Plant Growth Regulators; What You Should Know for 2016

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Plant Growth Regulators (PGR's)

- Synthetic compounds to modify growth and development.
  - Affect plant hormonal balances
- Intended to reduced lodging and increase yields in high input cereal production.


Grainnews.ca


Fwi.co.uk

Plant growth hormones

Auxin – primary cell elongation

Cytokinins – cell division

Abscisic Acid – germination, protein stores, and water stress

Gibberellins – longitudinal growth

Ethylene – stress and ripening

Plantcellbiology.masters.gricnaj.org;

ENGAGE AGRO

Manipulator®

Active Ingredient: Chlormequat Chloride (CCC) which is an Anti-Gibberellin, plus a patented biochemical safener making the product more effective at lower temperatures.

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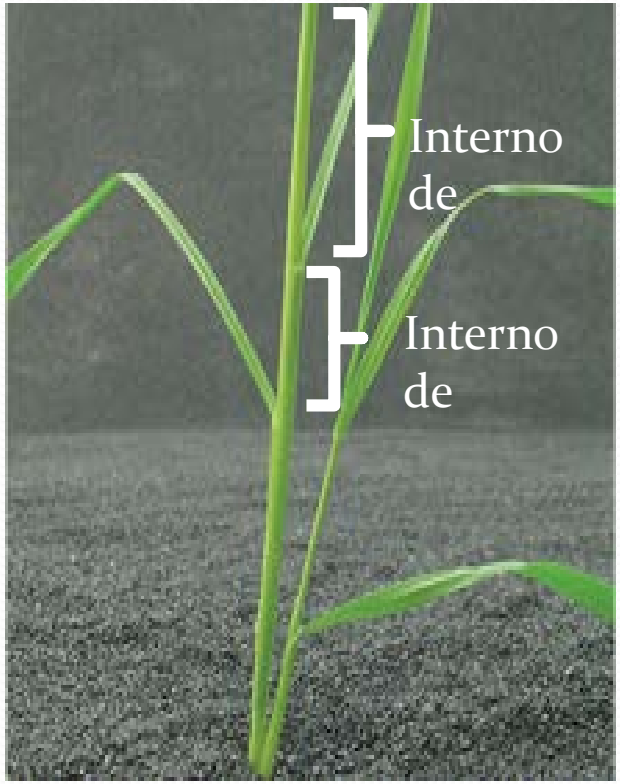
Application Timing:

- Safe to apply from 2 leaf through to just before flag leaf emergence.
- Not registered for tank mixing with herbicide or fungicide
- Ideal timing growth stage 31 (5 to 6 leaf)

Manipulator - How it works

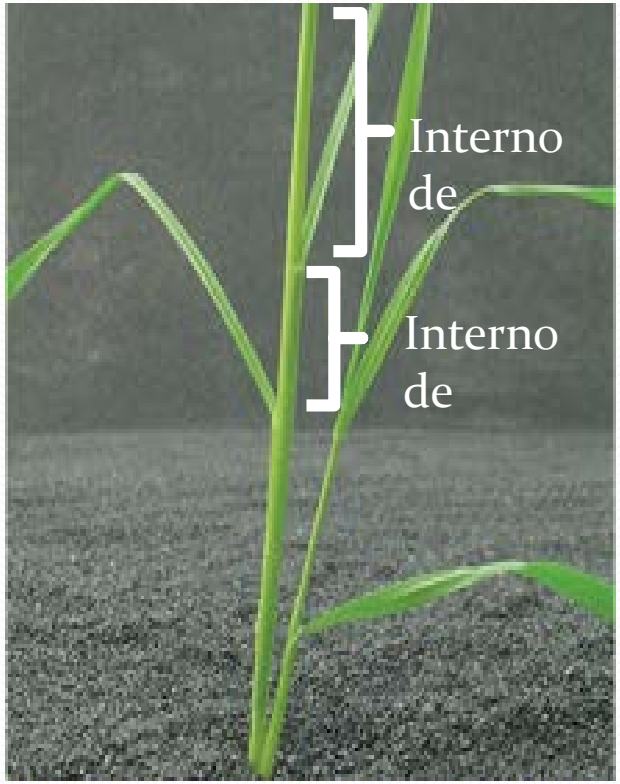
- Acts on the plant growth hormone responsible for stem elongation: gibberellin
- Prevents hormone biosynthesis
- Reduced internode length



