GOA Trial Site Report

Canola aphid control: understanding product options and timing effects, Gilgandra 2019.

Trial code:	GOIN00119-2
Year:	Winter 2019
Location:	'Inglewood', Gilgandra
Trial partners:	Tex and Jon Kilby

Keywords

GOIN001, canola, aphids, sucking insect pests, Gilgandra.

Key findings

- The insecticide product chosen had no effect on yield at the same spray timing.
- Aphids are most problematic in drier, lower yielding seasons.
- Early spraying controlled aphids better than a later timing.
- Aphid control was economically viable levels, even in a low rainfall year.

Background

Aphids are mostly present in canola crops in low numbers but periodically numbers can build up to levels warranting control. Grains Research and Development Corporation (GRDC) research has shown that infestations occurring between flowering to podding can cause yield losses of up to 33%. Since 2013 aphid issues in canola have been regularly raised in Grain Orans Alliance's (GOA) Local Research Updates, focussed on thresholds, timing of control and the economics of control options.

Current recommendations regarding aphid thresholds are not consistent. The GRDC 'Pest Management in Canola' guidelines states the threshold for cabbage and/or turnip aphid is '25 mm (or more) of stem infested in >20% plants', the same document also recommended 'threshold of 10-50 % infestation + limited compensation capacity'.

More recent research by Miles et al 2015[1] shows that the 'compensatory capacity of canola supports the use of less conservative aphid thresholds, and increased consideration of natural enemies in controlling outbreaks'. Further to this the advice is that 'a delay in enacting a spray decision at the 10% infestation level could be low risk and allow time for biological control. If natural enemies were ineffective, spraying on an increasing level of infestation up to 20-25% would unlikely result in irrecoverable crop damage. Similarly, late infestations of aphids are unlikely to pose damage to canola as the associated raceme disruption mainly affects flowers that contribute little to final yield'.

Aphids are most problematic in drier, lower yielding seasons, and thus questioning the economic justification for insecticide application. GRDC continue to invest into qualifying aphid thresholds,

[1] https://grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2015/02/insect-management-in-fababeans-and-canola-recent-research

however, there is very little work looking at the timing of control and the effectiveness and economics of various pesticide options.

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Aim

The aim of this project is:

- to see if delaying the timing of aphid control has any influence over final yields
- better understand the levels of control and the economic implications of selected pesticide control options.

Methods

Opportunity canola plots were sown on 26.4.2019 next to other 2019 winter trials. These plots were to be used for pest and/or disease trials is such problems arose. Toward the end of August 2019, a build-up of aphids at the site and surrounding paddock was observed and the aphid trial was initiated. The crop was harvested on 29.10.2019.

Experimental design

- All plots sown to Bonito canola @ 2.5 kg/ha on 26.4.2019.
- Randomized complete block design with 5 replicates.
- Buffer plots were placed between each treated plot to reduce the influence of pesticide drift.

Treatments

- 3 timings, ~2 weeks apart:
    - Timing 1: 29.08.2019
    - Timing 2: 11.09.2019
    - Timing 3: 24.09.2019.
- Each timing sprayed at 100 L/ha water with AIXR015 nozzles through a hand boom.
- 5 replicates of:
    1. Pirimor® @ 500 mL/ha
    2. Transform™ @ 50 mL/ha
    3. Fastac® Duo @ 300 mL/ha + 500 mL/ha Dimethoate® 400.

Measurements and counts:

- plant establishment counts
- aphid infestation – percentage of spikelets with aphids present (regardless of the number)
- colony infestation – percentage of spikelets with an aphid colony > I cm in length.

Results were analysed by ANOVA and results compared by using LSD method with a 95% confidence interval. Any references to differences between treatments should be assumed to be statistically different unless otherwise stated.

Table 1: Rainfall at Gilgandra in 2019 and the long-term average (LTA).

Month	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	TOTAL
2019	40	7	52	0	14	7	2	7	17	2	42	6	**196**
LTA	54	48	64	41	38	51	45	42	47	52	60	62	**604**

Observations

- Timing 1: 29.08.2019. The canola was close to the end of flowering and 40-50% infestations with infected with colonies of 10-25 mm in depth. The population was predominantly cabbage aphids.
- Timing 2: 11.09.2019. The number of heads infected was similar to the first timing, however the larger colonies had increased in size to 15–30mm. The canola had finished flowering.
- Timing 3: 24.09.2019. The population was in decline and the colonies were reducing in size. The canola was starting to dry down.

