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BARLEY

SECTION 7

INSECT CONTROL

APHIDS | ARMYWORM | HELICOVERPA SPP. (HELIOTHIS) | BLUE OAT MITE (PENTHALEUS SPP.) | VARIETAL RESISTANCE OR TOLERANCE | DAMAGE CAUSED BY PESTS | THRESHOLDS FOR CONTROL | MANAGEMENT OF APHIDS

SECTION 7

Insect control

More information

GRDC Insect Id App: https://www.grdc.com.au/Resources/Apps

QDAFF Publications: http://ipmworkshops.com.au/wp-content/uploads/Wintercereals_north-manual-July13.pdf

http://www.daff.qld.gov.au/plants/field-crops-and-pastures/broadacre-field-crops/integrated-pest-management/ipm-information-by-crop/natural-enemies-who-eats-who

QDAFF Integrated Pest Management For Australia's Northern Region Blog: http://thebeatsheet.com.au/about/

NSW DPI Publications: http://www.dpi.nsw.gov.au/agriculture/broadacre/pests-diseases

7.1 Aphids

Aphids are the primary insect pest affecting barley in the northern growing region. While aphids are vectors of *Barley yellow dwarf virus* (BYDV), a major problem in wet areas in southern growing regions, research has shown the main impact of aphids in the northern region is through their feeding activity, which reduces barley yields. [1]

The problem of rising aphid populations in northern winter cereals has intensified in recent years. [2] The most conclusive research about the nature and impact of aphid populations in barley in the northern region has come from trials led by Northern Grain Alliance (NGA) in 2008, 2009 and 2010. These trials suggest direct feeding damage from aphids is frequently causing yield loss of 5–15% in winter cereals, but has little consistent impact on grain quality. The trials have shown that the cost of applying an imidacloprid-based seed treatment or a well-timed foliar spray to control aphids can return an economic net benefit averaging AU$33–$37/ha. [3]

Seasonal conditions have a major effect on aphid populations, which are ultimately controlled by natural predators. However, aphid populations can do considerable damage before other insects or heavy rains reduce or eliminate them. [4] Therefore, growers should consider seed treatment prior to sowing and/or in-crop foliar pesticide spraying to control aphids.

When winged cereal aphids fly into crops from grass weeds, pasture grasses or other cereal crops, colonies of aphids start to build within the crop. In Australia, all aphids in a cereal crop are females, able to give birth to live young without the need to mate. The immature aphid nymphs have several growth stages and moult at each stage into a larger individual. Sometimes the delicate pale cast skins can be seen near colonies. When host plants become unsuitable or overcrowded, winged aphids, called alataes, develop and migrate to other crops or plants.

Three types of aphid are commonly found in barley crops in the northern region and they can all carry BYDV. In trials, aphids have been found to attack different parts of the barley plant at different times:

7.1.1 Oat aphids (*Rhopalosiphum padi*)

Despite their name, oat aphids can be found on all cereals and in most years of high infestation are the most abundant species. A vector of BYDV, the oat aphid colonises the lower portion of the plant with infestations extending from around the plant's base,

[1] R Daniel, L Price (2009) Aphids in barley 2008—impact and management, GRDC Update Papers 26 Nov. 2009, http://www.grdc.com.au/Research-and-Development/GRDC-Update-Papers/2009/11/Aphids-in-Barley-2008-Impact-and-Management

[2] J Hunt (2011) Aphids in winter cereals on the Liverpool Plains—the consultant's view. Northern Grower Alliance Sept. 2011, http://www.nga.org.au/results-and-publications/download/132/australian-grain-articles/pests-1/aphids-in-cereals-september-2011.pdf

[3] L Price (2010) Aphids in cereals. Goondiwindi Grains Research Update, Northern Grower Alliance, March 2010, http://www.nga.org.au/results-and-publications/download/19/grdc-update-papers-pests/aphids-in-winter-cereals/grdc-adviser-update-paper-goondiwindi-march-2010-.pdf