Source: cerealcentral.ca/crop-management

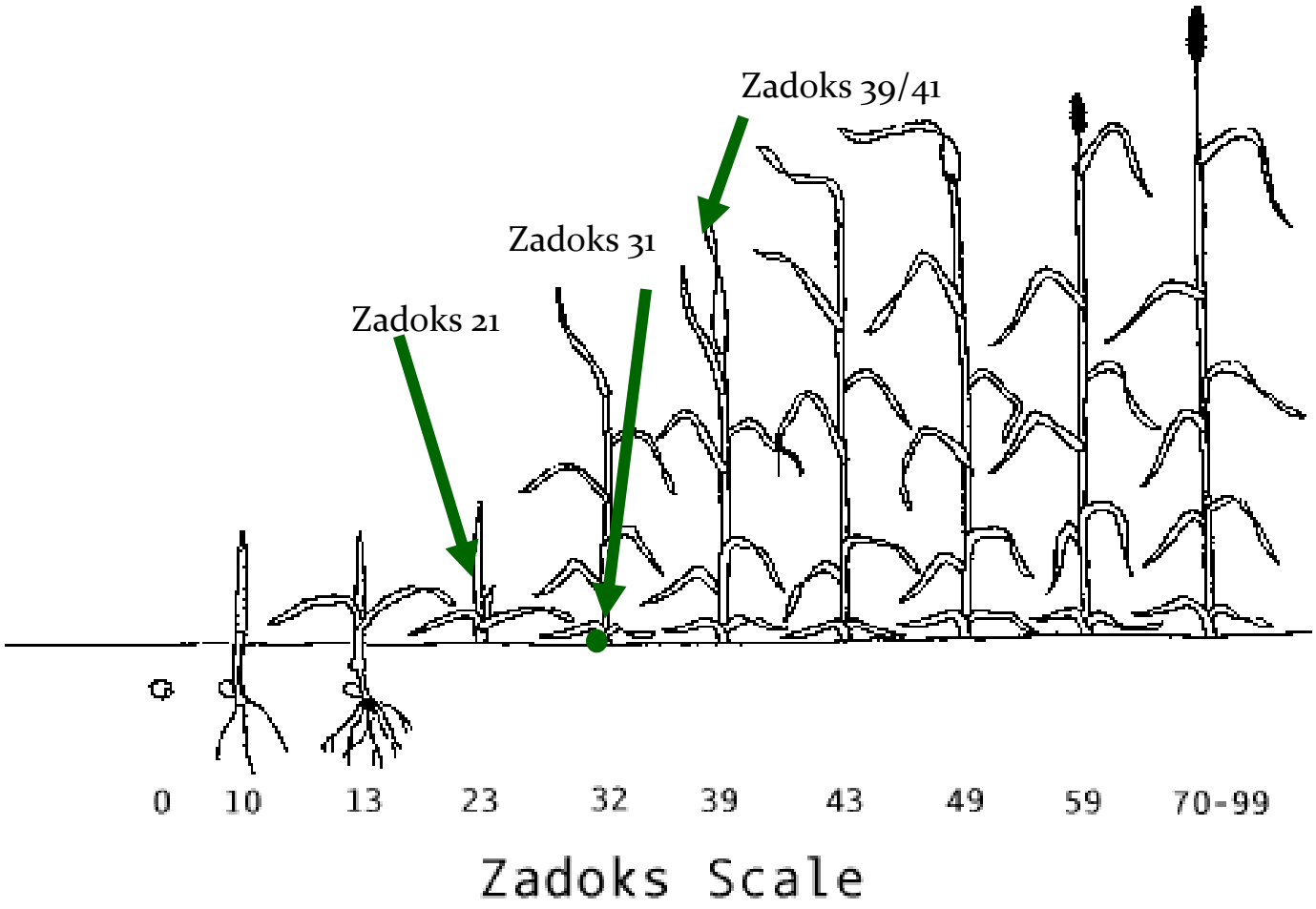
How it works

- Chlormequat Chloride: blocks metabolism early in pathway
- Trinexapac – ethyl (Syngenta): blocks enzymes late in pathway



Source: cerealcentral.ca/crop-management

Plant Growth Stages



Source: usask.ca/agriculture/plantsci/winter_cereals

Manipulator

by engage agro

- Better. Stronger. Shorter.
  - yield was increased, with and without lodging, 93% of the time.
  - producing stronger stems to reduce lodging
  - 94% of the time application resulted in shorter plants.
- Flexible: can be first applied at the 2-3 leaf stage up to early flag leaf.
  - Can be applied at temperatures just above freezing.
- Optimal: best results when applied at 1-2 node stage (Z31) at 1.8 L/ha
- Cost: $10 - $15 per acre.

Registered for use on spring, winter, and durum wheat for 2015

Source: Engage Agro product sheet, 2014.

