

Plant Growth Regulators Trial

In 2012 and 2013, trials looking at Plant Growth Regulator (PGR) use on barley were resulting in yield increases with the use of the PGR trinexapac-ethyl (Moddus Evo or Marvel) despite little effect on crop height or lodging.

The 2014 trial was sown to see if the yield improvement could be repeated and to expand the trial to examine the effects the effect of a range of PGRs on canola, fabas and wheat.

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®, Chlomequat®, Pix®
- iii. Triazoles eg propiconazole, Orius® (tebuconazole)
- 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.

Wheat Results

Over the years we have looked at PGRs on wheat with several different varieties and had variable responses in crop height but no yield responses. Although we used a range of varieties, it turns out they have similar genes that control crop height. In 2014, Corack was sown (unknown dwarfing gene profile at this stage) and treated with similar PGRs as the barley trial.

Wheat	Treatment	Yield (t/ha)	Height (cm)	Lodging	Protein %	Screenings %
	Control	6.78	81.0 ^a	9	8.2	0.8 ^a
	Marvel @Z32	7.21	73.3 ^b	9	8.9	1.1 ^a
	Marvel @Z32&Z39	6.50	68.3 ^b	9	8.3	1.6 ^b
	Orius @Z32& M@Z39	6.86	81.7 ^a	9	8.4	1.0 ^a
p		0.086	<0.001	-	0.052	0.018
lsd		NS	5.1	NS	NS	0.35
cv%			8.6			18.9

Similar to the barley results, tebuconazole had no effect on plant height, and no PGR had an effect on yield. Marvel reduced crop height, but this had no effect on lodging as the crop did not lodge in any treatment. Screenings were increased with the use of Marvel, a similar response to that in the barley.

In summary, the use of PGRs on the trials in 2014 did not bring any benefit, from either increased yields or improving harvestability. The cereals in 2014 were poorer crops compared with other years, and did not produce a large vegetative crop more prone to lodging. If improvements to rooting depth or recovery are promoted by the PGRs, the plant would have struggled to take advantage of this characteristic as the trial site was waterlogged through June and July, restricting roots to the surface. Further work needs to be done on canola and fabas as there were many questions regarding big bulky canola crops that did not yield as expected across the region, and faba bean crops that became too vegetative and lodged. Lodged faba crops can lead to reducing bee activity necessary for good pollination and pod set or upsetting the plant physiology and reducing bean fill, plus making harvest difficult or requiring the added expense of windrowing.