Results

Aphid populations

At Timing 1 ~39% of main spikes had aphids present with ~12% of plants with colonies (visible infestation on spike of about 1 cm depth or greater). At Timing 3 the populations moved to the lower canopy and declined as the crop matured (Figure 1).

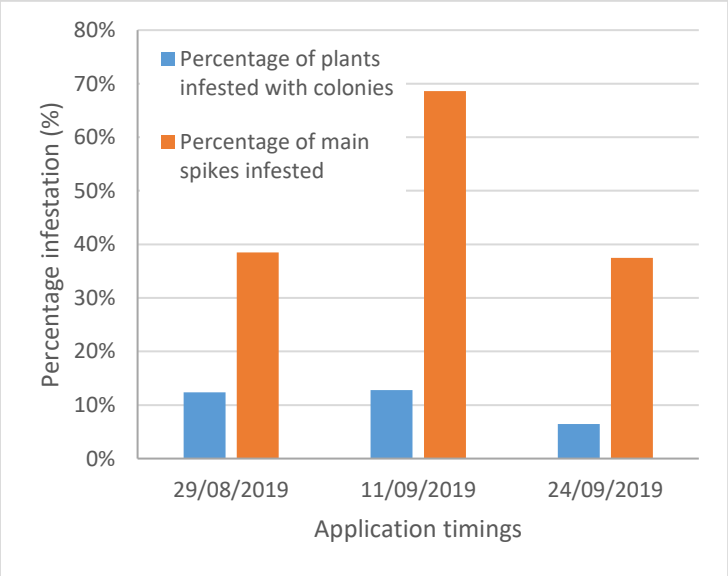


Figure 1. Aphid infestation levels in untreated plots prior to insecticide application at the three timings.

For Timing 1, populations were assessed 13 days after application on the 11/9/2019 where both Pirimor® and Fastac® Duo + Dimethoate® reduced the number of colonies by >90%, while no colonies were observed in the Transform treatments. Similarly, there was a reduction of just under 90% in the number of infected spikelets across all treated plots.

For Timing 2, populations were assessed 13 days after application on the 24.9.2019. No colonies and almost no infected spikelets were detected in the treated plots, although similar populations had

persisted in the untreated plots (just over 10% plants infected with colonies and ~50% infected spikelets).

Timing 3 was not assessed for aphid populations post application.

Yield and grain quality

The plots were taken through to maturity and harvested with a plot header. The site had an average yield of 0.88 t/ha and average oil content of 42.9%.

The first 2 timings retained more yield and had a higher oil content than the last timing and the control. The last timing had a slightly better yield than the untreated (**Figure 2**).

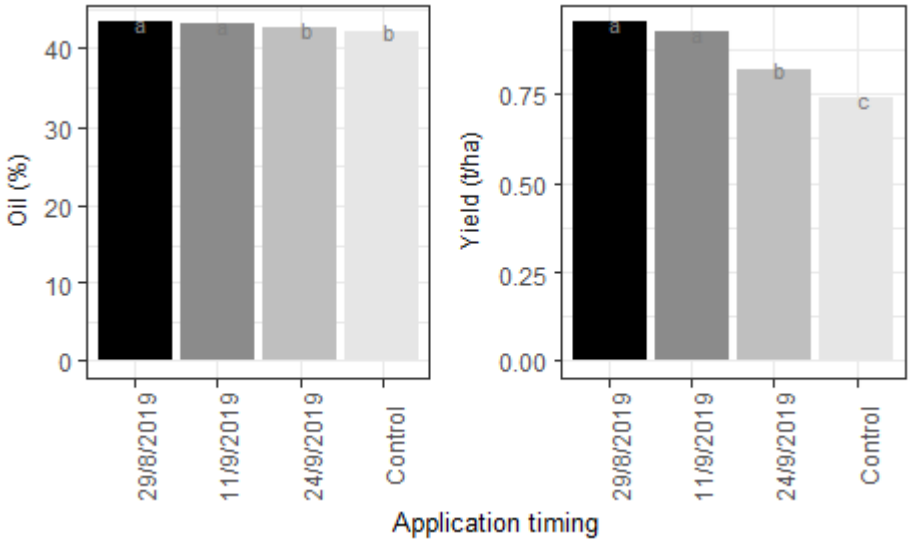


Figure 2. Oil and yield by time of application (averaged by product).