Large Plot Trials

Height Reduction	Occurrence of Trials with Height Reduction		
	CWRS (35 Trials)	CPS (12 Trials)	CWAD (5 Trials)
5% +	95%	100%	80%
10% +	83%	67%	
15% +	53%	33%	60%
20% +	20%	8%	

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*Trials from 2011 to 2014 – provided by Engage Agro

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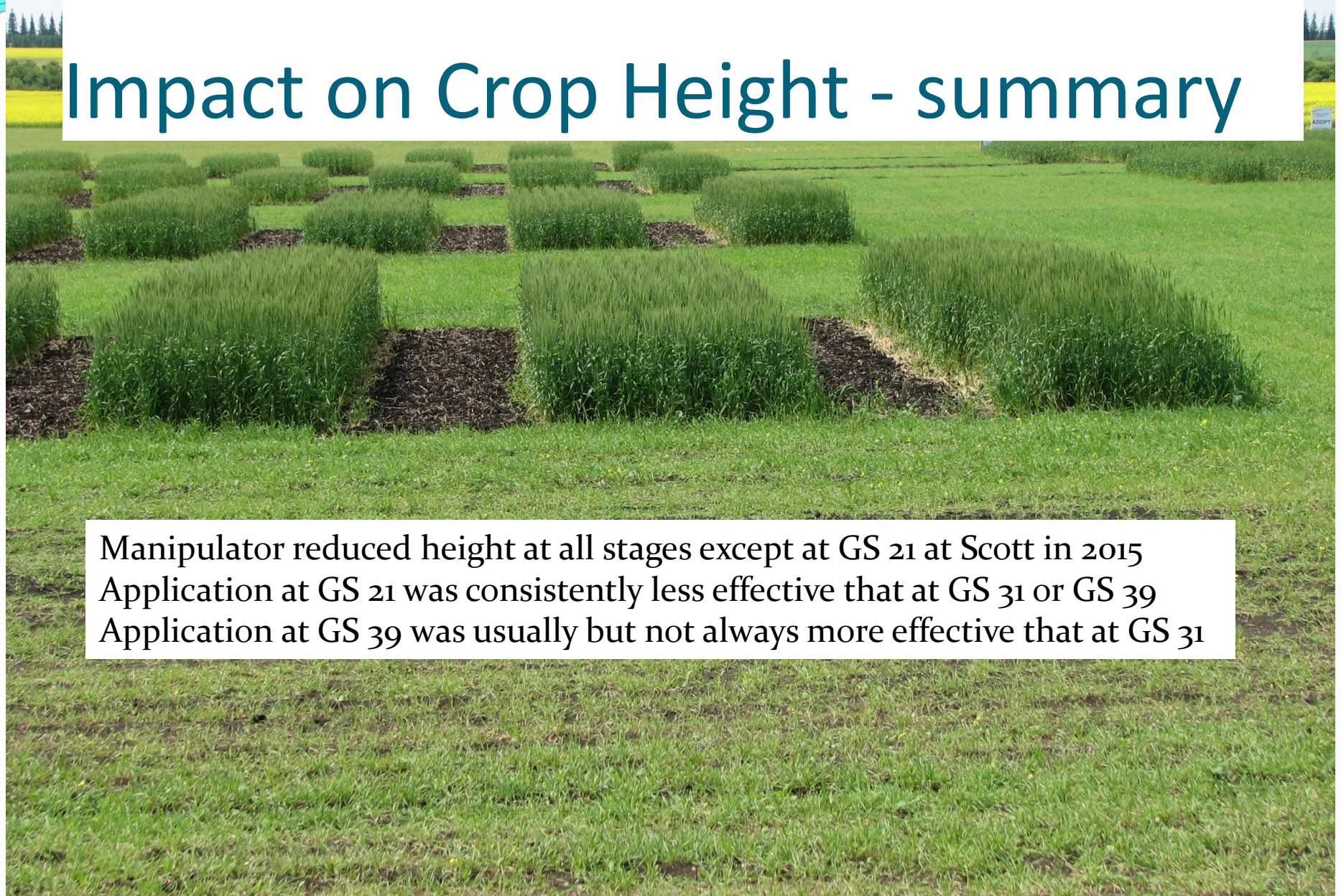
Impact on Crop Height

	Crop Height in inches (cm)	
	5 location yr Average	Range
Untreated	38.6 (98)	**35-43**
GS 21 (first tiller, herbicide timing)	36.2 (92)	**35–37**
GS 31 (first node detectable)	33.1 (84)	**31-36**
GS 39 (flag leaf, fungicide timing)	32.3 (82)	**30-34**

