

# BROAD BEAN CANOPY MANAGEMENT

Mick Lines, SARDI Clare, [michael.lines@sa.gov.au](mailto:michael.lines@sa.gov.au), 08 8842 6264

Larn McMurray, SARDI Clare, [larn.mcmurray@sa.gov.au](mailto:larn.mcmurray@sa.gov.au)

## Key Points:

- Agronomic or chemical assisted canopy management could have significant benefits to fungicide penetration and efficacy, disease intensity, grain yield and harvestability.
- Two canopy management treatments (simulated grazing and a low rate of glyphosate) suppressed plant height with no significant effect on grain yield.
- All other treatments either caused a yield penalty or did not suppress plant height.
- Several herbicides, including glyphosate and imazamox show promise as growth regulators, but require revision of application rates.

## Site:

Glenroy

## Farmer Co-operator:

Bruce McLean

## NVT:

Replicated (3 plots) Plot Trial  
8m X 1.6m plots, 15 cm row spacing's

## Yield Limiting Factors:

Waterlogging, post-flower moisture stress

## Background Information:

Poor penetration of fungicides into large bean canopies is a common problem, particularly in higher rainfall areas where canopies are larger, and incidence of disease can be higher due to increased humidity.

Manipulation of bean canopies by reducing height could allow improved fungicide application and efficacy, and may reduce disease intensity and plant lodging, potentially increasing grain yield.

## Trial Details

<b>Sowing Date</b>	20 June 2013			
<b>Variety</b>	PBA Kareema			
<b>Canopy Management Treatments<sup>#</sup></b> (plus an untreated control)	<b>Plant Growth Regulator (PGR) Hormones</b> 1. Chlormequat 2. Trinexapac-Ethyl 3. Chlormequat + Trinexapac-Ethyl 4. Ethephon 5. Nufarm Product X	<b>Herbicides</b> 1. Glyphosate_Low 2. Glyphosate_High 3. 2,4-D Amine 4. Imazamox 5. Clopyralid 6. Dicamba 7. Dicamba + MCPA Amine 8. Paraquat + Diquat	<b>Fungicides</b> 1. Tebuconazole_Low 2. Tebuconazole_High	<b>Agronomy</b> 1. "Grazed" = slashed with a lawn mower 14 <sup>th</sup> August. 2. Delayed Sowing (3wks)

<sup>#</sup> All treatments are unregistered for use on broad bean, and chemical rates are experimental only. Product identification and application rate details have been with-held.

## Trial Results

Early season waterlogging caused significant variability throughout trials in 2013 and early growth and canopy development was suppressed during winter. Despite these factors, grain yield was high due to above average winter rainfall. The untreated control produced an average grain yield of 5.43t/ha. Disease was kept to a minimum in this trial by implementing a fungicide regime representative of local grower practice.

Early season plant height (Table 1): All herbicide treatments and the agronomic practices of “Grazing” and delayed sowing showed reduced growth in late September compared to the untreated control. Height reductions generated from the herbicides ranged from 12% (low rate of Glyphosate) to 70% (Clopyralid) at this measurement time. The agronomic practices of “Grazing” and delayed sowing reduced plant height by 30% and 35% respectively. Of the 5 plant growth regulator (PGR) treatments only Ethephon and Trinexapac-Ethyl suppressed plant height at this timing. The fungicide Tebuconazole showed no effect on plant height.

Late-season plant height (Table 1): By late October only the herbicides and the agronomic practice of “Grazing” still showed a significant reduction in plant height. The herbicide treatments Clopyralid, Dicamba and Dicamba + MCPA caused high plant mortality at the rates used in this trial. The PGR and fungicide treatments showed no difference in plant height at this timing.

Grain yield (Table 1): All herbicide treatments except the low rate of Glyphosate showed a significant yield loss, ranging from 23% (Imazamox) to 85% (Clopyralid). None of the agronomic practices, PGR or fungicide treatments had a significant effect on grain yield.

