**TIPS & TACTICS**

**RUSSIAN WHEAT APHID**

---

**KEY POINTS**

- Russian wheat aphid (RWA) is a high priority pest but it is manageable.
- The pest was found in Australia in 2016. The first case was identified in a wheat crop in South Australia’s Mid North, and infestations now stretch into Victoria, New South Wales and Tasmania.
- Russian wheat aphid survives on a wide range of host plants and can reproduce rapidly.
- Implement the FITE strategy (Find, Identify, Threshold approach, Enact), see right and page 2.
- Do not spray where pests are not present or are present in low numbers.
- GRDC and partners are conducting ongoing research and providing information and advice to growers as it becomes available.

---

**Russian wheat aphid is established in Australia. Monitor carefully and manage where needed.**

Russian wheat aphid (RWA) (Photo 1) can damage cereal crops and reduce yields. Growers should implement the “FITE” strategy (Find, Identify, Threshold approach and Enact) and report any incursions.

---

**IMPLEMENT A “FITE” STRATEGY**

**Find**

Look for aphids and the characteristic plant symptoms of infection including leaf streaking or leaf rolling on cereal crops and grasses (Photo 2).

**Identify**

Positively identify RWA by consulting with an industry specialist.

**Threshold approach**

Before deciding on your plan of attack consider thresholds for control, the presence of natural aphid enemies in the crop, crop growth stage and potential yield losses.

**Enact**

Take appropriate action: Manage your next steps including encouraging beneficial insects and protecting honeybees before implementing control options.

Read more on page 2.

---

**Photo 1:** Russian wheat aphid adults.  
Source: Helen Brodie, SARDI

**Photo 2:** Symptoms of damage from RWA include leaf streaks and rolling of leaves.  
Source: Michael Nash, SARDI
Taking the “FITE ” to the Russian wheat aphid

Find: symptoms of infection

Sample following a repeatable pattern that targets early sown and volunteer plants. A perimeter search and a ‘W’ shaped search pattern through each paddock will give a consistent sampling effort (Figure 1). Individual monitoring points could be logged using GPS to increase accuracy of repeated monitoring.

Look for:

1. Whitish, yellowish to pink-purple chlorotic streaks along the length of the leaves (Photo 2).
2. Longitudinal rolling of leaves where the aphids shelter (Photo 3)

These symptoms can often be confused with nutrient deficiency or herbicide damage from bleaching herbicides such as diflufenican.

Plants with heavy infestations of RWA have their growth stunted with tillers lying almost parallel to the ground. Later infestations of RWA can have a larger impact on yield through affecting the development of major yield contributing leaves (flag leaf, leaf two and leaf three).

Infestation of the flag leaf may result in curling of the leaf, trapping the awn and thus preventing the head from completely emerging (Photo 4). This produces a gooseneck head and, as a result, the grain does not properly mature. Heads can also appear bleached.

Identifying the aphid

Use a hand lens or smartphone macro lens. The key things to look for are:
- pale green colour (Figure 2a)
- approximately 2 mm long (Figure 2b)
- short antennae (Figure 2a)
- elongated spindle-shaped body (Figure 2c)
- two tiny tails at the rear end (Figure 2c)
- lack of the usual excretion tubes or ‘exhaust pipes’ on the top of the rear end of the body compared to other cereal aphids (Figure 2a).
Take a threshold approach

Aggressive action to kill aphids should only be taken after RWA numbers reach this threshold. More than 20% of seedlings infested up to the start of tillering and 10% of tillers infested thereafter.

Crop yield loss may be minimised through protection of the top three (major yield contributing) leaves.

Consider:
- thresholds for control as well as the crop’s growth stage, yield potential and potential yield losses
- prevailing environmental conditions: rainfall and drying winds can kill RWA outside the shelter of leaf rolls, with heavy rain events sometimes killing 50% of the aphid population.

Enact an effective management strategy

Genetic resistance of crops, strategic use of insecticides, control of ‘green bridge’, and promoting natural enemies will be integral to the long-term management of RWA. The main management strategies fit into two categories: environmental and chemical management.