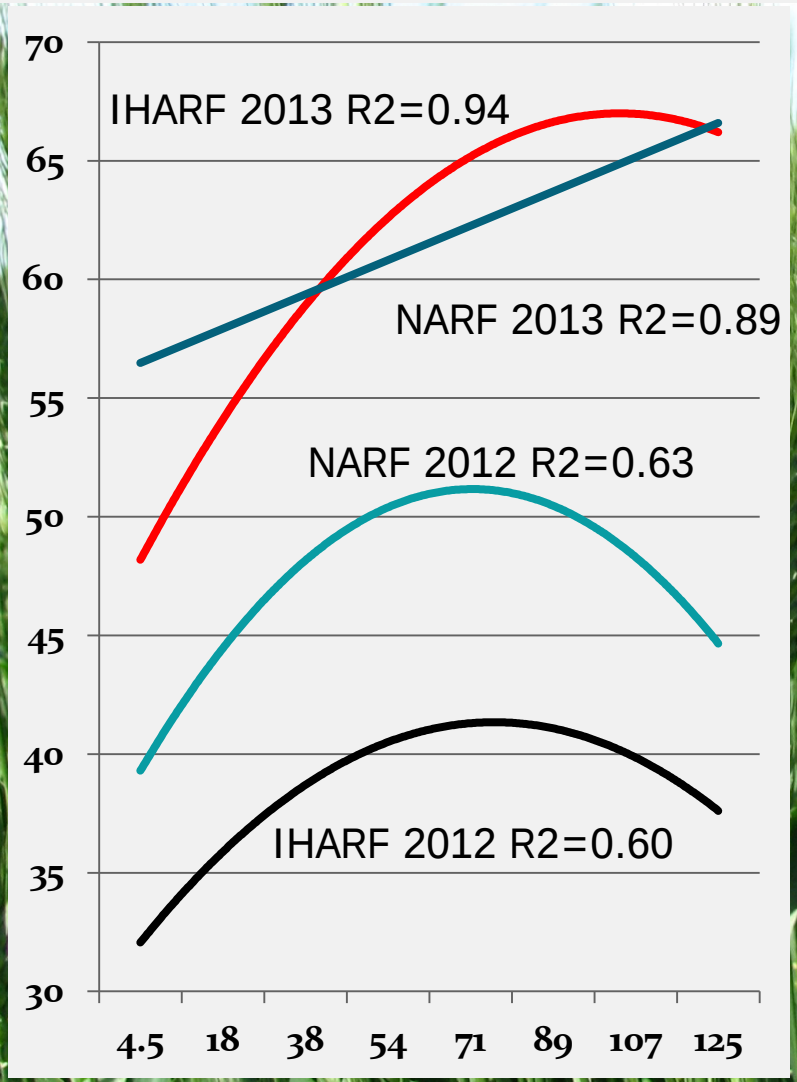
Impact on Crop Height - summary



Manipulator reduced height at all stages except at GS 21 at Scott in 2015
Application at GS 21 was consistently less effective that at GS 31 or GS 39
Application at GS 39 was usually but not always more effective that at GS 31

Impact on Lodging?

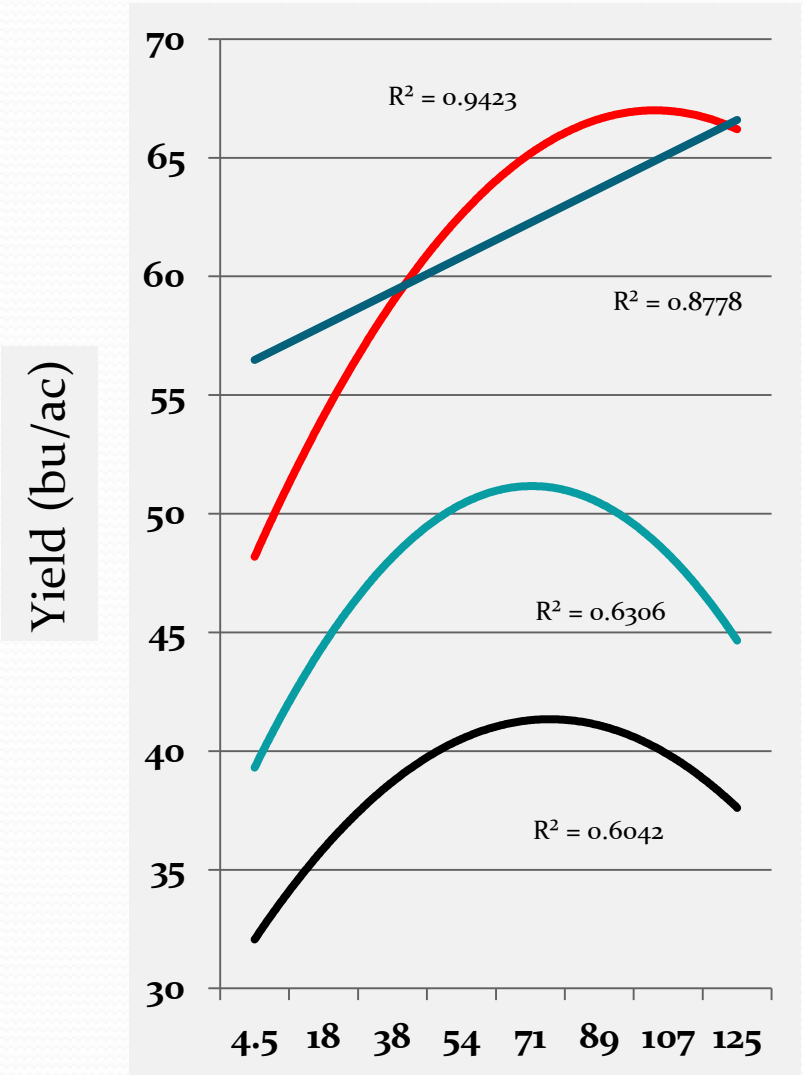
Wheat Response to N at IHARF and NARF 2012 &2013