[4] L Price (2010) Aphids in cereals. Goondiwindi Grains Research Update, Northern Grower Alliance, March 2010, http://www.nga.org.au/results-and-publications/download/19/grdc-update-papers-pests/aphids-in-winter-cereals/grdc-adviser-update-paper-goondiwindi-march-2010-.pdf

More information

Update Papers:
http://www.grdc.com.au/Research-and-Development/GRDC-Update-Papers/2009/11/Aphids-in-Barley-2008-Impact-and-Management

http://www.nga.org.au/results-and-publications/download/19/grdc-update-papers-pests/aphids-in-winter-cereals/grdc-adviser-update-paper-goondiwindi-march-2010-.pdf

Australian Grain:
http://www.nga.org.au/results-and-publications/download/132/australian-grain-articles/pests-1/aphids-in-cereals-september-2011.pdf

up on to the leaves and stems as the crop starts elongation (Figure 1). Mature adults are about 2 mm long and may have wings that are dark green and rounded or pear-shaped, while the juveniles are paler and smaller. Both are characterised by a dark reddish patch on the tip of the abdomen.

Figure 1: Heavy infestation of oat aphids.

7.1.2 Corn aphid (*Rhopalosiphum maidis*)

While they are most likely to be found in barley crops, corn aphids also occur in wheat as well as sorghum and maize. More rectangular in shape than the oat aphid, adults, which may have wings, are 2 mm long with legs and antennae that are typically darker than the green-blue body, which sometimes has a waxy appearance. Colonies generally develop within the furled emerging leaves of tillers (Figure 2) and they can be difficult to see. Corn aphids can be important vectors of BYDV if arriving early in crops.

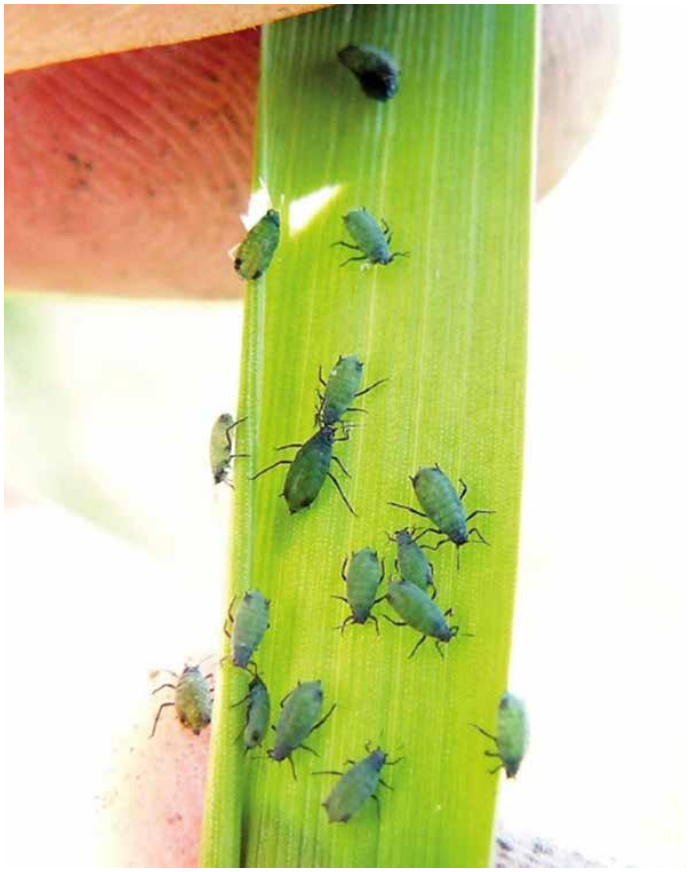

Figure 2: Corn aphids.

