

Winchester Research Update: Some results from winter wheat PGR x N experiments

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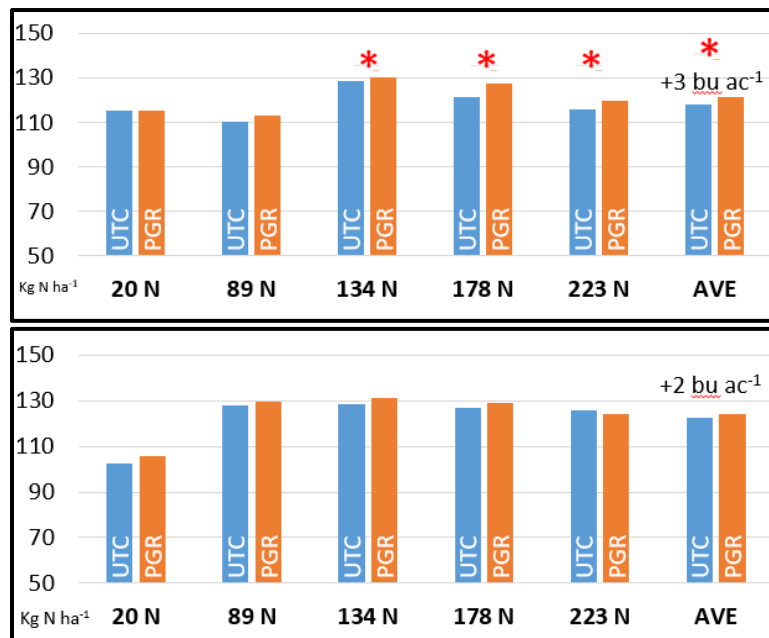
- Study repeated for two years (2021, 2022). Both years excellent winter survival.
- Two cultivars: Adrianus and 25R74
- Five N rates applied (lbs N ac⁻¹): 20, 89, 134, 178, 223.
- With and without a PGR (Manipulator)
- Fertilizer management: combination of Ammonium Sulfate to provide 22 units S with remaining N applied as UAN. All fertilizer applied prior to stem elongation (<GS30)

N fertilizer rate x PGR effects on yield at Winchester: interactions?

Conclusion: In both 2021 and 2022, N rates greater than **134 lbs-N ac⁻¹** did not result in additional yield. At other trial locations (Arva, Ridgetown) yields continued to increase past 134 lbs N ac⁻¹. Like corn, wheat in eastern Ontario may require less N than in western Ontario.

Conclusion: PGR provided an average yield increase of +3 bu ac⁻¹ in 2021 and +2 bu ac⁻¹ in 2022. This yield increase being statistically significant only in 2021. In 2021, the positive yield effect of PGR on yield was apparent only at N rates greater than 89 lbs lbs-N ac⁻¹.

Fig 1. Winter wheat yield (bu ac⁻¹) across N fertilizer rates with a PGR (orange) and without (blue). Red stars indicate significant difference in yield between PGR and untreated. Above: 2021 crop year. Below: 2022 crop year.



N fertilizer rate x PGR effects on lodging at Winchester: interactions?

Conclusion (variety): Adrianus hardly lodged at any N rate, while 25R74 lodged in both years even at 20 N.

Conclusion (N rate x PGR): In 2021, lodging severity was reduced by 71% when 89 N was applied compared to 20 N. N deficiency may have weakened root and stem structures at the lowest N rate, increasing lodging. Lodging severity* increased by 300% moving from 89 N to 223 N. The above was calculated including both PGR and control treatments as PGRs did not prevent lodging at greater N rates. In 2022, lodging was overall less severe than 2021, and lodging was significant only at the two greatest N rates.

Conclusion (PGR x N rate): PGRs reduced lodging in 2021 at N rates greater than 89 lbs-N/ac. In 2022, PGR reduced lodging only at the highest N rate. There was less lodging overall in 2022 than 2021, which is why the PGR did not influence lodging as much in 2022.

Splitting high rates of N: does it make a difference?

- At 178 and 223 N total N, two split N strategies were compared:
 - o All N applied prior to stem elongation (GS30) as UAN and ammonium sulfate
 - o The last 45 N applied as AMIDAS between flag leaf and mid-boot stage (GS38-45). AMIDAS also provided 6.5 units of S.
- Total sulfur application was kept constant at 22 units S for both application strategies.
- Both with and without a PGR was compared.

Conclusion (yield): Split application increased yield in three of four cases by 2-5 bu ac⁻¹ depending on year and total N rate. In the one case, a split-application of 178 N reduced yield by 10 bu ac⁻¹ in 2021.

Conclusion (lodging): Split application consistently reduced lodging severity by 10-20%, depending on year and total N rate.

Total N (and S) rate Lbs ac ⁻¹	Split N strategy	2021 Yield (bu ac ⁻¹)	2022 Yield (bu ac ⁻¹)
178 (22)	All N and S before GS30 as UAN and AS	125	129
	133 N + 16 S before GS30 as UAN/AS PLUS balance N and S as <u>Amidas</u> (GS39-45)	113	131
223 (22)	All N and S before GS30 as UAN and AS	118	126
	133 N + 16 S applied before stem elongation as UAN/AS PLUS balance N and S as <u>Amidas</u> (GS39-45)	123	128

Moddus or Manipulator: Is one better than the other?

- Moddus, manipulator and an untreated control were compared at two N rates: 178 and 223 N total N. All N applied prior to stem elongation (GS30) as UAN and AS
- Four cultivars: Adrianus, Pro81, R2574, B654SWR
- Lodging assessed weekly from mid-June to harvest

Conclusion: Lodging occurred in all years, but was always more severe in the lodging susceptible cultivars (B654SRW and R2574) than the lodging resistant ones (Adrianus, Pro81).

Conclusion: There was no difference in the efficacy of Moddus or Manipulator, with one exception. In general, when a PGR reduced lodging compared to untreated, it did not matter if the PGR used was Moddus or Manipulator. The only exception was in 2022 at 223 N, when Moddus reduced lodging to a greater extent than Manipulator.

Conclusion: Both PGRs were more effective at reducing lodging during grain-fill, compared to reducing lodging after maturity during dry-down. The earlier lodging occurs, the greater the yield impact.

Conclusion: PGRs did not eliminate lodging in lodging-susceptible cultivars or after major storms. They reduced lodging by 15-30% in these cases. In lodging-resistant cultivars, PGRs were able to eliminate lodging virtually completely. However, these cultivars did not display much lodging even when untreated.

Lodging 101: What determines lodging risk

- 1) **Yield:** Higher yielding crops are more prone to lodging. Lodging can in some cases be a consequence of success (good crop management). Not always, but can be.
- 2) **Weather:** Years with higher than normal rainfall. With wet soils, wind speed needed for lodging is lower. With dry soils, greater wind speeds are needed for lodging.
- 3) **Soil properties:** Anything that compacts and strengthens a soil will reduce lodging risk. Soils that are drier, have greater clay content, lower organic matter content, and greater bulk density, reduce lodging risk.
- 4) **Crop traits:** Lodging risk increases as: 1) plant height increases, especially as basal internode length increases, 2) spike becomes heavier, 3) tiller number per plant increases, 4) stem becomes thinner, 5) crown roots are shallower in the soil and smaller