

## The impact of rate and timing of clethodim herbicide applications on canola performance- Parkes 2013

<b>Trial Code:</b>	GOCD00113-1
<b>Season/year:</b>	Winter, 2013
<b>Trial Location:</b>	“Weerona” 10 km North of Parkes, NSW
<b>Trial Collaborators:</b>	The Wright Family

### Keywords

Canola, clethodim, weeds, annual ryegrass, *Lolium rigidum*, pre-emergent, herbicides, Parkes, , tank mixing, resistance, GOA1310, GOCD00113-1

### Take home messages

In this trial there was very little impact on the yield performance of the canola from a range of clethodim rates and timings, even when applied beyond label timings.

Only one treatment in this trial resulted in any impact on canola yields in the variety tested- clethodim applied at 500mL/ha plus Factor at 80g/ha, applied beyond label recommended crop stages, resulting in a yield penalty of 160kg/ha compared to the untreated control (UTC).

There was no impact on canola oil % by any of the treatments applied in this trial.

This trial only included one variety of canola, 44Y84. Other varieties may show different tolerance results.

### Background:

Increasing levels of Group A ‘fop’ resistance and the reduction in pricing of clethodim herbicides has driven increases in both the frequency of use and the rates applied of these products in canola for the control of annual ryegrass. Coinciding with this there has been an increase in the observed level and occurrence of crop damage by that same herbicide. Damage by clethodim in canola has long been documented but the triggers that result in this expression are not very clear and neither are the possible impacts on yields.

Visual symptoms of crop damage have been rarely reported for the lower label rates of 250 mL/ha but are more commonly observed at higher rates of 500mL/ha, indicating that rates could be to blame, however, the use of the high rate does not universally result in crop damage. Suggested label timings of spraying before bud initiation may not always be achieved in reality, however, late applications have not consistently resulted in damage, thus suggesting that damage may be in response to a combination of rate and unfavourable conditions at application.

As mentioned above the true effect upon yield is unclear - some commentary suggests that the visual symptoms of flower distortion or abnormal or missing pods has little or no impact upon yield as the canola can compensate for the damage incurred. At the other end of the commentary is that the impacts on flowering and pod formation are terminally detrimental and the effects upon yield substantial.

A trial in South Australia<sup>1</sup> in 2013 suggests that grain yield losses from clethodim occur when using higher rates (1 L/ha) after the 8-leaf stage and resulted in up to 40% losses when applied at bud initiation. This work also indicated a possible variation in susceptibility between varieties.

Grain Orana Alliance have initiated a series of field trials to gain a better understanding of clethodim damage in canola, specifically investigating the impact that application rates and their timing may have on canola yields. These trials have also sought to investigate the potential for an alternate Group A, DIM herbicide, Factor<sup>®</sup> to cause damage in canola.

## DISCLAIMER

**Following is a report on a scientific experiment. It may contain some herbicide treatments that are not registered for the situation, manner or rate at which they are used in this trial. This document or anything else resulting from, construed or taken from this or by GOA or its representatives should not be taken as a suggestion, recommendation or endorsement of any unregistered herbicide uses.**

## Aim:

- Identify possible contributors to the expression of clethodim damage in canola, such as the critical rate, timing or other factors such as environmental conditions around application
- Quantify what is the level of yield and grain quality impact associated with the use of clethodim

## Methodology:

This trial was a small plot, randomised complete block design with three replicates.

All plots were sown with 100 kg/ha of MAP (10% N, 21.9% P, 1.5% S) drilled with the seed, 80 kg/ha of Gran Am (20.2% N and 24% S) and 100kg/ha of granular urea (46% N) broadcast and incorporated by sowing.

Plots were sown with Pioneer Hybrid - 44Y84 @ 3.5 kg/ha on the 15/5/2013.

The trial site was treated with trifluralin (IBS), Roundup<sup>®</sup> Attack<sup>™</sup> pre-sowing and Dual Gold<sup>®</sup> (PSPE) and bifenthrin post sowing. The trial area was treated with Intervix<sup>®</sup> at 750 mL/ha on the 21/6/2013

---

<sup>1</sup>[http://www.hartfieldsite.org.au/media/2013%20TRIAL%20RESULTS/17\\_Clethodim\\_tolerance\\_in\\_canola\\_2013HartTrialResultsBook.pdf](http://www.hartfieldsite.org.au/media/2013%20TRIAL%20RESULTS/17_Clethodim_tolerance_in_canola_2013HartTrialResultsBook.pdf)

to control any weeds presents before clethodim treatments were applied. Any surviving weeds were manually removed when found.

