

Aphid management in barley 2008

Background

Aphid infestations in northern barley crops (and to a lesser extent in other winter cereals) appear to have been occurring both at higher densities and more frequently in recent seasons. Although growers and agronomists have a range of seed treatment or foliar insecticides available, there is little regional information as to when these strategies should be employed and the likely level of cost or benefit.



This project was primarily designed to generate data on the fit and benefits of aphid management strategies under commercial conditions.

Project aims

1. To measure yield and grain quality impacts of aphid infestations in barley
2. To evaluate the performance of seed treatment and foliar applications for aphid management
3. To determine what species of aphid infest barley crops and start to identify population dynamics

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Pirimor[®] is a registered trademark of a Syngenta Group Company

Results in a nutshell

Aphid population:

- *Aphids were found in all trials at levels in excess of 35/tiller*
- *Three species were identified with a minimum of two species at every site*
- *Populations built up rapidly in late August and early September 2008 but also declined quickly ~3-4 weeks later*

Aphid control:

- *Zorro[®] seed treatment provided extended aphid control (~70-90 days after planting) but did NOT give season long protection*
- *Dimethoate provided <50% control when applied on aphid colonies in the crown*
- *Dimethoate and Pirimor[®] both provided ~70-85% control of aphid colonies in the middle and upper canopy. Control levels may be impacted by small plot design*

Yield impact:

- *Zorro provided an average 10% yield benefit (~330 kg/ha) in a year with high aphid pressure*
- *Foliar insecticide yield responses were similar to seed treatment when well timed on colonies in the crop canopy*

Net economic benefit:

- *Zorro provided a mean \$37/ha net benefit (range \$25-50/ha)*
- *Similar level of benefit from foliars when application well timed*

Overall:

- ***Good levels of benefit from management under high pest pressure***
- ***However still need to better understand the dynamics of the different species, their relative economic impact and the fit and role of IPM***

Trial design

NGA, in collaboration with NSW I&I, established four small plot trials in 2008 near Yallaroi, Bullarah, Gilgandra and Spring Ridge. Each trial evaluated three varieties (Fitzroy, Grout and Gairdner) across four replicates with plot sizes of 5 rows x 12m. All sites were located in commercial paddocks sown to winter cereal. Seed size and % germination were determined for all seed lots with sowing rates adjusted so that equal numbers of viable seed per plot were compared for all varieties.

Seed for 'Untreated' plots or foliar insecticide treatment received a standard fungicide treatment of Baytan® (150 g/L triadimenol + 4 g/L triflumuron) at a rate of 150 mL/100 kg of seed. Baytan does not have any known impact on aphids. The aphid active seed treatment Zorro (180 g/L imidacloprid + 56 g/L triadimenol) was applied at 400mL/100 kg of seed. This provided the equivalent fungicide loading in Baytan.

All foliar sprays were applied in a volume of 50 L/ha. Dimethoate 400 (400 g/L dimethoate) was applied at a product rate of 500 mL/ha. Pirimor® (500 g/kg pirimicarb) was applied at a rate of 150 g/ha at Spring Ridge and above eastern states label rate at Gilgandra.

