Minimal yield loss of canola to green peach aphid

Svetlana Micic, Martin Harries and Brenda Coutts, Department of Agriculture and Food, WA

Key messages

- Green peach aphid feeding damage to flowering canola did not cause yield loss
- Canola seed oil content also was not correlated to population density of green peach aphids
- Applying insecticides to control feeding damage in the absence of virus may be of little benefit and increase the rate of insecticide resistance.

Aims

To better determine the impact of green peach aphid feeding damage in the absence of virus on canola yield and seed quality.

Background

Previous work has shown that yield loss caused by green peach aphid (GPA) feeding damage is minimal in canola. However, defining this yield loss has been complicated by aphid-transmitted virus, such as *Beet western yellows virus*. It is also common for multiple aphid species to colonise canola at the same time and cabbage aphids can cause significant yield loss through feeding damage if numbers are high enough. In this trial we ensured that GPA was the only aphid species present and was devoid virus.

Method

Canola, cv. Pioneer 43Y23, was sown at Geraldton on April 12 using a plot cone seeder. Twelve insect exclusion tents measuring approximately $3m^3$ were placed over the seeded area to ensure aphids could not colonise the canola from the surrounding area. At the 6 leaf growth stage, canola seedlings were thinned to ensure all tents contained 20 plants in a similar spatial configuration.

Treatments included a nil, (no aphids introduced) and three different dates of aphid introduction; May 27 (early), June 21 (mid) and July 19 (late), with four replicates of each treatment. Aphid introductions were done by placing a green leaf with 10 live aphids onto each plant within the insect proof tents. The aphids that were introduced were early were bred in the laboratory, those introduced late were collected from capsicum plants, which are not a host for canola viruses.

Aphid populations in the tents were measured by counting the number of aphids on 20 random plant leaves. This was done three times (98, 111 and 128 days after sowing) during the growing season. GPA populations were left to persist on plants until harvest without an insecticide application. Plants were hand harvested with biomass, yield components, yield and seed quality measured.

Results

Seasonal conditions

Rainfall at the site was 392 mm for the year from sowing to maturity (Table 1). This compares to a long term yearly average for Geraldton of 445 mm. The season was very mild with a soft finish.

Table 1. 2016 monthly rainfall (mm) from BOM Geraldton Airport station (8315).

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Geraldton	20.2	0.2	13.0	22.6	33.6	90.6	124.6	69.8	17.8	-	-	-	392.4

Aphid populations

Aphid populations were highest in the tents with the earliest introduction of aphids. At 111 days after sowing aphid colonies peaked. At this time the earliest introduction treatments had aphids that were 4 times higher than the late introduction treatment with more than10,000 aphids per 20 leaves (Figure 1). The controls were all free of aphids at 111 days after sowing but there was one replicate of the control with at least 100 aphids per 20 leaves at 128 days after sowing. An insecticide was applied to all control treatments tents at this time to ensure the aphid numbers were brought back to zero.

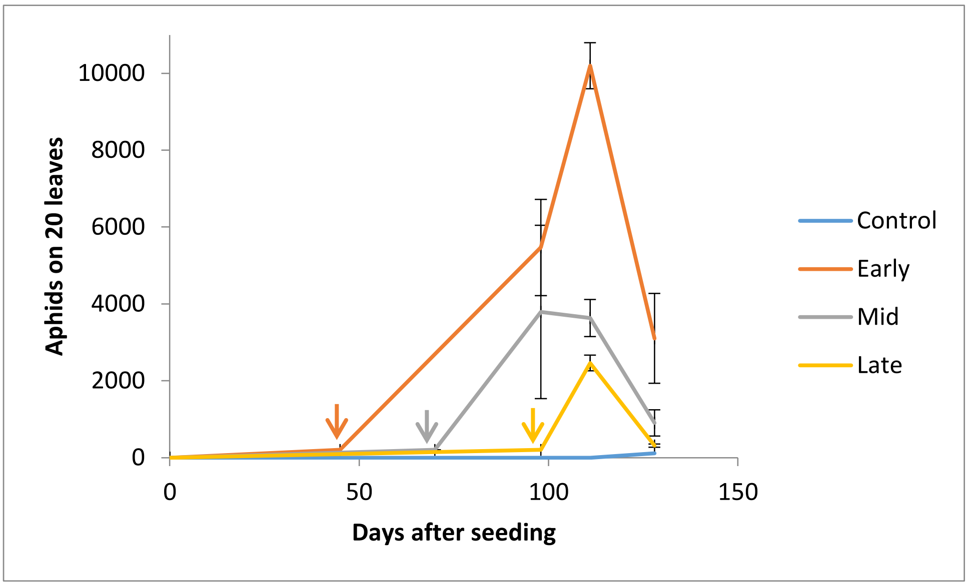

Figure 1. Green peach aphid population dynamics from different dates of introductions ± standard error (SE). Arrows indicate dates of aphid introductions.