The trial treatments consisted of three planned timings of early, late and 'unfavourable conditions'. The early treatment was targeted within recommended timings of the 2-4 leaf stage, the late treatment was targeted to be applied when the crop was beyond bud initiation/visible stage approximately 8 leaf stage. The last (flexible) treatment was to be targeted at 'unfavourable' growing conditions, ideally very frosty conditions but in this trial, such a period was not identified. Instead two further treatments were added, (i) very late (crop bolting but not yet flowering) and (ii) extremely late (at early flowering).

At each of these timings a range of treatments were applied including three rates of clethodim (250, 500 and 1000 mL/ha) and a single rate of Factor<sup>®</sup> (80 g/ha) as well as a tank-mix of clethodim (250 or 500ml/ha) + Factor<sup>®</sup> (80 g/ha). All treatments were applied with Uptake™ spraying oil at 0.5%.

All these treatments were applied by hand boom with 100 L/ha of rain water through AIXR015 nozzles @ 3 bar. The details are listed in table 2 below.

**Table 1:** Treatment list

Treatment	Rate (mL or g/ha)
Untreated Control (UTC)	Nil
Clethodim (early)	250
Clethodim (early)	500
Clethodim (early)	1000
Clethodim (late)	250
Clethodim (late)	500
Clethodim (late)	1000
Factor <sup>®</sup> (early)	80
Factor <sup>®</sup> (late)	80
Clethodim + Factor <sup>®</sup> (early)	250 + 80
Clethodim + Factor <sup>®</sup> (early)	500 + 80
Clethodim + Factor <sup>®</sup> (late)	250 + 80
Clethodim + Factor <sup>®</sup> (late)	500 + 80
Clethodim (applied very late)	500
Clethodim (applied extremely late)	500

**Table 2:** Application data

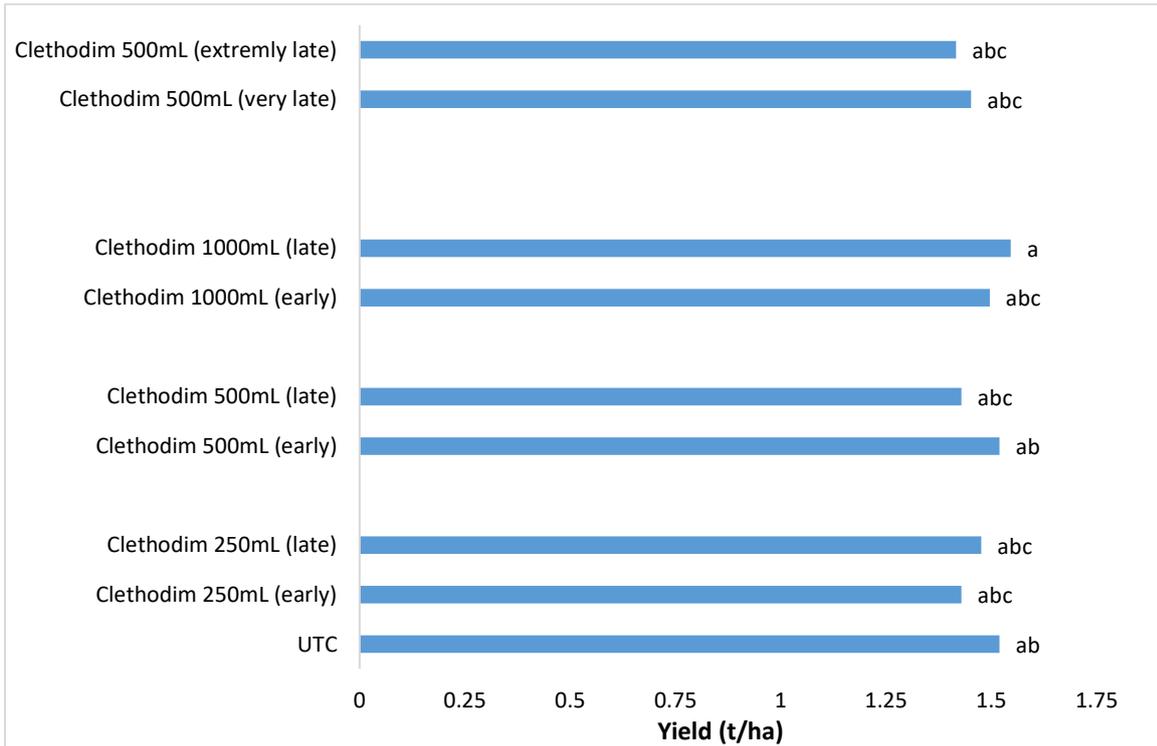
Early (2-4 leaf)	Date Applied	3/07/13	Temp (°C)	Wind (km/hr)	Wind Dir.	Humidity (%)
	Start time	4pm	18	3	S	66
	Finish Time	5pm	Δt	7.7	% Cloud	10
	Water rate (L/ha)	100	Nozzle	AIXR015	Pressure	3 bar
	Equipment	Hand boom				
Late (8 leaf)	Date Applied	26/07/13	Temp (°C)	Wind (km/hr)	Wind Dir.	Humidity (%)
	Start time	12.30 pm	18	3-5	SW	40
	Finish Time	1.10 pm	Δt	7	% Cloud	5
	Water rate (L/ha)	100	Nozzle	AIXR015	Pressure	3 bar
	Equipment	Hand boom				
Very late (Elongating)	Date Applied	14/08/13	Temp (°C)	Wind (km/hr)	Wind Dir.	Humidity (%)
	Start time	9.00 am	15	1-7	NW	51
	Finish Time	9.30 am	Δt	5.1	% Cloud	10
	Water rate (L/ha)	100	Nozzle	AIXR015	Pressure	3 bar
	Equipment	Hand boom				
Extremely late (Early flowering)	Date Applied	22/08/13	Temp (°C)	Wind (km/hr)	Wind Dir.	Humidity (%)
	Start time	9.30 am	12	1-5	NW	52
	Finish Time	10.00 am	Δt	7.1	% Cloud	10
	Water rate (L/ha)	100	Nozzle	AIXR015	Pressure	3bar
	Equipment	Hand boom				