7.1.3 Rose-grain aphid (*Metopolophium dirhodum*)

The rose-grain aphid (Figure 3) tends to colonise the leaves higher on the plant, making it easy to detect and identify. Adults are up to 3mm long, and are a large, pale aphid with a dark stripe down the midline of the back. Clusters of juveniles are common on leaves.

Figure 3: Rose-grain aphids.

More information

http://www.grdc.com.au/Research-and-Development/GRDC-Update-Papers/2014/03/Improved-understanding-of-thresholds-of-armyworm-in-barley-and-aphids-in-canola

7.2 Armyworm

Armyworm (Figure 4) is the caterpillar stage of certain moths, and can occur in large numbers, especially after good rain following a dry period. Larvae shelter in the throats of plants or in the soil and emerge after sunset to feed on the leaves of all winter cereals, particularly barley and oats, generally during September and October. Leafy cereal plants can tolerate considerable feeding, and control in the vegetative stage is seldom warranted unless large numbers of armyworms are distributed throughout the crop or are moving in a 'front', destroying young seedlings or completely stripping older plants of leaf. The most serious damage occurs when larvae feed on the upper flag leaf and stem node as the crop matures, or in barley when the older larvae start feeding on the green stem just below the head as the crop matures.

Figure 4: Armyworm.

The most common species are common and northern armyworm (*Leucania convecta* and *L. separata*), and lawn armyworm (*Spodoptera mauritia*). Infestations are evident by scalloping on margins of leaves caused by feeding of the older larvae. Larvae target the stem node as the leaves become dry and unpalatable, and the stem is often the last part of the plant to dry. One large larva can sever up to seven heads of barley a day. One larva/m^2 can cause a grain loss of 70 kg/ha.day (Table 1). A larva takes around 8–10 days to develop through the final, most damaging instars, with crops susceptible to maximum damage for this period.

Check for larvae on the plant and in the soil litter under the plant. The best time to do this is late in the day when armyworms are most active. Alternatively, look around the base of damaged plants where the larvae may be sheltering in the soil during the day. Using a sweep net (or swing a bucket), check a number of sites throughout the paddock. Sweep sampling is particularly useful early in an infestation when larvae are small and actively feeding in the canopy. One full sweep with a net samples the equivalent of 1 m^2 of crop.

Table 1: The value of yield loss incurred by 1 and 2 armyworm larvae/m².day, based on approximate values for wheat and an estimated loss per larva of 70 kg/ha. Based on these figures, and the relatively low cost of controlling armyworm, populations in ripening crops of >1 large larva/m² warrant spraying

Value of grain (AU$/t)	Value of yield loss ($) per day	
	1 larva/m²	2 larvae/m²
$140	$9.80	$19.60
$160	$11.20	$22.40
$180	$12.60	$25.20
$200	$14.00	$28.00
$220	$15.40	$30.80
$250	$17.50	$35.00
$300	$21.00	$42.00
$350	$24.50	$49.00
$400	$28.00	$56.00

Early recognition of the problem is vital, as cereal crops can be almost destroyed by armyworm in just a few days. Although large larvae do the head lopping, controlling smaller larvae that are still leaf-feeding may be more achievable. Prior to chemical intervention, consider how quickly the larvae will reach damaging size, and the development stage of the crops. Small larvae take 8–10 days to reach a size capable of head-lopping, so if small larvae are found in crops nearing full maturity/harvest, spray may not be needed, whereas small larvae in late crops that are still green and at early seed-fill may reach a damaging size in time to reduce crop yield significantly.

Control is warranted if the armyworm population distributed throughout the crop is likely to cause the loss of 7–15 heads/m². Many chemicals will control armyworms. However, their effectiveness often depends on good penetration into the crop to achieve contact with the caterpillars. Control may be more difficult in high-yielding, thick-canopied crops, particularly when larvae are resting under soil at the base of plants. As larvae are most active at night, spraying in the afternoon or evening may produce the best results. If applying sprays close to harvest, be aware of relevant withholding periods.

