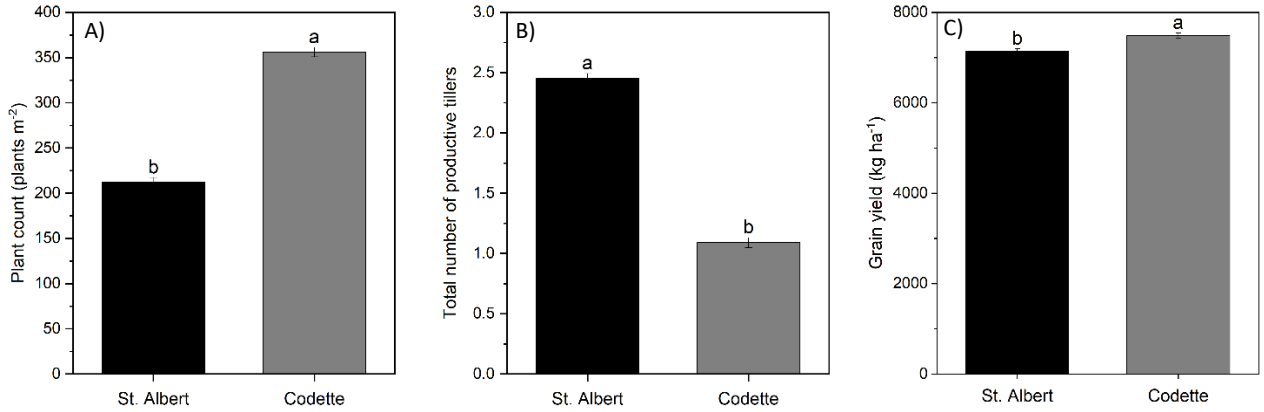

Figure 7. Mean plant count (A), total number of productive tillers (B), and grain yield (C) at St. Albert, AB, and Codette, SK. Different letters indicate significant differences at $\alpha = 0.05$ (Tukey HSD test). Error bars indicate standard error.

Table 3. Analysis of variance summarizing Trinexapac-ethyl and Chlormequat Chloride residue levels when Moddus and Manipulator are applied at growth stages BBCH31 and BBCH37 in the oat variety, AC Morgan, evaluated at two sites in 2024.

Source of Variation	Trinexapac-ethyl (Moddus)	Chlormequat (Manipulator)
Timing	ns	*
Site	ns	***
Timing × Site	ns	ns

*, **, and *** represent significance at $p<0.05$, $p<0.01$, $p<0.001$, respectively. "ns" denotes no significant effect.

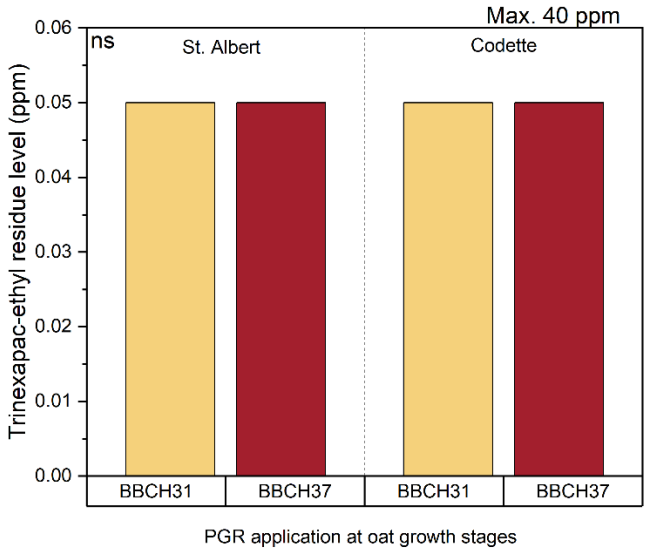

Figure 8. Mean Trinexapac-ethyl residue levels when Moddus was applied at oat growth stages (BBCH 31 and BBCH 37) at St. Albert, AB, and Codette, SK. Error bars indicate standard error; ns indicates non significance.

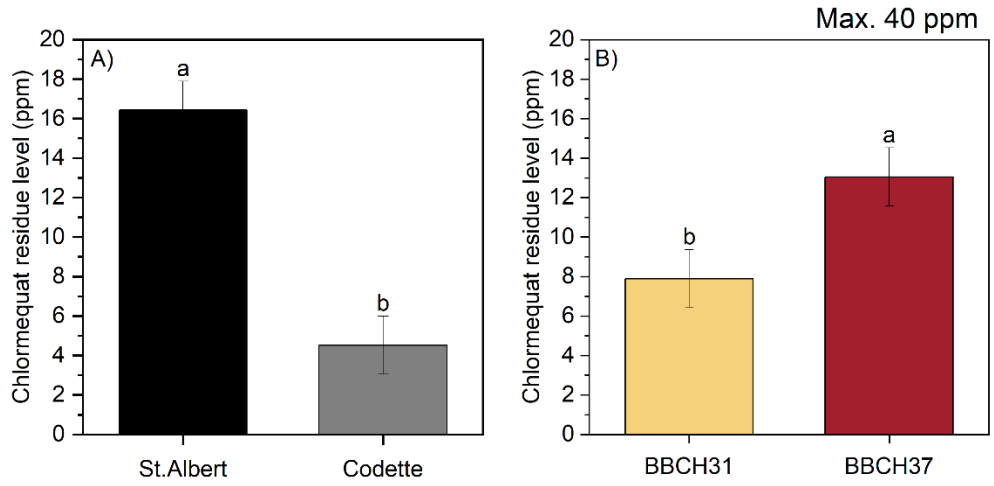

Figure 9. Mean chlormequat residue levels when Manipulator was applied at sites St. Albert, AB, and Codette, SK (A), and at growth stages: BBCH 31 and BBCH 37 (B). Different letters indicate significant differences at $\alpha = 0.05$ (Tukey HSD test). Error bars indicate standard error.