

B5 Canopy Management, HRZ South East (Bool Lagoon), South Australia

Aim

To determine the effect of various plant growth regulator (PGR) hormones, herbicides, fungicides and agronomic practices on canopy architecture and grain yield of faba bean.

Treatments

As described in Table 1.

Table 1. Treatments, rates and application dates for faba bean canopy management trial sown at Bool Lagoon, South Australia.

Treatments not registered for use on faba bean, and chemical rates are experimental only. Product identification and application rate details have been withheld.

Herbicides #		Application Date	Plant Growth Regulator (PRG) Hormones #		Application Date
1.	Atrazine	28/08/2014	1.	Chlormequat	26/08/2014
2.	Clomazone	26/08/2014	2.	Chlormequat	9/09/2014
3.	Glyphosate - Low	26/08/2014	3.	Ethephon	26/08/2014
4.	Glyphosate - Medium	26/08/2014	4.	Ethephon	9/09/2014
5.	Glyphosate -High	26/08/2014	5.	Paclobutrazol	28/08/2014
6.	Imazamox – Low	26/08/2014	6.	Paclobutrazol	9/09/2014
7.	Imazamox – Medium	26/08/2014	7.	Trinexapac-Ethyl	26/08/2014
8.	Imazamox – High	26/08/2014	8.	Trinexapac-Ethyl	9/09/2014
9.	Paraquat + Diquat -Low	26/08/2014	9.	Product A	26/08/2014
10.	Paraquat + Diquat -High	26/08/2014	10.	Product A	9/09/2014
Fungicides #		Application Date	Agronomy Practices		Application Date
1.	Tebuconazole – Low	26/08/2014	1.	Low density sowing - 6 plants/m ²	10/06/2014
2.	Tebuconazole – High	26/08/2014	2.	Wide row sowing – 30cm spacing's	10/06/2014
Control Treatment			3.	Delayed sowing	3/07/2014
1.	Nil - no treatment applied	-	4.	Delayed sowing + wide row (30 cm spacing's)	3/07/2014
			5.	Simulated grazing	28/08/2014

Other Details

Variety: PBA Kareema
Sowing Date: 10 June 2014
Delayed Sowing Date: 3 July 2014
Fertiliser: Grain Legume Zn 2% @ 150kg/ha at sowing
Plant Density: 12 plants/m²
Low Plant Density: 6 plants/m²
Fungicides: 14 August Mancozeb @ 1 kg/ha; 29 September Mancozeb @ 2 kg/ha

Results and interpretation

- The site experienced average rainfall through April-July, with dry conditions post July. As a consequence of the dry conditions yields were considerably down on previous seasons.
- The Nil treatment produced a grain yield of 2.58 t/ha, compared to 5.43 t/ha in 2013. Similar low yields were recorded at trials nearby.
- Disease was kept to a minimum at the site by implementing a fungicide regime representative of local grower practice.
- Plant height (cm) (8th October), grain yield (t/ha) and 100 grain weight (gm) (9th December) were measured (Table 2).
- The Nil treatment measured 71.6 cm in height and had a 100 grain weight of 136.8 g.

- Heights across treatments did vary significantly with the lowest height measured, simulating grazing treatment, at 33.3 cm. This treatment also recorded the lowest grain yield, 0.85 t/ha, and 100 grain weight 122.0 gm, significantly less than the Nil.
- Delayed sowing, Glyphosate (medium) and Glyphosate (high) reduced height by 33-35%, but resulted in a significant yield penalty.
- Wide row spacing did not decrease height nor did it have a yield or 100 grain weight penalty. Delayed sowing and wide row spacing did decrease height, but resulted in a yield penalty.
- Both delayed sowing treatments had significantly reduced 100 grain weight compared to the Nil.
- Four treatments reduced height from the Nil, without a significant yield penalty; Clomazone, Paraquat + Diquat (High), Ethephon (26 Aug) and Ethephon (9 Sept). Paraquat + Diquat (High) and Ethephon (26 Aug) did not differ in 100 grain weight from the Nil. Clomazone and Ethephon (9 Sept) had significantly lower 100 grain weights compared to the Nil.