## Results

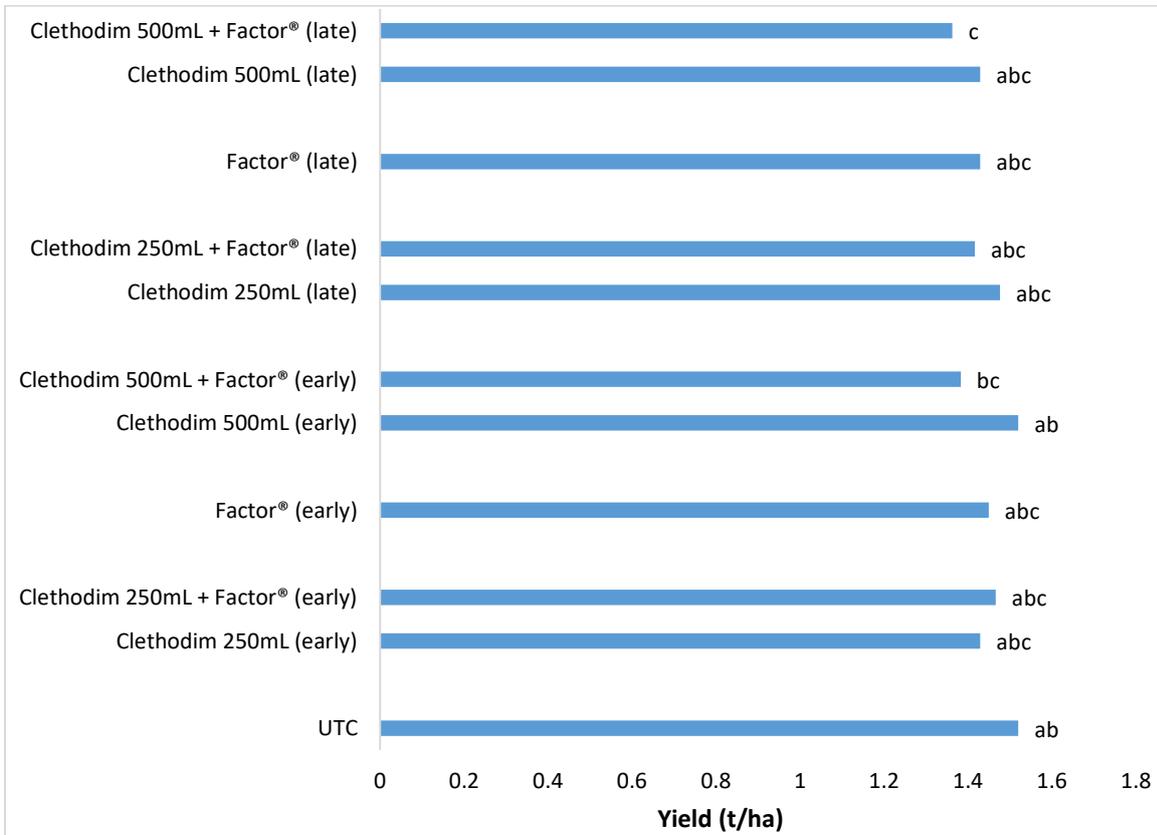
There were no apparent differences in any of the NVDI assessments (measure of crop biomass) following any herbicide applications, however, there was a small amount of visually damaged flowers of 2-3% in some of the later treatments but these were neither statistically significant nor alarming to observe.