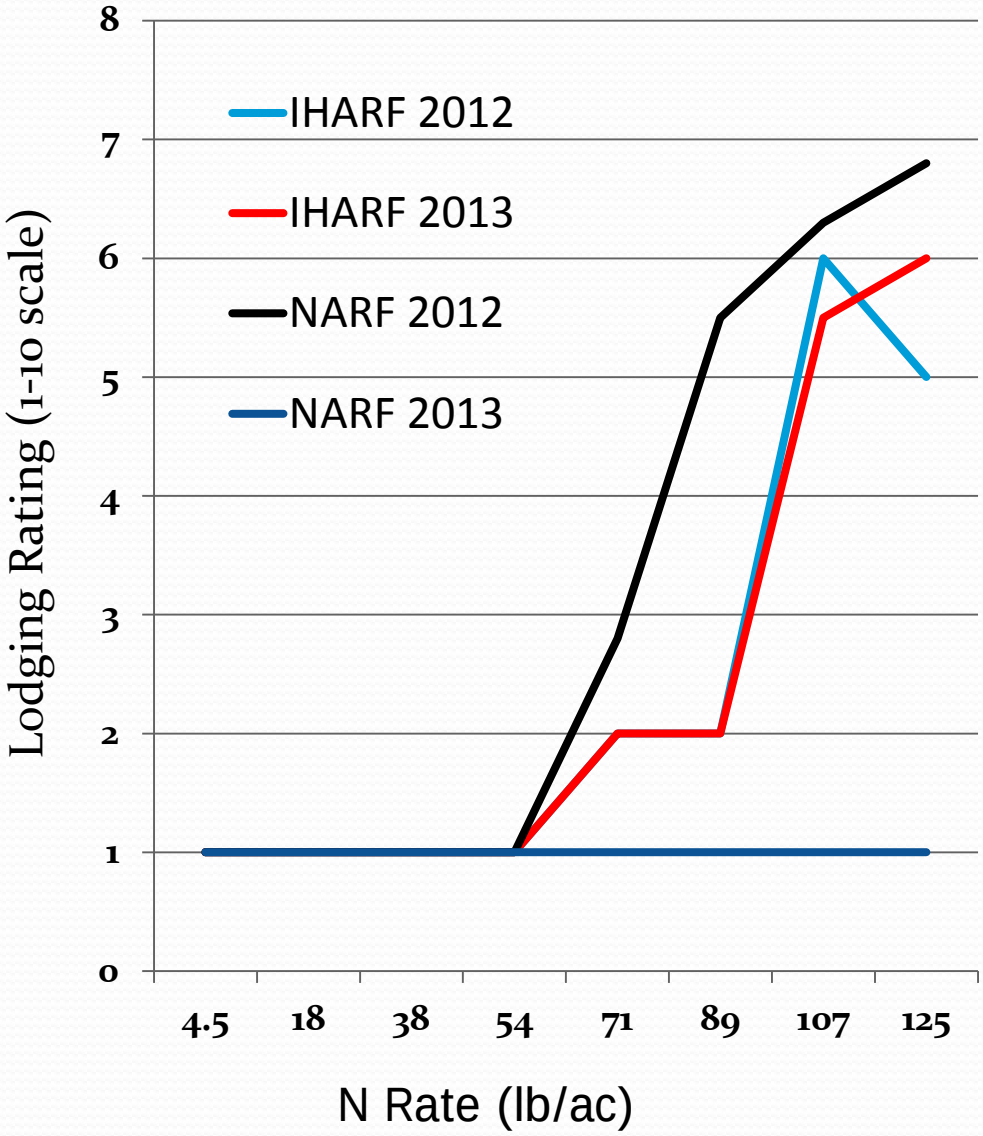


Optimum was about 60 lb/ac N in 2012, and 80 Lb/ac at IHARF in 2013 but not NARF 2013.

