

Plant Growth Regulators Trials - Wheat

The ICC has been trialling the use of Plant Growth Regulator (PGR) for many years. Results have been mixed, but their use on barley appears to be promising with yield increases in 3 out of 4 seasons, using the PGR trinexapac-ethyl (Moddus Evo or Marvel) despite little effect on crop height or lodging. Other crops have had mixed results - wheat has seen variable response to crop height control and little yield response, minimal height response in canola with no change in yield and no response at all in fabas.

PGR Overview

Plant Growth Regulator is a term that describes many agricultural and horticultural chemicals that influence plant growth and development. This influence can be positive, eg larger fruit or more pasture growth, and negative eg shorter stems or smaller plant canopies. Most of the broadacre use of PGRs is to have a negative influence on plant growth, ie they are applied with the intention of producing a smaller plant that is resistant to lodging or reduce excessive growth in the crop. There are 4 broad groups of PGRs in use in Australian crops. **NOTE: Not all products are registered for use on all crop types, and some products are registered for use but not as PGRs which may have different rates and timings from that on the label.**

- i. Ethephon eg Ethrel®
- ii. Onium types eg Cycocel®, Chlormequat®, Pix®
- iii. Triazoles eg propiconazole, tebuconazole, paclobutrazol
- iv. Trinexapac-ethyl eg Moddus Evo®, Marvel®

These PGRs act by reducing plant cell expansion, resulting in, among other things, shorter and possibly thicker stems. If the stems are stronger and shorter, then the crop is less likely to lodge.

The majority of the PGRs (groups ii to iv) reduce crop height by reducing the effect of the plant hormone gibberellin. These are applied at early stem elongation (Z30-32). Ethephon is applied from flag leaf emerging (Z37) to booting (Z45) and reduces stem elongation through the increase in concentration of ethylene gas in the expanding cells.

Other benefits claimed by the producers of various products include;

1. better root development that allows for increased root anchorage
2. better root development providing greater opportunity for water and nutrient scavenging
3. may offer improved grain quality
4. reduction in shedding in barley
5. increased Harvest Index (the ratio between grain and total dry matter)
6. faster harvest speeds and reduced stress at harvest.

An alternative to the chemical PGRs is grazing. Demonstrated in the Grain and Graze project on a number of sites was the effect grazing had on the crops where

the grazed treatments/crops were shorter than the non-grazed and were less prone to lodging.

The Wheat PGR trial was conducted in conjunction with the Wheat Fungicide Trial. One true PGR treatment was applied (Moddus Evo at 400 ml/ha) to Scout wheat at 1st node along with Prosaro fungicide at a higher than label rate applied at 2nd node. The trial was harvested on December 7th.

Treatment	Yield t/ha	Plant Height (cm)	Lodging Score
Moddus Z31	9.69	81.0	1.3
Control	9.48	84.7	4.0
Prosaro Z32 High Rate	9.19	88.3	4.7
p	0.844	0.024	0.25
lsd	NS	4.34	NS
cv%	3.9	2.3	>25

No treatment yielded significantly different to the control. Similarly, no treatment affected height, although the Prosaro treatment is significantly higher than the Moddus treated plants. If the Prosaro treatment is included, lodging differences between the treatments was not significant.

If the Prosaro treatment is excluded (from the data, it did not act as a PGR), then the Moddus did reduce plant height (statistically speaking, not so much from a practical sense) and lodging.

What does it mean?

Like many of our wheat PGR trials, there did not appear to be any benefit from applying a PGR to Scout. Yield was not improved and plant height reduction was minimal. A reduction in lodging may have made harvesting easier.

PGR work in wheat is also complicated by the various genes that control plant height and the effect the PGRs have on their expression. Our earlier work in wheat used H45, Chara and Derrimut, which while being a diverse group, all have the same genes controlling plant height, while the Durum wheats respond to PGR applications. We do not have the genetic data on the newer varieties and so results may vary depending on their genetics controlling plant height.