Biological control agents may be important in some years. These include parasitic flies and wasps, predatory beetles and diseases. Helicoverpa NPV (nucleopolyhedrovirus) is not effective against armyworm. [5]

7.3 *Helicoverpa* spp. (*Heliothis*)

Helicoverpa spp. are frequently found in winter cereals, usually at levels too low to warrant control, but occasionally numbers may be sufficiently high to cause economic damage. Virtually all *Helicoverpa* present are *H. armigera* (Figure 5), which has developed resistance to many of the older insecticide groups. It is not unusual to find both *Helicoverpa* and armyworm in cereal crops, so correct identification of the species present is important. *Helicoverpa* do not cause the typical head-cutting damage of armyworms. Larvae tend to graze on the exposed tips of a large number of developing grains, rather than totally consuming a low number of whole grains, thus increasing the potential losses. Most (80–90%) of the feeding and crop damage is done by larger larva (the final two instars).

[5] DAFF (2012) Insect pest management in winter cereals. Department of Agriculture, Fisheries and Forestry Queensland, http://www.daff.qld.gov.au/plants/field-crops-and-pastures/broadacre-field-crops/integrated-pest-management/ipm-information-by-crop/insect-pest-management-in-winter-cereals

Figure 5: Helicoverpa armigera.

Check for larvae on the plant throughout the growing season (monitoring can be done in conjunction with sampling for armyworm). Using a sweep net, check a number of sites throughout the paddock. Larger larvae are more difficult to control than small larvae, and NPV is most effective when larvae <13 mm long are targeted.

No thresholds have been developed for *Helicoverpa* in winter cereals; however, using a consumption rate determined for *Helicoverpa* feeding in sorghum (2.4 g/larva), one larvae/m^2 can cause 24 kg grain loss/ha. Table 2 shows the value of yield loss incurred by a range of larval densities, using an estimated consumption of 2.4 g/larvae and a range of grain values for wheat. Note that larval damage is irrespective of the crops yield potential (i.e. each larva will eat its fill whether it is 1 t/ha crop or a 3 t/ha crop).

Table 2: Value of yield loss ($/ha) incurred by a range of Helicoverpa larval densities

Cereal price ($/t)	Larval density			
	4 larvae/m^2	6 larvae/m^2	8 larvae/m^2	10 arvae/m^2
150	14.4	21.6	28.8	36
200	19.2	28.8	38.4	48
250	24.0	36.0	48.0	60
300	28.8	43.2	57.6	72
350	33.6	50.4	67.2	84
400	38.4	57.6	76.8	96
450	43.2	64.8	86.4	108

Based on Table 2, a crop worth $250/twill incur a loss of $6/ha from each larvae. If chemical intervention costs $30/ha (chemical + application costs), the economic threshold or break-even point is 5 larvae/m^2. These parameters can be varied to suit individual costs, and they can incorporate a working benefit/cost ratio. A common benefit/cost ratio of 1.5 means that the projected economic benefit of the spray will be

1.5 times the cost of the spray. Spraying at the break-even point (benefit/cost ratio of 1) is not recommended.

Small larvae (<7 mm) can be controlled with biopesticides (e.g. NPV). Biopesticides are not effective on larger larvae. *Helicoverpa armigera* has historically had high resistance to pyrethroids, and control of medium-large larvae using pyrethroids is not recommended. Predators of *Helicoverpa* eggs and larvae include spined predatory bug, glossy shield bug, damsel bug and big-eyed bug.

Where winter cereals have previously been treated with broad spectrum insecticides to control aphids, fewer natural enemies may be present and survival of caterpillar pests could be greater than in an untreated field. [6]

7.4 Blue oat mite (*Penthaleus* spp.)

Blue oat mites (Figure 6) are important pests of seedling winter cereals, but are generally restricted to cooler grain-growing regions (southern Queensland through eastern New South Wales, Victoria, South Australia and southern Western Australia).