There were also yield differences between the products. Transform had a yield advantage over the Control of 250 kg/ha and outperformed Pirimor (

Figure 3). All products had a higher oil content than the Control.

Transform outyielded the Control at all timings (Figure 4).

Figure 3. Oil and yield by product (averaged by timing).

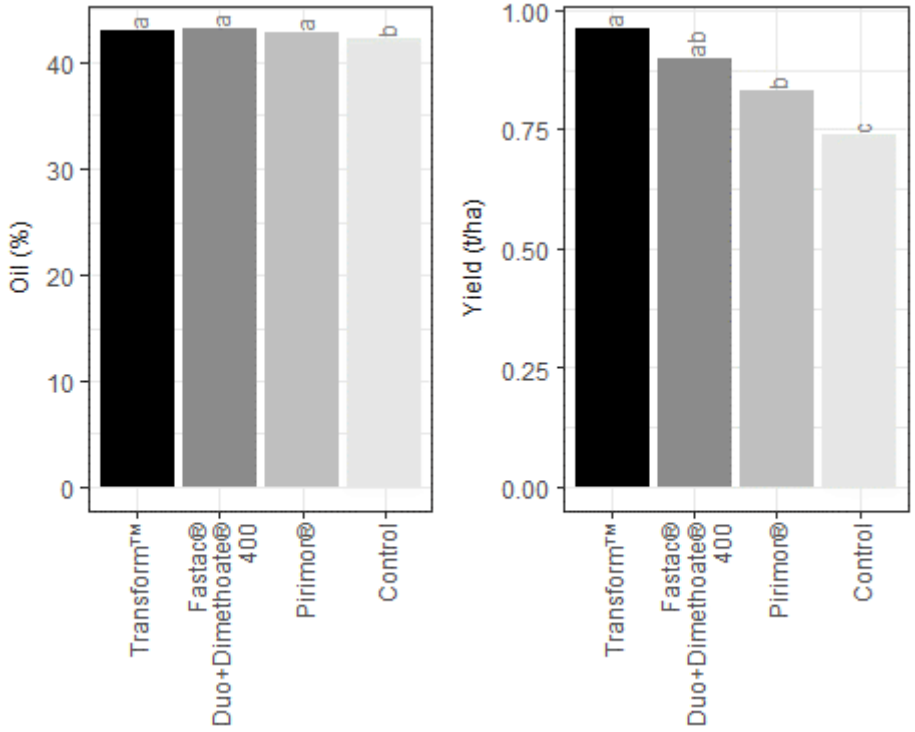
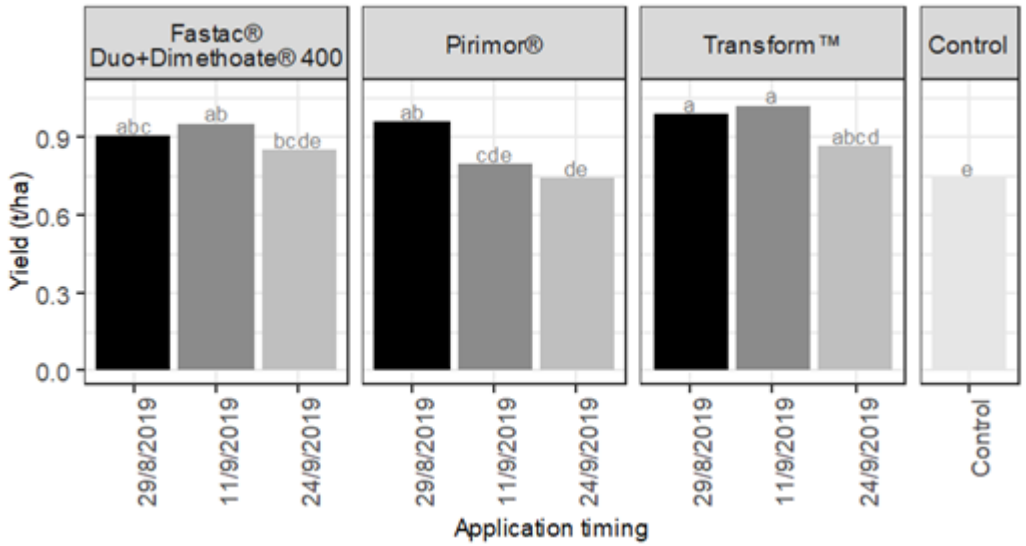


Figure 4. Yield by product and timing.