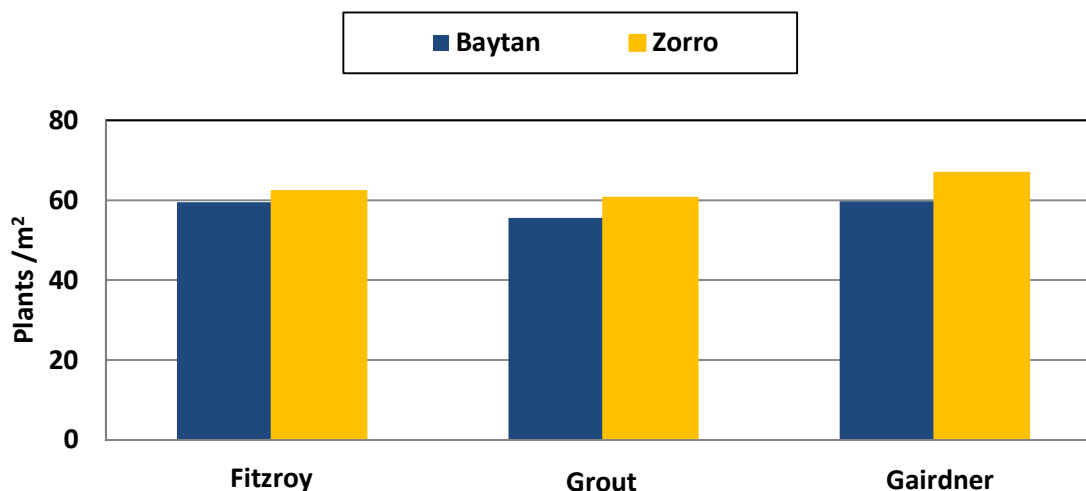
Assessments

1. Crop establishment: established plants in 2 x 2 m lengths of row
2. Aphid population: Until the end of August aphids were counted on 10 whole plants per plot. From early September counts were on 10 tillers per plot. Species present were noted and confirmed by QPIF.
3. Yield impact: All plots were harvested by small plot header
4. Grain quality: Quality parameters were assessed by NSW I&I at Tamworth

Multi-trial summary

Crop establishment

Barley establishment (mean of 4 trials) 19 – 26 DAP



DAP = days after planting

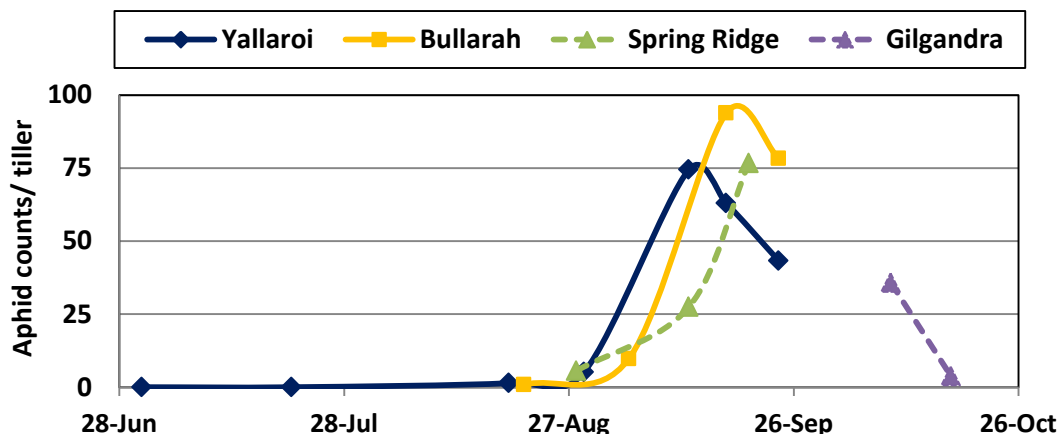
There was no significant difference in establishment count between Zorro and Untreated seed in any trial or on any variety. However there was a trend to slightly increased establishment counts where Zorro was used.

Key message - crop establishment

- Zorro provided similar or slightly increased establishment counts compared to the Untreated (Baytan 150 mL/100 kg)

Aphid population

Aphid counts in Untreated barley



Key messages – aphid population

- High levels of aphid pressure (35-95 aphids/tiller) occurred naturally in all trials
- Generally rapid population buildup in late August/early September with equally rapid decline ~3-4 weeks later

Key messages – aphid species

- Corn aphid (*Rhopalosiphum maidis*) and rose grain aphid (*Metopolophium dirhodum*) found at all sites
- Oat aphid (*Rhopalosiphum padi*) found at Yallaroi, Bullarah and Spring Ridge
- Oat aphid generally dominant species until early September. Initially in the crown and roots but moved up into the lower canopy in late August. Individuals often spread throughout canopy
- Corn aphid colonized rapidly in September. Frequently high in the canopy, on and around the emerging upper leaves. Generally in dense colonies
- Rose grain aphid were last species detected and found predominantly on the undersides of leaves in the upper canopy. Appeared to persist in crop for longer than the other species

Aphid control

Graphs showing aphid control are included in individual trial summaries. At Yallaroi and Bullarah an application of dimethoate was made to investigate efficacy on aphids colonising the crown area. This timing was compared to a dimethoate application when aphids were high in the canopy. At Spring Ridge and Gilgandra Pirimor and dimethoate were applied on the same day to canopy colonies.