Figure 6: Blue oat mite. (Photo: QDAFF)

Adults and nymph mites pierce and suck leaves, resulting in silvering of the leaf tips. Feeding causes a fine mottling of the leaves, similar to the effects of drought. Heavily infested crops may have a bronzed appearance, and severe infestations cause leaf tips to wither and can lead to seedling death. Damage is most likely during dry seasons when mites in large numbers heighten moisture stress and control may be warranted in this situation.

Check from planting to early vegetative stage, particularly in dry seasons, monitoring a number of sites throughout the field. Blue oat mites are most easily seen in the cooler part of the day, or when it is cloudy. They shelter on the soil surface when conditions are warm and sunny. If pale-green or greyish irregular patches appear in the crop, check for the presence of blue oat mite at the leaf base.

Where warranted, foliar application of registered insecticide may be cost-effective. Check the most recent research to determine the likely susceptibility of blue oat mite to the available registered products. Cultural control methods can contribute to reduction in the size of the autumn mite population (e.g. cultivation, burning, controlling weed hosts in fallow, grazing and maintenance of predator populations). Since eggs laid in the soil hibernate throughout winter, populations of the mite can build up over a number

[6] DAFF (2012) Insect pest management in winter cereals. Department of Agriculture, Fisheries and Forestry Queensland, http://www.daff.qld.gov.au/plants/field-crops-and-pastures/broadacre-field-crops/integrated-pest-management/ipm-information-by-crop/insect-pest-management-in-winter-cereals

of years and cause severe damage if crop rotation is not practiced. The use of control tactics solely in spring will not prevent the carry-over of eggs into the following autumn.

Predators of blue oat mites include spiders, ants, predatory beetles and the predatory anystis mite and snout mite. Blue oat mites are also susceptible to infection by a fungal pathogen (*Neozygites acaracida*), particularly in wet seasons. [7]

The blue oat mite is an important pest of seedling winter cereals. When infestations are severe, the leaf tips wither and eventually the seedlings die. Eggs laid in the soil hibernate over winter, allowing populations to build up over a number of years. This can cause severe damage if crop rotation is not practiced.

7.5 Varietal resistance or tolerance

In 2008, the NGA in association with Industry & Investment NSW (I&I NSW) conducted trials at four locations on three barley varieties (Fitzroy(b), Grout(b) and Gairdner(b)), assessing the impact and economics of managing aphids. Trial results showed that oat, corn and rose-grain aphid populations were not influenced by barley variety. [8]

In virus-prone areas, growers are advised to use resistant plant varieties to minimise losses due to BYDV. [9]

7.6 Damage caused by pests

Aphids can damage barley crops in two ways: by stressing the crop, particular if it is suffering from lack of moisture, and by spreading BYDV. In the absence of BYDV, aphids affect cereal plants by direct feeding, effectively creating a nitrogen (N) sink, diverting N away from the developing and filling grain. Aphids use the N for their growth and reproduction. [10] Oat aphids appear to affect yield by reducing the number of viable tillers. [11]

Infection of BYVD in barley causes a characteristic bright yellowing of leaves (particularly older leaves) and interveinal chlorosis starting from the leaf tips and moving towards the base. In some varieties, reddening of leaf tips may also develop. Late infections do not result in severe stunting but young leaves may turn yellow. [12]

All early BYDV infections of cereal plants will mean they have less above-ground biomass and a less extensive root system. Grain size can be smaller or it can become shrivelled, which causes lower yields, higher screenings and reduced marketing options. Researchers in the northern region have found it difficult to detect symptoms of BYDV by visual inspection because the signs are similar to those of heavy aphid infestation or moisture stress. [13]

Aphids transmit BYDV from plant to plant. When aphids feed on plants, their mouthpart (stylet) penetrates the leaf epidermis and enters the plant's vascular system, namely