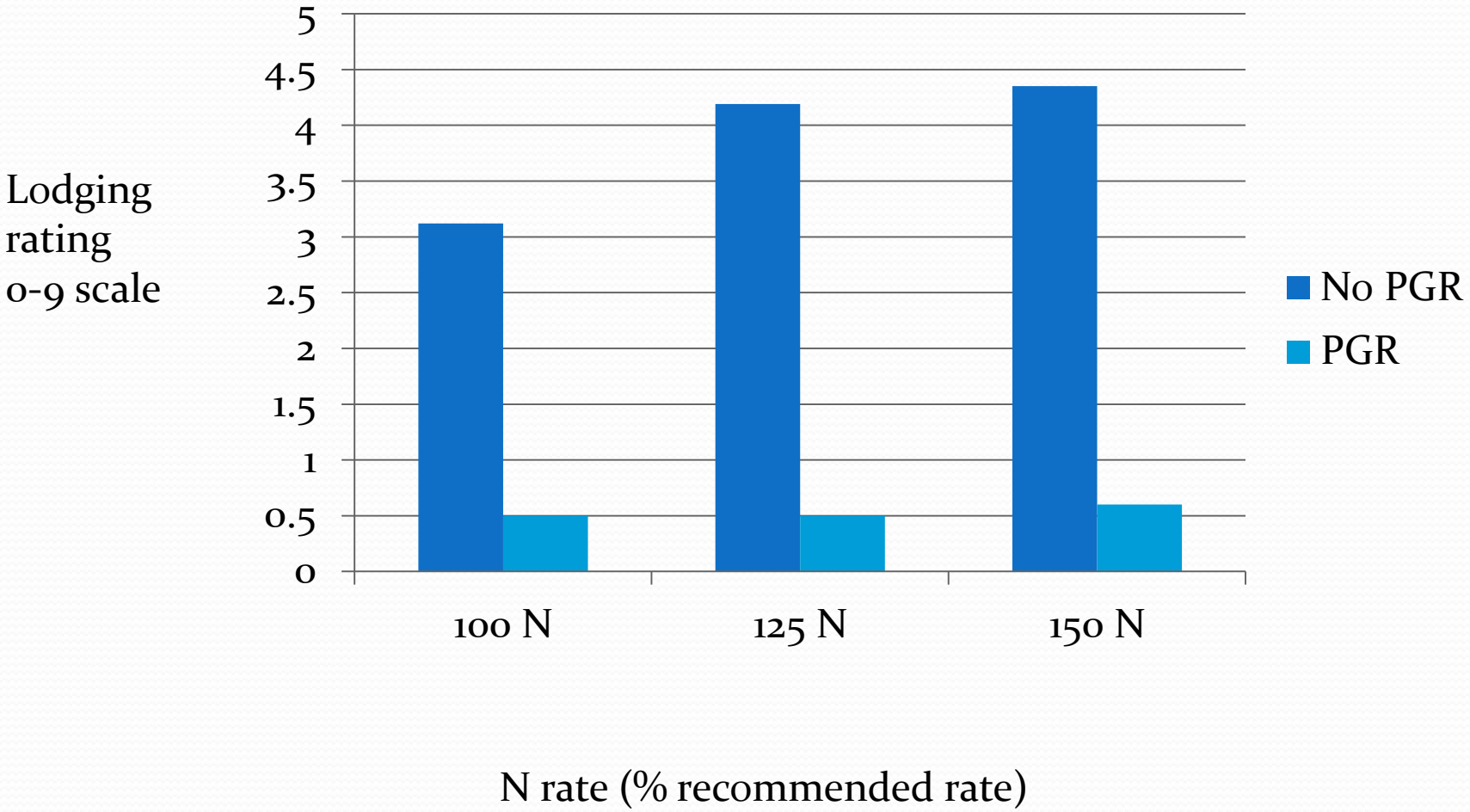
Why?