Key messages – aphid control

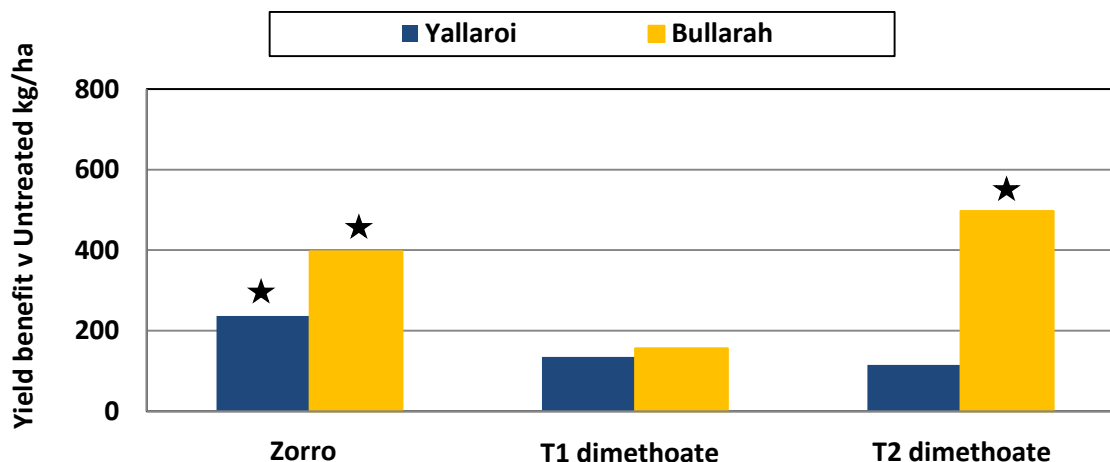
- Zorro provided effective aphid control for ~70-90 days with useful suppression after that period. Zorro appeared to delay the peak in aphid counts compared to the Untreated
- Dimethoate control of 'crown' colonising aphids was not effective
- Pirimor and dimethoate provided similar levels of aphid control but did not provide 90% control in any trial. Control level may be impacted by small plot design



Oat aphids colonising the crown region in barley

Yield impact

Yield benefit - Yallaroi and Bullarah

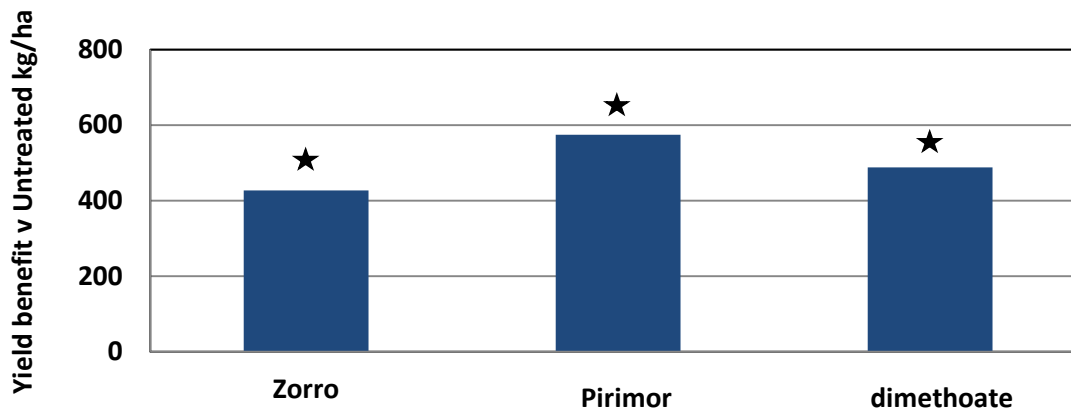


★ = significant **increase** in grain yield compared to untreated (factorial analysis)

NB No application of Pirimor at either of these sites. Timing 1 (T1) dimethoate applied when aphids colonizing crown and T2 dimethoate when aphid populations in canopy and close to their peak numbers.