7 DAFF (2012) Insect pest management in winter cereals. Department of Agriculture, Fisheries and Forestry Queensland, http://www.daff.qld.gov.au/plants/field-crops-and-pastures/broadacre-field-crops/integrated-pest-management/ipm-information-by-crop/insect-pest-management-in-winter-cereals

8 R Daniel (2009) Aphids in winter cereals—just a nuisance or an economic pest? Northern Grower Alliance, Sept. 2009, http://www.nga.org.au/results-and-publications/download/39/australian-grain-articles/pests-1/aphids-in-barley-september-2009.pdf

9 DAFF (2011) Oat aphid, wheat aphid. Department of Agriculture and Fisheries and Forestry Queensland, http://www.daff.qld.gov.au/plants/field-crops-and-pastures/broadacre-field-crops/integrated-pest-management/a-z-insect-pest-list/aphid-overview/oat-aphid,-wheat-aphid

10 M Miles (2009) Winter cereal aphids—a researcher's view. Northern Grower Alliance Sept. 2009, http://www.nga.org.au/results-and-publications/download/39/australian-grain-articles/pests-1/aphids-in-barley-september-2009.pdf

11 GRDC (2010) Cereal Aphids. GRDC Fact Sheet July 2010, http://www.grdc.com.au/uploads/documents/GRDC_FS_CerealAphids1.pdf

12 S Simpfendorfer (2010) Barley Yellow Dwarf Virus widespread in northern NSW in 2009. GRDC Update Papers 24 Sep 2010, https://www.grdc.com.au/Research-and-Development/GRDC-Update-Papers/2010/09/BARLEY-YELLOW-DWARF-VIRUS-WIDESPREAD-IN-NORTHERN-NSW-IN-2009

13 GRDC (2010) Aphid control in cereals can pay. GRDC Fact Sheet July 2010, http://www.grdc.com.au/uploads/documents/GRDC_FS_CerealAphids1.pdf

the phloem. Within 15 minutes of feeding, the aphid either contracts the virus if the plant is already infected or it transmits the disease to the uninfected plant. The infection is restricted to the phloem where it replicates and blocks phloem tissues, reducing transport of sugars through the leaves. BYDV is a persistent virus which means an infected aphid will transmit the virus for the rest of its life. The virus survives from one season to the next in infected summer crops, weeds and host volunteer plants. It can only survive in living tissues and does not survive in stubbles or soils. It is not airborne. [14]

In all the sites which made up the 2008, 2009 and 2010 NGA trials, the only visible symptoms of BYDV were found at Spring Ridge in 2010. These results were confirmed by immunoassay.

7.7 Thresholds for control

Evidence suggests there is a case to use seed treatments in barley. In the NGA trial years of 2008 and 2009 the need to apply a foliar spray later in the season was high where a seed treatment was not used.

Aphids can affect any crop stage but are unlikely to cause economic damage to cereal crops expected to yield <3 t/ha. Consider treatment if there are more than 10–20 aphids on 50% of the tillers. [15]

The NGA trials conducted in the northern region in 2008, 2009 and 2010 were designed in part to confirm or suggest a suitable aphid threshold for foliar insecticide application. A spray threshold of 10 aphids/tiller appears realistic, but spraying needs to be made on an increasing aphid population and where beneficial insect activity is limited. [16]

7.8 Management of aphids

The overall results from NGA trials in 2008, 2009 and 2010 showed that seed treatment provided more consistent yield and economic benefits than foliar applications in controlling aphids in barley, and that imidacloprid seed treatments should be considered as a management option for growers in higher aphid-pressure situations.