Key findings and comments

- The concept of canopy management for improved disease control, fertiliser use efficiency and grain yield has been well documented in cereals, however limited research has been conducted on this concept in pulse crops, including faba beans.
- While large bean canopies are beneficial from a nitrogen fixation perspective, these often pose a number of problems, such as shading of flowers, poor fungicide penetration, increase disease intensity, increased plant lodging, decreased harvestability and the potential for haying off in seasons with a sharp finish.
- This trial compliments work that has been undertaken in South Australia's Mid North (Tarlee) and builds on previous work in the South East. It expands the products tested and agronomic practices evaluated, such as evaluating Clomazone and wide row spacing.
- This study has shown (and supports 2013 findings) that grazing and different rates of Glyphosate suppress plant height. These treatments were however associated with a significant yield penalty in 2014, compared with 2013 where there was no significant yield loss.
- Paraquat + Diquat (high) reduced height more than Paraquat + Diquat (medium) without a significant yield penalty. This demonstrates the need to evaluate chemicals at various rates to maximise their potential.
- In 2014 as in 2013, Ethephon reduced plant height without a yield penalty. The later application slightly increased yield, decreased 100 grain weight and had a lesser impact on height, showing that timing of application needs to be considered. The repeated application of PGR hormones has not been tested in current trial work and is a possible area for further research.
- These results suggest that there may be the potential to use chemicals to manipulate plant architecture without yield penalty. Identifying a chemical or rate that reduces plant height with little or no effect on grain yield could potentially have significant benefits to fungicide penetration and efficacy, disease intensity, grain yields and harvestability.

Table 2. Effect of applied treatments on height (cm) (% of Nil treatment) recorded 8 Oct 2014, grain yield (t/ha) and 100 grain weight (gm) (harvested 9 Dec 2014) at Bool Lagoon, South Australia.

Treatment	Height (% of Nil)	Yield (t/ha)	100 grain weight (gm)
Nil - no treatment applied	100 (71.6 cm)	2.58	136.8
Herbicides			
Atrazine	77	1.90	137.9
Clomazone	77	2.50	123.5
Glyphosate – Low	79	1.56	133.9
Glyphosate – Medium	67	1.50	136.2
Glyphosate –High	65	1.30	130.0
Imazamox – Low	95	2.50	134.3
Imazamox - Medium	91	2.44	135.9
Imazamox – High	93	2.40	142.9
Paraquat + Diquat -Low	91	2.39	134.5
Paraquat + Diquat -High	84	2.21	135.5
Fungicides			
Tebuconazole - Low	98	2.68	139.7
Tebuconazole - High	98	2.82	136.4
Plant Growth Regulator PGR) Hormones			
Chlormequat - 26 Aug	102	2.73	138.5
Chlormequat - 9 Sept	95	2.56	135.8
Ethephon - 26 Aug	81	2.16	133.4
Ethephon - 9 Sept	86	2.39	127.7
Paclobutrazol - 28 Aug	100	2.62	135.2
Paclobutrazol - 9 Sept	95	2.50	132.7
Trinexapac-Ethyl - 26 Aug	98	2.49	133.0
Trinexapac-Ethyl - 9 Sept	95	2.45	135.2
Product A - 26 Aug	100	2.70	136.2
Product A - 9 Sept	98	2.79	137.7
Agronomy Treatments			
Low density sowing	93	2.22	135.8
Wide row sowing	102	2.30	138.9
Delayed sowing	65	1.61	124.2
Delayed sowing + wide row	72	1.95	124.7
Simulated grazing	47	0.85	122.0
	Site Average	2.25	133.9
	LSD (P<0.001)	0.44	7.73