Wheat Yield and Lodging Response to N
IHARF and NARF 2012 &2013



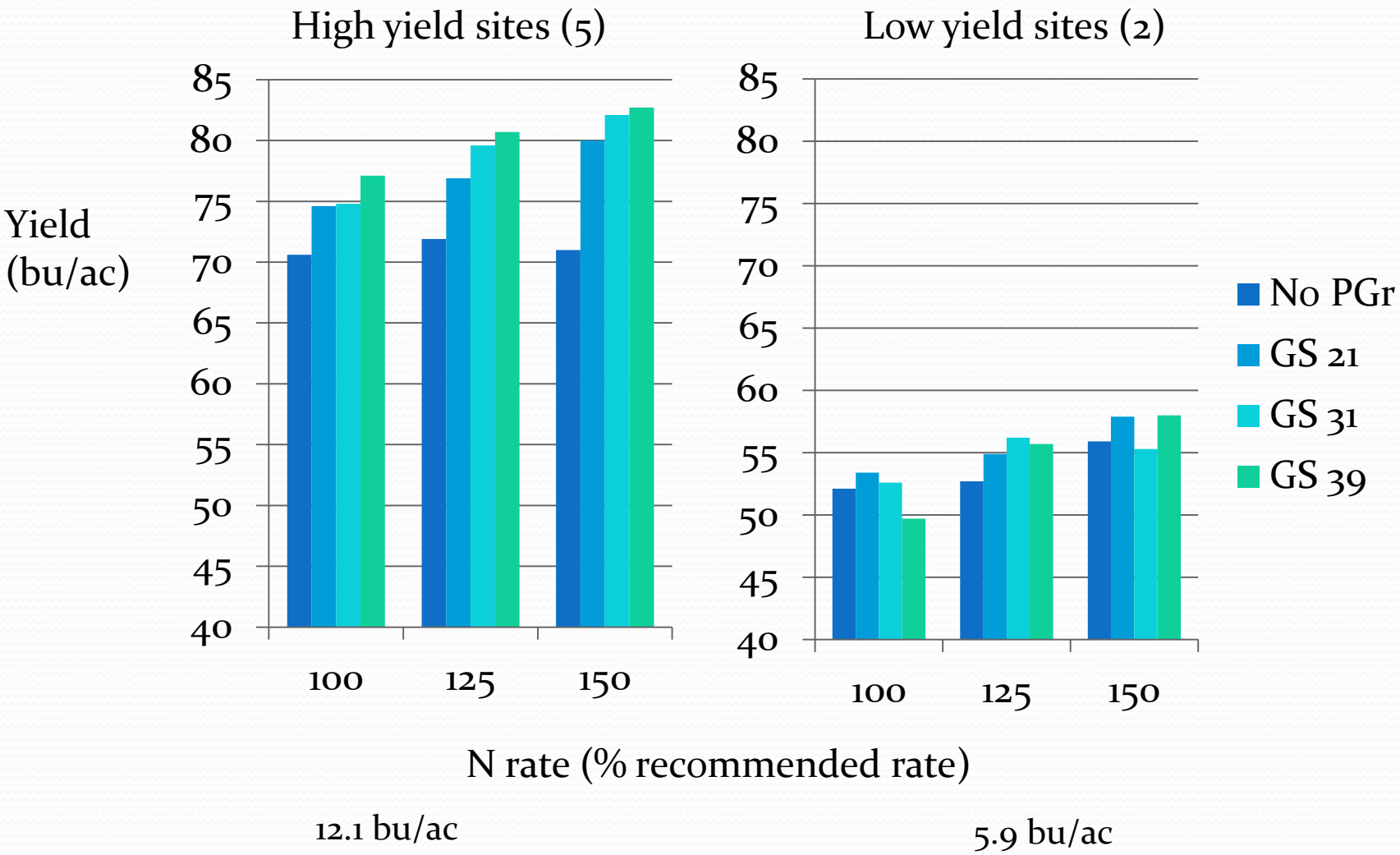


Influence of PGR on lodging at 3 N rates (4 location yr. average at IH and Melfort)