Discussion

In this trial, the application of various insecticides provided control of aphids resulting in yield increases. Transform™ and the tank mix of Fastac® Duo + Dimethoate® 400 provided better control than Pirimor® under some circumstances (i.e., the second application timing).

At Timing 1, aphids were present on ~39% of spikelets, with 12% of plants infested with colonies. This is on the lower end of the current recommended thresholds of 25 mm (or more) of stem infested in

>20% plants. However, 2019 was a very dry year limiting the 'compensation' potential of the canola crop was reduced, control was arguably justified and for the purposes of this trial could be thought of as a more aggressive approach.

At Timing 2, the population had increased (though not the number of colonies) to above 60% of spikelets infected, almost exceeding thresholds and certainly justifying control (in terms of populations). In this trial it might be viewed as a more conservative approach.

At Timing 3 the numbers of aphids and their colonies was in decline and would have to be considered as a late application.

Yields showed that regardless of product, Timing 1 and 2 (13 days apart), were better options than Timing 3, indicating that there may be some flexibility in timing particularly while the crop has potential for compensatory yield.

The site average yield was low at less than 1 t/ha, a level where the gross margin becomes a marginal. The 2020 GRDC Gross Margin and Enterprise Planning[2] guide suggests that conventional canola at 1t/ha and $500/t is a marginally profitable exercise. The challenge for the grower is to be able to estimate yield, understand the aphid population dynamics then determine if the additional expense to control aphids might be justified.

The very dry year of 2019 with limited crop yield potential coincided with an aphid outbreak, which can be typical of dry seasons. This combination made the economic decision around aphid control difficult. The average yield increase from Timing 1 and 2 (regardless of product) was ~200 kg. At $500/t this equates to close to $100/ha gross margin gain from the application of well-timed aphid control. The treatments used in this trial ranged from about $6 - $15/ha, application costs are likely to be $15-$20/ha (once crop damage is considered). Timely aphid control would be approaching economically viable levels, even in a yield suppressed year. As there was no significant yield gain from the later applications delayed control measures would represent a loss to growers of ~ $20 - $35/ha.

These results tend to support the current recommendations[3] for aphid 'threshold for cabbage and/or turnip aphid is 'If >50% of plants with clusters 25 mm long on stems or 4–5 stems per m^2 with clusters 50 mm long on stems (NSW)'. The use of both these measures could help to guide management decisions.

Conclusion

Follow the more recent recommendations regarding aphid thresholds and base spray decisions on presence of natural predators and compensation capacity of the crop.

Acknowledgements

The research undertaken as part of this project is made possible by the significant contributions of growers through both trial cooperation and the support of the GRDC, the authors would like to thank them for their continued support. Special thanks to Tex and Jon Kilby from Gilgandra who hosted this trial.

[2] 2020 Farm Gross Margin and Enterprise Planning Guide - GRDC

[3] https://grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2015/02/insect-management-in-fababeans-and-canola-recent-research

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Appendix

Results

		Yield		Oil	
		(t/ha)		(%)	
Product	Application timing	p.v.	s1	p.v.	s1
Fastac® Duo + Dimethoate® 400	1	0.9	abc	43.4	a
	2	0.95	ab	43.3	a
	3	0.85	bcde	42.6	bcd
Pirimor®	1	0.96	ab	43.0	ab
	2	0.8	cde	43.1	ab
	3	0.74	de	42.3	cd
Transform™	1	0.99	a	43.4	a
	2	1.02	a	43.0	abc
	3	0.87	abcd	42.6	bcd
	CONTROL	0.74	e	42.2	d
	lsd	0.14		0.7	

p.v. predicted value
s1 values with the same letter for each variable are not significantly different