BROAD BEAN CANOPY MANAGEMENT

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KEY MESSAGES

- Agronomic or chemical assisted canopy management could have significant benefits to fungicide penetration and efficacy, disease intensity, grain yield and harvestability.
- Four treatments reduced height without a significant yield penalty: Clomazone, Paraquat + Diquat (High), Ethephon (applied 26 Aug) and Ethephon (applied 9 Sept).

Broad Bean Canopy Management Trial Information

Poor penetration of fungicides into large bean canopies if a common problem, particularly in the higher rainfall areas where canopies are larger, and incidence of disease can be higher due to increased humidity. Manipulation of canopies by reducing height could allow for improved fungicide application and efficacy, and may reduce disease intensity and plant lodging, potentially increasing grain yield.

A trial was sown at Bool Lagoon on 10 June and harvested on 9 Dec, to determine whether broad bean plant architecture (PBA Kareema) can be manipulated with the use of chemicals or agronomic management practices (Table 1).

Five herbicides were evaluated, Glyphosate and Imazamox were evaluated at low, medium and high concentrations and Paraquat + Diquat was evaluated at low and high concentrations. Herbicides were applied either on the 26 or 28 August.

One fungicide was evaluated, Tebuconazole, at a high and low rate which was applied 26 August. Plant Growth Regulator (PGR) hormones were applied at two different timings, 26 August and 9 September and five different PGR hormones were evaluated.
Treatments are unregistered for use on broad bean crops and chemical rates are experimental only, as such product identification and applications have been withheld.

Five agronomic treatments were applied, a low density and a wide row sowing (applied at sowing 10 June), a delayed sowing and a wide row + delayed sowing (delayed sowing 3 July) and a simulated grazing (28 August).

Table 1. Management practices evaluated and date of application

#Treatments are unregistered for use on broad bean and chemical rates are experimental only, as such product identification and applications have been withheld.

Herbicides#	**Application Date**	**Plant Growth Regulator (PRG) Hormones#**	**Application Date**
Atrazine	28 Aug	Chlormequat	26 Aug
Clomazone	26 Aug	Chlormequat	9 Sept
Glyphosate - Low	26 Aug	Ethephon	26 Aug
Glyphosate - Medium	26 Aug	Ethephon	9 Sept
Glyphosate -High	26 Aug	Paclobutrazol	28 Aug
Imazamox - Low	26 Aug	Paclobutrazol	9 Sept
Imazamox - Medium	26 Aug	Trinexapac-Ethyl	26 Aug
Imazamox - High	26 Aug	Trinexapac-Ethyl	9 Sept
Paraquat + Diquat -Low	26 Aug	Product A	26 Aug
Paraquat + Diquat -High	26 Aug	Product A	9 Sept
Fungicides#		**Agronomy Treatments**	
Tebuconazole - Low	26 Aug	Low density sowing	10 June
Tebuconazole - High	26 Aug	Wide row sowing	10 June
Control Treatment		Delayed sowing	3 July
Nil - no treatment applied		Delayed sowing + wide row	3 July
		Simulated grazing	28 Aug

Results

Plant height was measured on 8 October and harvest grain yield (t/ha) measured. Yields were down on 2013 (2013 Nil treatment recorded 5.43 t/ha compared to 2.58 t/ha in 2014). The lower yields were a result of extremely dry conditions in the South East post July and throughout spring, with similar yields being recorded at trials nearby.

On October 8 the Nil measured 71.6cm in height and at harvest yielded 2.58 t/ha. Height (cms) across the treatments did vary significantly (P (<0.001), LSD 6.9cm), as did yields (Table 2). The lowest height measured was for the grazed plots at 33.3cm, with a yield of 0.85 t/ha, the lowest yield recorded and 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 penalty. Delayed sowing + wide row did decrease height, but also resulted in a yield penalty.

Four treatments reduced height from the Nil, without a significant yield penalty: Clomazone, Paraquat + Diquat (High), Ethephon (26 Aug) and Ethephon (9 Sept).

Table 2. Height % of Nil Treatment recorded 8 October and Harvested Grain Yield (t/ha)

Treatment	Height 8 Oct (% of Nil)	Yield (t/ha)
Nil - no treatment applied	100	2.58
Herbicides		
Atrazine	77	1.90
Clomazone	77	2.50
Glyphosate - Low	79	1.56
Glyphosate - Medium	67	1.50
Glyphosate -High	65	1.30
Imazamox - Low	95	2.50
Imazamox - Medium	91	2.44
Imazamox - High	93	2.40
Paraquat + Diquat -Low	91	2.39
Paraquat + Diquat -High	84	2.21
Fungicides		
Tebuconazole - Low	98	2.68
Tebuconazole - High	98	2.82
Plant Growth Regulator PGR) Hormones		
Chlormequat - 26 Aug	102	2.73
Chlormequat - 9 Sept	95	2.56
Ethephon - 26 Aug	81	2.16
Ethephon - 9 Sept	86	2.39
Paclobutrazol - 28 Aug	100	2.62
Paclobutrazol - 9 Sept	95	2.50
Trinexapac-Ethyl - 26 Aug	98	2.49
Trinexapac-Ethyl - 9 Sept	95	2.45
Product A - 26 Aug	100	2.70
Product A - 9 Sept	98	2.79
Agronomy Treatments		
Low density sowing	93	2.22
Wide row sowing	102	2.30
Delayed sowing	65	1.61
Delayed sowing + wide row	72	1.95
Simulated grazing	47	0.85
	Site Average	2.25
	LSD (P<0.001)	0.44

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 broad beans.

This trial compliments work that has been undertaken in Tarlee in South Australia's mid north and builds on previous work in the South East. It expands on 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, but in contrast to 2013 where there was no significant yield loss, in 2014 these treatments resulted in significant yield penalties.

In 2014 as in 2013 Ethephon reduced plant height without a yield penalty. The later application slightly increased yield but had lesser of an impact on height, showing that timing of application needs to be considered.

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 potential.

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.

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