

Plant Growth Regulators Trials – Faba Beans

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.

There are no registered PGRs for faba beans. Previous work by the ICC on the use of PGRs on fabas showed no response to any of the PGRs used so far. Timing this season was brought forward well prior to flowering in an attempt to curtail growth with an “Early” application in June

The timing of the treatments was:

1. One application “Early” on June 29th.
2. One application at “1st Flower” on August 11th.
3. Two applications, one at “Early” and the other at “1st Flower”.

The PGR treatments were:

1. Tebuconazole + Chloremequat (triazole + pgr)
2. Paclobutrazol (triazole fungicide)
3. Reward (mepiquat pgr)
4. Moddus (trinexapac-ethyl pgr)

Post application, the PGRs appeared to be having an effect, but the rain event in mid-September saw all plots collapse to the ground. Subsequently the ends of the plants began to grow vertically again. Attempts were made to measure plant height prior to harvest, but due to the intertwined stems, accurate measurement was difficult without destroying the plants or losing pods. Of the measurements collected, plant height was variable between the treatment replicates, but the paclobutrazol appears to have shortened the fabas.

The trial was harvested on December 12th. No treatment was significantly better or worse than the control even though the paclobutrazol “1st flower” treatment was over a 1 t/ha better simply due to the variability of the data.

| Treatment | Yield (t/ha) |
|--|--------------|
| Paclobutrazol “1 st Flower” | 7.62 |
| Moddus x 2 applications | 7.42 |
| Mepiquat “1 st Flower” | 7.23 |
| Moddus “Early” | 7.12 |
| Chlomequat + Tebuconazole “1 st Flower” | 7.10 |
| Moddus “1 st Flower” | 7.04 |
| Paclobutrazol x 2 applications | 7.04 |
| Chlomequat + Tebuconazole “Early” | 7.03 |
| Paclobutrazol “Early” | 6.98 |
| Chlomequat + Tebuconazole x 2 | 6.67 |
| Mepiquat x 2 applications | 6.58 |
| Control | 6.49 |
| Mepiquat “Early” | 6.29 |
| p | 0.401 |
| lsd | NS |

| | |
|-----|-----|
| cv% | 8.8 |
|-----|-----|

What does it mean?

If using a PGR to prevent lodging was the aim, then all treatments failed. However the trial identified a potential PGR but further work needs to be done with rates and timing.