There was only one treatment statistically different to the UTC, in crop yield or oil% of the harvested grain, a tank mix of clethodim at 500mL/ha and 80g/ha of Factor when applied beyond label recommended crop stages. All other treatments did not result in any different yield or oil% than that of the UTC. Figure 1 details of the yield in response to the clethodim application rate and timings.

The use of Factor® herbicide alone and in a tank-mix with clethodim showed no statistically significant impact on the final yield of canola except in the treatment mentioned above- clethodim 500 mL/ha + Factor® when applied late resulting in a yield penalty of approximately 160 kg/ha less than the UTC.



**Figure 1:** Canola yield in response to varying application timings and rates of clethodim.



**Figure 2:** Canola yield in response to the use of Factor® either alone or in tank-mix combination with clethodim

## Discussion

The use of clethodim alone and even at double the label rate in this trial failed to impact on yield or oil content. There was also no observable impact in these trials even when the products were applied at very late or extremely late timings.

The use of Factor® either alone or in combination with clethodim also had little statistically significant impact on yield or oil content with only a reduced yield from one treatment, clethodim 500 mL/ha + Factor® applied late. However there was a trend to see reduced yields especially when Factor tank mixes with the higher rates of clethodim when applied beyond label timings.

This overall lack of responsiveness could lend support to an argument that clethodim damage is not simply a function of the use of high herbicide rates and/or late crop stage at the time of application but something else such as adverse weather.

Weather conditions around the timings of application could be suggested as not beyond typical for the region, as detailed below, which would tend to support the lack of potential to result in any major impact.

- The four days following the early treatment a run of 4 frosts occurred, recording temperatures as low as -2.7 °C
- For the late timing a frost was recorded for the day of, and the days before and after application
- The frosting events noted above were nearly the only ones in the month of July in the critical treatment period and the average minimum temperature was 1.2 °C above normal, and the maximum also 1.2°C above normal.

It should also be noted at this stage only one variety was tested in this trial and its relative 'tolerance' to clethodim is unknown, other varieties may respond differently.

## Conclusion

The results from this one trial demonstrated that the use of clethodim within the stipulated label conditions for rate and timing did not cause significant yield reductions in the variety Pioneer 44Y84. However application at rates in excess of the label and/or beyond stipulated crop stages also did not result in any penalties.

This would suggest that the triggers to result in damage from clethodim are more than simply excessive rates and/or delayed timing and from this trial are not clear. Further to this it should be noted that only one variety was tested in in this trial and its relative sensitivity to clethodim is unknown. Other canola varieties may be more sensitive to clethodim damage and excessive rates or delayed timing might result in significant penalties.

Growers and advisors should refrain from making clethodim applications outside of label recommendations as damage is more likely although not demonstrated in this trial.

Further investigations are needed to help better identify what the triggers for clethodim damage may be.

The trial is one of a series of trials investigating clethodim damage and should not be considered in isolation nor any of the experimental timings or rates used in this trial as a suggestion, recommendation or otherwise to use such rates or timings.

## **Acknowledgements**

GOA would like to thank GRDC support in running these trials which would not be possible without such funding. GOA would also like to thank Greg Wright for hosting this trial on his property and a final thanks to Pioneer Hybrid for supply seed for these trials.