

## 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.

## Canola Results

There are no PGRs registered for use on canola, although there are products used overseas that may be registered for use in Australia in the future. PGRs are used in Europe to reduce the depth of the canopy so light can reach the lower pods and aid grain fill. Compared to European conditions, Australian crops ripen under much higher sunlight levels that can penetrate through the canopy. Work done on using PGRs in southern Victoria has had variable results to date. The trial conclusions were that the PGRs used did alter plant height, podding, seed numbers/pod and canopy structure but did not improve the Harvest Index (ratio of grain to crop biomass) or grain yields. The lack of yield response was attributed to no lodging in the trials. A comment was also made regarding the inconsistency of responses, either from season to season or between sites.

Timing of application of the treatments is not definitive. While searching papers for suitable treatments to include in this trial, successful results were achieved with the application of the PGRs at around buds visible through to the flower buds starting to yellow. In this trial, the treatments to 45Y86 were applied when buds were just visible.

Canola	Treatment	Yield (t/ha)	Height (cm)	Lodging	Oil %
	Control	2.69	121.0 <sup>a</sup>	9	46.2
	Orius	2.64	119.2 <sup>a</sup>	9	46.1
	Orius + Cycocel	2.45	107.0 <sup>b</sup>	9	46.0
	Marvel	2.67	118.2 <sup>a</sup>	9	45.0
p		0.411	0.035	-	0.08
lsd		NS	5.9	NS	NS
cv%			6.2%		

As can be seen from the results, PGRs had no effect on yield, lodging or oil content. However, the Orius + Cycocel treatment did reduce the plant height by approximately 100mm, which while statistically significant, was of little benefit in practice.