Growth and yield

The timing of aphid introduction and subsequent aphid numbers had no effect on the key measurements of growth including single plant weight, pods per plant and seed weight (Table 2). There was a trend towards decreased seed weight with increased aphid pressure (as shown in the early timing of introduction treatments) but this was not significant. ($P<0.05$).

The oil content of the grain was approx. 38% and did not differ significantly between treatments, even with the very early introduction of aphids.

Table 1. Average canola yield components for the green peach aphid treatments were not significant (NS) at P<0.05.

Treatment	Plant weight (g)	Pods per plant	Oil%	1000 seed weight (g)
No aphids	97	513	38.9	3.8
Late	107	563	37.1	3.7
Mid	93	471	37.7	3.7
Early	91	489	38.5	3.1
	NS	NS	NS	NS

Yield was not significantly affected by the timing of aphid introduction (Figure 2), however yield was lowest in canola plants given early GPA introduction which had the largest aphid populations.

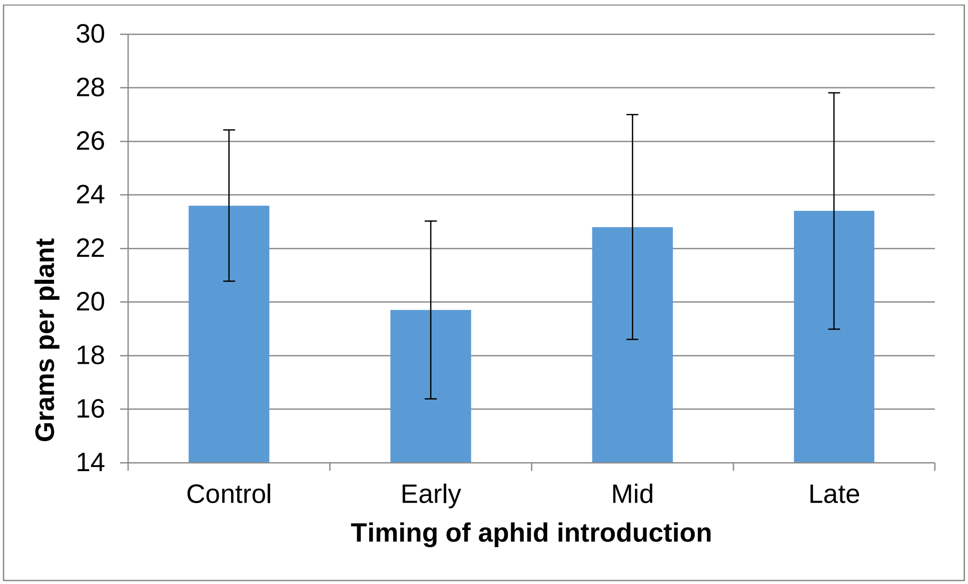

Figure 2. Average single canola plant grain yield of the treatments nil (control), early (19 July), mid (21 June) and late (19 July) timing of introduction of green peach aphids.

Conclusion

Despite very high levels of GPA being established in the trial, GPA feeding damage to flowering canola did not impact on the growth of the canola plants or on yield. This demonstrates that GPA feeding damage is unlikely to be a major cause of yield loss on its own.

However, GPA can be a vector for viruses and often colonises canola in combination with other aphid species such as cabbage aphid which has been shown to reduce yield and seed quality through feeding damage. This research does highlight that it is important to determine the species of aphid colonising the plant and likelihood of virus infection to manage GPA effectively. The over use of insecticides to control feeding damage of GPA alone may be a waste of insecticide and contribute to the evolution of insecticide resistance.

Further research is needed to determine if GPA colonisation of canola at the seedling stage and subsequent feeding damage causes yield loss in canola.

Key words

Green Peach Aphid, Canola, Yield

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