The 2008, 2009 and 2010 trials evaluated the efficacy of seed treatments containing imidacloprid, the insecticidal active ingredient in Bayer CropScience products Hombre™, Zorro® and Gaucho®. The manufacturer claims that imidacloprid has been scientifically proven in its trials in Australia to stimulate the plant's production of 6-CNA, an inherent growth booster, which can be limited by environment stresses such as extended dry periods. Bayer CropScience also claims that its preparations containing imidacloprid, available as Hombre (tebuconazole + imidacloprid) and Zorro (triadimenol + imidacloprid) can be used to improve the yield of wheat, barley and oats. [17] These claims appear to be supported by the results.

The 2008 NGA-led trials conducted at four locations (Bullarah, Gilgandra, Spring Ridge and Yallaroi) highlighted the limited understanding of the impact of aphids in winter cereals at that time. High levels of aphid pressure—approximately 35–95 aphids/tiller in untreated crops—occurred in all four trial sites. Untreated aphid numbers rapidly built up from early September, but also rapidly declined about 3–4 weeks later.

[14] GRDC (2013) : Management tips to avoid yield penalties. GRDC Fact Sheet Aug. 2013, https://www.grdc.com.au/~/media/A4741C713F5C486B9907F96745BF2EEE.pdf

[15] DAFF (2011) Oat aphid, wheat aphid. Department of Agriculture and Fisheries and Forestry Queensland, http://www.daff.qld.gov.au/plants/field-crops-and-pastures/broadacre-field-crops/integrated-pest-management/a-z-insect-pest-list/aphid-overview/oat-aphid,-wheat-aphid

[16] NGA. Aphid management in winter cereals 2009–2010, http://www.nga.org.au/module/documents/download/79

[17] K Blowers (2009) Imidacloprid, the insecticidal active ingredient in Hombre and Zorro is more than just an insecticide. GRDC Update Papers 16 Sep 2009, https://www.grdc.com.au/Research-and-Development/GRDC-Update-Papers/2009/09/IMIDACLOPRID-THE-INSECTICIDAL-ACTIVE-INGREDIENT-IN-HOMBRE-AND-ZORRO-IS-MORE-THAN-JUST-AN-INSECTICIDE

The following treatments were evaluated at each site:

- untreated: Seed treated with Baytan® (triadimenol) only
- seed treated with Zorro (triadimenol + imidacloprid) at 400 mL/100 kg seed
- seed treated with Baytan then sprayed with two different foliar insecticide treatments

At Yallaroi and Bullarah, dimethoate was applied at two different timings, while at Spring Ridge and Gilgandra, dimethoate and Pirimor® were applied at the same timing. Dimethoate was applied at 500 mL/ha in all situations. Pirimor was applied at 150 g/ha at Spring Ridge and at 300 g/ha at Gilgandra.

The 2009 trials encountered lower insect pressure than the 2008 trials and were conducted as two intensive in-house trials at Moree and Edgeroi, evaluating a range of management options on Grout and Fitzroy barley. In addition, eight trials were conducted in collaboration with I&I NSW, and the Department of Employment, Economic Development and Innovation Queensland, at Dalby, Lundavra, Yallaroi, Bullarah, Cryon, Tamworth, Spring Ridge and Gilgandra. The imidacloprid seed treatment did not give season-long control in 2008. Therefore, in 2009 a higher rate of imidacloprid was included in all trials. All treatments had the equivalent loading of fungicide seed treatment for barley of triadimenol via Baytan.

Key treatments in all 2009 trials were:

- imidacloprid at low label rate (Imid 1x) via Zorro at 400 mL/100 kg seed and at high label rate (Imid 2x) via Emerge® at 240 mL/100 kg seed on all crops
- foliar applications of pirimicarb (Pirimor) when the aphid population was 10 aphids/tiller and rising

In 2010, 14 trials evaluating imidacloprid seed treatment compared to pirimicarb application were conducted with Fitzroy and Grout barley.