- Significant yield improvement from Zorro at both sites
- No significant yield benefit from T1 dimethoate applied on crown colonizing aphids at either site
- Significant yield benefit from T2 spray at Bullarah only
- Level of yield benefit ~100-500 kg/ha (3-21% yield benefit)

Yield benefit - Spring Ridge

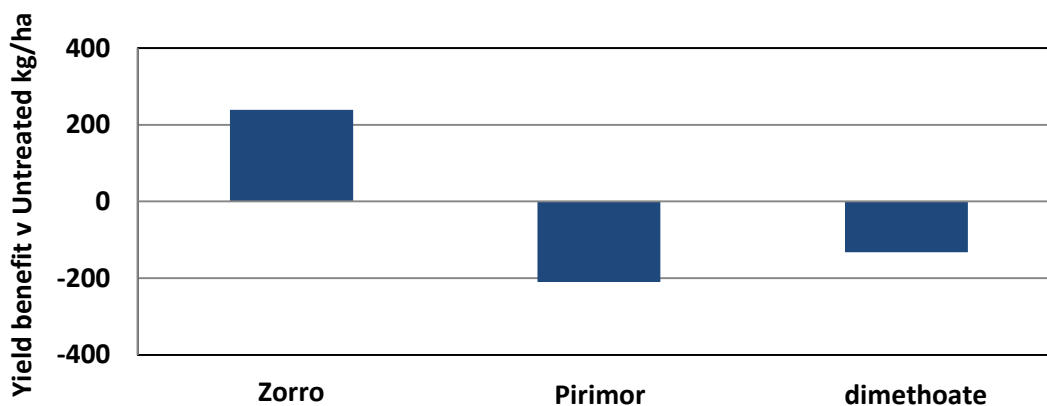


★ = significant **increase** in grain yield compared to untreated (factorial analysis)

NB Pirimor and dimethoate both applied to population of ~25 aphids/tiller just prior to rapid population build-up. Results may indicate benefit of a well timed spray.

- Significant yield improvement from all treatments
- Level of benefit ~400-600 kg/ha (9-12% yield benefit)

Yield benefit - Gilgandra



★ = significant **increase** in grain yield compared to untreated (factorial analysis)

NB Pirimor and dimethoate both applied in a **very late application** to a population in rapid natural decline.

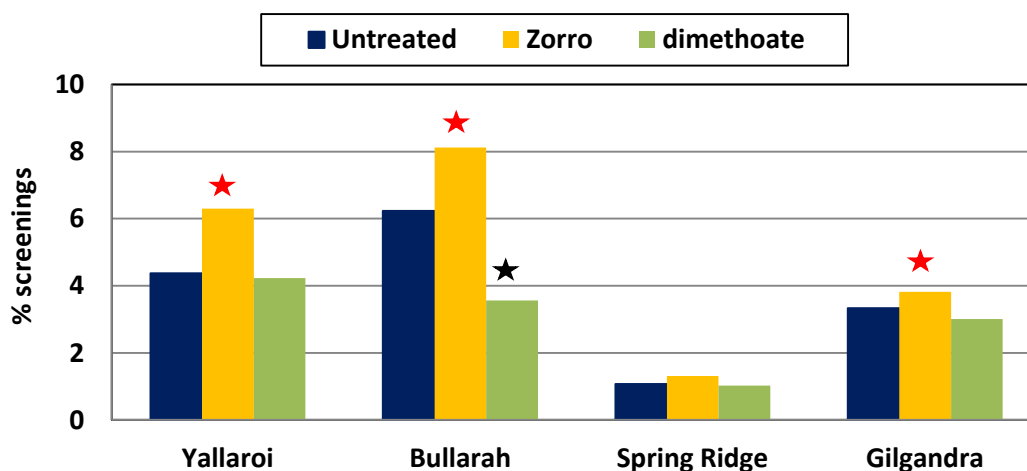
- No significant yield benefit from any management option
- Trend to reduced yield from foliar sprays probably due to physical crop damage from ATV application at advanced crop growth stage

Key messages - yield benefit

- Significant yield improvement from Zorro treatment at 3 of 4 sites. Mean yield benefit 330 kg/ha, range 240-440 kg/ha
- No benefit from foliar application when aphids colonising crown or when population rapidly declining
- Similar yield benefit to seed treatment when foliar sprays applied during build-up of aphid colonies in crop canopy with populations of 25/tiller or greater