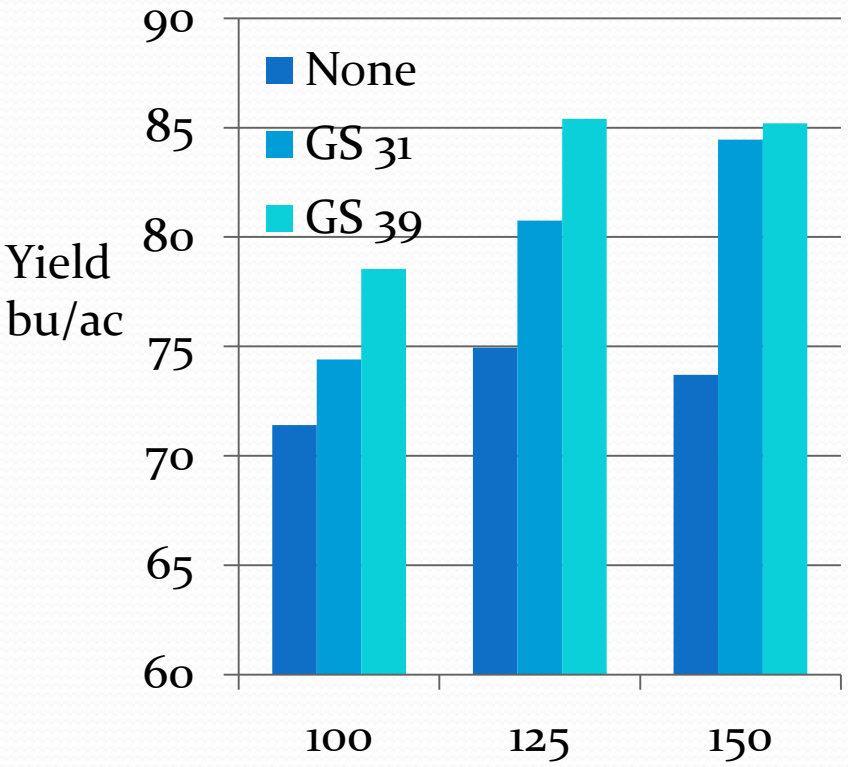


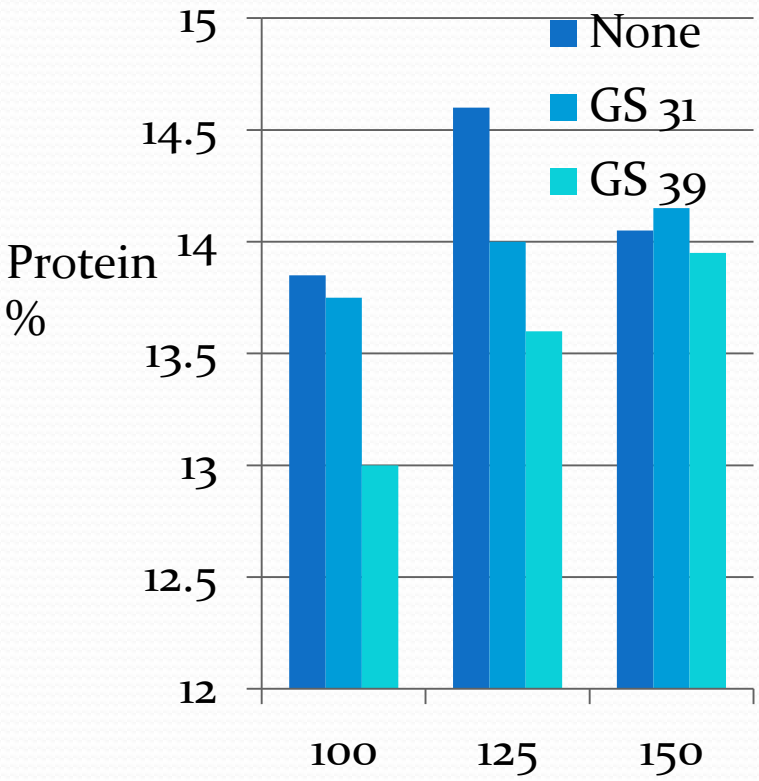
- Lodging didn’t always occur
  Where lodging did occur:
    - Manipulator consistently reduced lodging
    - Manipulator didn’t always fully prevent lodging

Influence of N rate on PGR responses



Relationship between yield and protein with PGRs Average for IH (2014 and 2015)





N rate (% recommended rate)

Summary of Yield Responses

Manipulator applied at or near GS 31

	Wheat Class		
	HRSW (61 trials)	CPS (12 trials)	CWAD (6 trials)
Maximum	-2.7	-0.5	-0.3
Minimum	17.1	7.2	12.0
Mean	5.7	1.85	7.35

Based on combined data from Engage Agro and Agri Arm sites from large and small plot trials

Wheat classes and likely varieties differ in response to Manipulator
HRSW and CWAD respond well (usually offset costs)
CPS clas less responsive
Need more data for CPS and likely CWAD
Results from small plots are similar to large plots

Manipulator SUMMARY

- Works best at GS 31 to 39
- Consistently reduces crop height and straw volumes
- Reduces risk of lodging
- Consistently enhances yield in high yield environments, less so in low yield environments
- PGRs may enhance responses to other inputs
  - Limited trials to date suggest positive interactions are possible (eg N rates, seed rates, fungicides)

Some cautions about PGRs

- Minimum Residue Limits are not established in US
  - Application is pending but not likely for 2016 crop
- No tank mixes registered with fungicides or herbicides
  - Optimal timing for PGRs may not coincide with optimal timing for FHB control

Fungicide at Flag vs Fungicide at 75% Head Emergence to 50% Bloom

- 21 Comparisons over 11 Location Years
- Untreated Check = 61.2 bu/ac
- Fungicide at Flag = 65.5 bu/ac
- Fungicide at 75% Head Emergence to 50% Bloom = 70.2 bu/ac

Are there ways we can add value with PGRs

- Increase yield with higher fertility?
- Improve FHB fungicide timing with higher seed rates?
  - Fewer tillers may improve application timing
- Enhance or maintain protein in high yield environments?
  - We often increase yield at the expense of protein

What Next?

- Is it time to examine potential of intensive wheat management?
  - PGRs, Fertility, Varieties, Fungicides, Herbicides, etc

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ENGAGE AGRO

ADOPT Funding
- Agriculture Demonstration of Practices and Technology