The following results were observed over 2008, 2009 and 2010:

Aphid population:

- Aphid pressure was rated as moderate in 2009 with >10 aphids/tiller at 6 of 10 sites with peak counts at 25–50/tiller.
- Aphid pressure was rated as low in 2010 with ~5–10 aphids/tiller found at all four sites.
- Three different aphid species were found at nearly all sites, but varied in population dynamics and timing.
- Oat and rose-grain aphid were found in similar numbers in wheat, durum and barley crops, but the corn aphid was nearly exclusively found in barley.
- Populations generally built up and naturally declined within about 3–4 weeks.
- High levels of beneficial insects (wasps and ladybirds) were seen at a number of sites and appeared to initiate population declines.

Aphid control:

- The standard label rate of imidacloprid seed treatment (e.g. Zorro at 400 mL/100 kg) provided extended aphid control of ~70–90 days after planting.
- The high label rate of imidacloprid seed treatment (e.g. Emerge®) at 240 mL/100 kg) extended aphid suppression by an additional about 10–14 days.
- Pirimor provided good levels of knockdown control.

http://www.nga.org.au/module/documents/download/84

Yield and grain quality impact:

- The standard rate of imidacloprid resulted in mean yield benefits of ~6% (150–200 kg/ha) at sites with aphid pressure at >5 aphids/tiller during both 2009 and 2010.
- In 2008, with higher aphid pressure (>70 aphids/tiller in all four trials), the same rate provided yield benefits of about 10% (330 kg/ha).
- Increased yield benefit was obtained with the high rate of imidacloprid.
- Level of benefit was reduced at sites with low aphid pressure (unsprayed sites).
- Pirimor resulted in mean yield benefits of ~2–4% or 100–150 kg/ha.
- No consistent impact was found on grain quality from any treatment.

Net economic benefit:

- The standard rate of imidacloprid resulted in mean net benefits of about $20–30/ha at sites with aphid pressure of >5 aphids/tiller during both 2009 and 2010.
- In 2008, with higher aphid pressure (>70 aphids/tiller in all four trials), the same rate provided net benefits of about $37/ha at a grain price of $125/t.
- Mean net benefit was about $9/ha at unsprayed sites with low aphid pressure.
- Increased net benefit was obtained with the high rate of imidacloprid.
- Mean net benefit from Pirimor was about $5/ha in both years.

In the northern region, low numbers of the oat aphid and the corn aphid are always present in cereal crops. Then, about every 5–7 years, enormous numbers develop during early spring, particularly in barley, and these may reduce yield through feeding damage. However, most populations will be reduced to sub-economic levels by natural enemies. If spraying is economic, growers generally use dimethoate, chlorpyrifos or pirimicarb. [18]

Growers in Queensland are advised to apply a foliar insecticide in late winter or spring to avoid direct damage to tillers and heads. To prevent losses from BYDV in virus-prone areas, aphids should be controlled early in the cropping year. [19] For current chemical control options, visit Pest Genie (http://www.pestgenie.com.au/) or APVMA (http://www.apvma.gov.au/).

Trials have shown that a greater understanding of aphids' natural enemies is required to ensure foliar spraying is not applied when predation by insects including hoverflies, lacewings and ladybirds and parasitism by wasps can reduce aphid populations. However, the killing or driving out of aphids by other insects cannot be relied upon in every season. Heavy rain may reduce aphid populations significantly. Stakeholders in the northern region's cropping areas believe integrated pest management (IPM) could play a greater role in controlling aphids.

[18] L Lawrence (2009) Taking the fight to aphids. CSIRO Farming Ahead number 215, Dec. 2009, http://www.csiro.au/Outcomes/Food-and-Agriculture/Fighting-Aphids.aspx

[19] DAFF (2011) Oat aphid, wheat aphid. Department of Agriculture and Fisheries and Forestry Queensland, http://www.daff.qld.gov.au/plants/field-crops-and-pastures/broadacre-field-crops/integrated-pest-management/a-z-insect-pest-list/aphid-overview/oat-aphid,-wheat-aphid