Grain quality impact

Screenings impact



★ = significant **increase** in % screenings compared to untreated (factorial analysis)

★ = significant **decrease** in % screenings compared to untreated (factorial analysis)

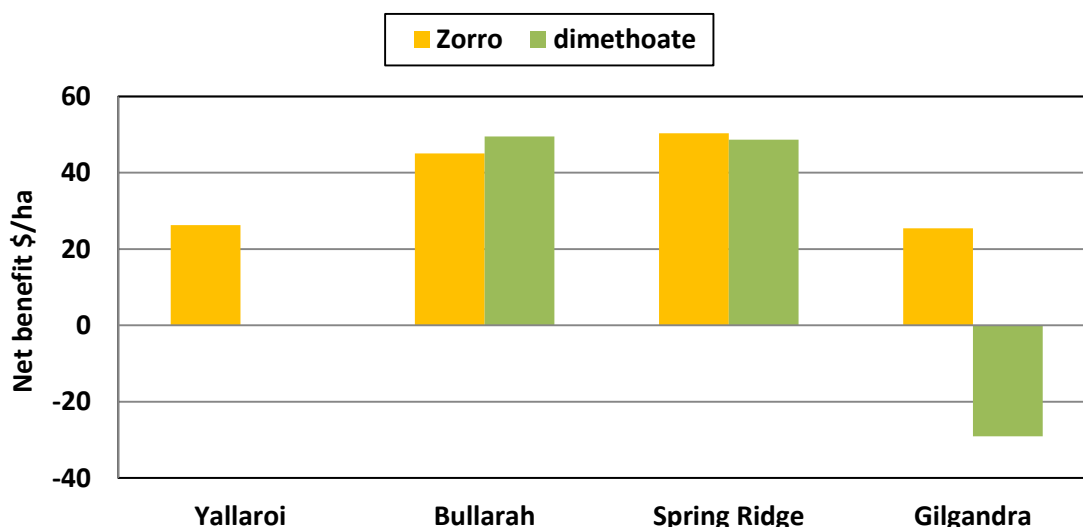
Key messages – screenings impact

- Screenings increased by average 1% in Zorro treatments, range 0.2-1.9%
- Foliar application on canopy colonies of aphids resulted in equivalent or marginally reduced screenings compared to the Untreated

Quality classification

No difference in receival grade for any treatment, on any variety, at any site. At Yallaroi, Bullarah and Gilgandra all treatments were eligible for Feed 1 delivery. At Spring Ridge both Fitzroy and Gairdner were eligible for Malt 1, Grout was eligible for Feed 1.

Net economic benefit



Assuming all grain Feed 1 - \$125/t on-farm, Zorro \$160/t, Baytan \$60/t, seed treatment application \$30/t, dimethoate \$4.5/ha at 500 mL/ha, ground rig application \$8/ha, results from where dimethoate applied on colonies in crop canopy

Key messages – net benefit

- Mean net benefit of \$37/ha from Zorro, range \$25-50/ha
- Similar level of benefit from dimethoate when application well timed
- Dimethoate 'loss' at Gilgandra likely due to physical crop damage

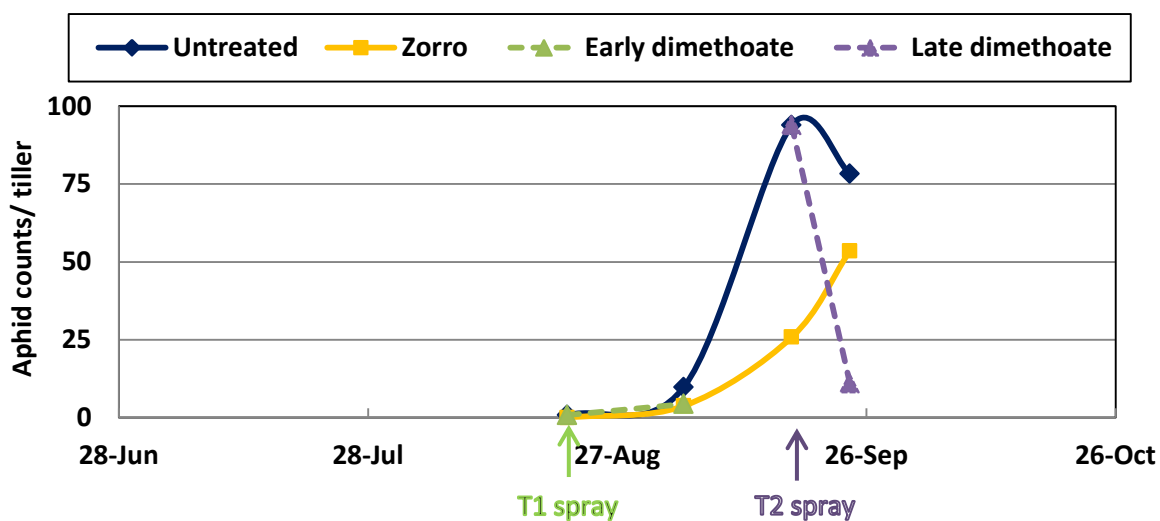
Trial number: NGA0808
Site: 'Boonaldoon' Bullarah
Co-operator: James Christie