Table 1: Effect of various chemicals and agronomic practices on plant height and grain yield of PBA Kareema at Glenroy, 2013. Treatments are ranked in order of grain yield loss.

Treatment	Plant Height Reduction (%)		Grain Yield Loss (%)
	23-Sept	30-Oct	
<i>Nil</i>	<i>35 cm</i>	<i>77 cm</i>	<i>5.43 t/ha</i>
Clopyralid	70	*	85
Dicamba + MCPA Amine	60	*	79
Dicamba	65	*	73
Paraquat + Diquat	28	43	38
Glyphosate_High	27	32	31
2,4-D_Amine	49	36	26
Imazamox	26	40	23
“Grazed”	30	29	16
Glyphosate_Low	12	21	14
Delayed sowing (3wks)	35	7	13
Nufarm Product X	7	5	4
Ethephon	19	8	3
Chlormequat	0	2	3
Tebuconazole_Low	9	1	1
Chlormequat + Trinexapac-Ethyl	10	9	0
Trinexapac-Ethyl	11	6	0
Tebuconazole_High	3	3	0
<b>LSD (P&lt;0.05) %</b>	<b>10</b>	<b>10</b>	<b>18</b>

Shading denotes significant difference to the Nil treatment

\* Near 100% mortality. Some plants with variable height surviving

## Comments

The concept of canopy management for improved disease control, fertiliser use efficiency and grain yield has been well researched and relatively widely adopted in cereals, however limited research has been conducted on the merits of this concept in pulse crops, including faba and broad beans.

While large bean canopies are beneficial from a nitrogen fixation perspective, these often present a range of problems such as shading of flowers, poor fungicide penetration, increased disease intensity, increased plant lodging, and the potential for haying off (where high biomass production leaves insufficient moisture for grain fill) in seasons with a sharp finish.

A previous trial conducted by this project at Tarlee in South Australia's Mid North evaluated the use of several PGR hormones and two herbicides for their effect on plant growth, and found a number of these treatments regulated plant growth. This trial at Glenroy in 2013 expanded the volume of products being tested. It also includes several agronomic practices and the fungicide Tebuconazole, which has previously been found to reduce plant height in cereals when used at very high rates. The use of herbicides for canopy management is also being closely examined in this trial for their known suppressive effect on plant growth (which often also penalises grain yield), but these may also have the added benefit of providing some level of weed control. It is possible that low rates of certain products may significantly reduce plant height with little or no effect on grain yield.

This study showed that two treatments (Grazing and the low rate of Glyphosate) permanently suppressed plant height with no significant effect on grain yield. All other herbicide treatments caused significant yield loss, and none of the PGR or fungicide treatments had a lasting effect on plant height, although some treatments did show short term effects. Delaying sowing by three weeks had no lasting effect on plant height, and although this practice showed no yield penalty in this trial, the effect on grain yield is likely to be variable across seasons.

The effect of these treatments on plant lodging could not be fully assessed due to minimal levels of plant lodging as a result of suppressed canopy development from waterlogging.

The herbicide treatments 2,4-D Amine and the high rate of Glyphosate produced similar results to a previous trial conducted at Tarlee in 2012 (15-37% height suppression and a 26-32% yield penalty). Previous studies conducted at Tarlee also found that the PGR hormones Trinexapac-Ethyl and Ethephon were able to reduce height of faba beans by 9-21%, however no lasting differences were generated from these treatments in this trial. High variability in growth and grain yield was noted across the trial due to the early season waterlogging, and further work is required to validate these inconsistent results. Further study could also examine alternative products or different rates of products which appeared promising in this trial, such as Glyphosate and Imazamox. Glyphosate caused high yield losses at the high application rate, but a 21% reduction in plant height and no significant yield loss at the low rate. Imazamox also appeared promising, with a 40% reduction in plant height and a 23% yield penalty from the application rate used in this trial. 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 yield and harvestability.

## Acknowledgements

- Trials were conducted by the SARDI New Variety Agronomy group at Struan.
- This work was funded by GRDC as part of the Southern Region Pulse Agronomy Project.