Sowing date: 12/06/2008
Harvest date: 12/11/2008

Aphid pressure

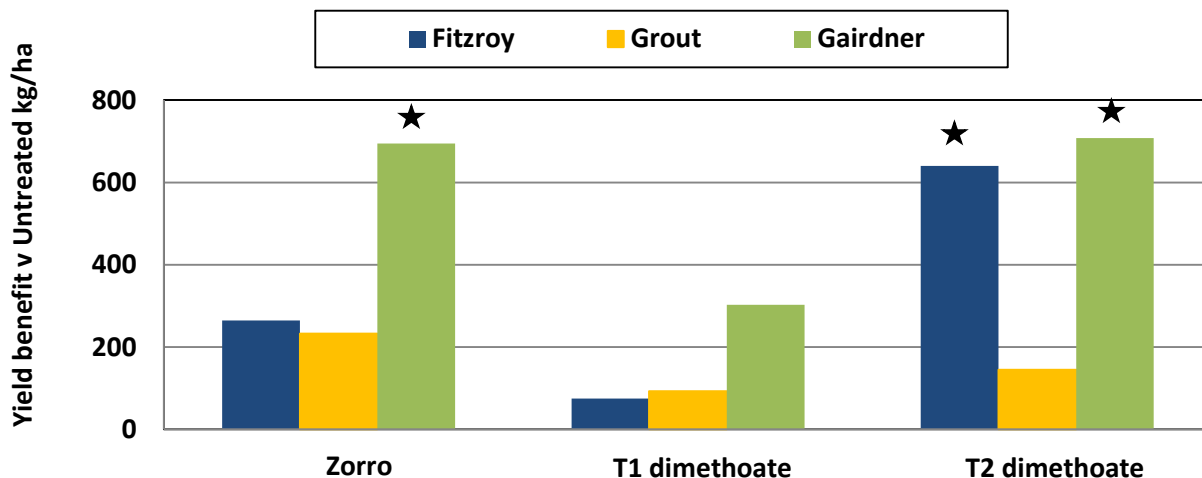
Timing 1: 25/08/2008 ~ 3-5/plant
Timing 2: 17/09/2008 ~76-110/tiller

Aphid population



- Population built up rapidly between end of August and mid-September
- Population began to naturally decline after mid September
- Zorro resulted in significantly lower aphid populations than the Untreated to mid September (~97 days after planting)
- T1 dimethoate spray to aphids in crown & roots only reduced population by ~50%
- T2 dimethoate spray to population, near peak numbers, provided ~85% control

Impact on grain yield



★ = significant **increase** in grain yield compared to untreated of the same variety
 Untreated yields: Fitzroy 2.3 t/ha, Grout 2.9 t/ha and Gairdner 2.3 t/ha

- Zorro trended to increased yields of all varieties but was only significant on Gairdner
- Increased yield benefit from T2 dimethoate application compared to T1 with significant yield benefits in both Fitzroy and Gairdner

Mean net benefit

- Zorro \$45/ha, T1 dimethoate \$7/ha, T2 dimethoate \$50/ha

Key messages

- Most consistent level of benefit on slowest maturing variety Gairdner
- Useful level of yield benefit from Zorro on all varieties
- T1 spray was too early
- T2 spray provided good benefits