Environmental management

There are three key steps to take:

1. Manage the ‘green bridge’
   Many grass weed and pastures can host RWA. Remove all volunteer cereal plants either by spraying, cultivating or heavy grazing at least four weeks before the next crop is sown.
   Control host weeds during the growing season to prevent seed set that could contribute to ‘green bridge’ development in the next fallow period.

2. Consider planting timing and location
   If there are alternate hosts nearby, consider planting crops away from them to reduce the risk of infestation. There has been a trend to plant earlier in the season, for example to avoid frosts, however this is risky because RWA infestation is more likely with early planting.

3. Promote natural enemies
   A crucial management strategy is to preserve populations of natural enemies to help manage aphid numbers. Natural enemies include predators, parasitoids and pathogens (often referred to as ‘beneficials’). Integrated pest management strategies should be used to encourage the proliferation of natural enemies wherever possible. These will complement other control tactics such as insecticides, cultural and genetic control options.

Environmental management

A diverse range of beneficial are known to predate on RWA, including those that commonly attack other cereal aphid species in the Australian environment. They include:
- Minute parasitoid wasps (Aphidius colemani, A. platensis, Diaeretiella rapae, Aphelinus asychis, A. varipes).
- Generalist predators including ladybird beetles (Coccinella spp., Hippodamia spp.) (Photo 5), lacewings (Chrysopa spp.), damsel bugs (Nabis spp.) and hoverflies (Syrphus spp.).
- Entomo-pathogenic (beneficial) fungi. These fungi were favoured by high rainfall during the 2016 growing season and seemed to play a substantial role in the unexpected and sharp decline of RWA populations in spring of that year.

Many of these species are likely to be most abundant in cereals in spring. The presence (and activity) of beneficials should be weighed up when determining the most appropriate management option, specifically in relation to insecticide timing and choice.

Chemical management

Prophylactic sprays for managing invading or dispersing RWA are not supported and are generally ineffective in providing protection. These sprays may be detrimental to natural enemies and/or may create secondary pest outbreaks, such as other cereal aphids.

Do not spray unnecessarily, only spray when economic thresholds are reached.

In-crop spraying

- If spraying is warranted, use softer chemistry (e.g. pirimicarb) where possible to encourage natural predators and beneficial insects, especially early in the season.
- Chlorpyrifos and pirimicarb are currently registered for control under two Australian Pesticides and Veterinary Medicines Authority (APVMA) Emergency Use Permits. Keep chlorpyrifos for heavy infestations. Good spray coverage and consideration of weather conditions (temperature, rainfall) in the 24 hours prior and shortly after application are important.

Seed treatments

- Neonicotinoid seed treatments are expected to provide effective early season control of RWA. Preliminary evidence indicates that the length of protection against RWA provided by seed treatments is similar to that observed for other cereal aphid species.
- Prophylactic use of neonicotinoid seed treatments is discouraged and use should be targeted at those situations deemed to be of higher risk (early sowing, especially early sown barley crops; or areas where volunteer cereals and/or live aphids are identified prior to sowing).

Find out more about beneficials and integrated pest management:


Integrated pest management & pest suppressive landscapes with Phil Bowden. Video https://youtu.be/xkknI35m3GY
Preferred crops and hosts

The host range of RWA includes more than 140 species of cultivated and wild plants within the Gramineae (grasses) family. While Australian research is ongoing, recent international research indicates that RWA tends to favour common cereal crops in this order:

1. Barley
2. Durum wheat
3. Bread wheat
4. Triticale
5. Cereal rye
6. Oats

Source: GRDC, 2016.

RWA establish most successfully where there is a continual green bridge of host plants over the summer/autumn period. Where wheat and barley sowing occurs in autumn/winter, with crops growing actively from March to December, plus spring sowing, the risk of RWA infestation increases. Volunteer wheat plants may also emerge over the summer period (December to March) and with summer growing grass species, these additional host plants allow RWA populations to persist from one growing season to the next.

Report suspected new infestations to the Exotic Plant Pest Hotline 1800 084 881 or the contacts provided below. This assists with monitoring and confirming distribution (Figure 3) and informing other growers, government agencies and industry. Take an image of the infestation. You might be asked to send a sample.

Victoria: send samples using the CropSafe Sample Recording Form. Or contact 03 5362 2111.

South Australia: send samples to PestFacts, SARDI Entomology Unit, GPO Box 397, Adelaide SA 5001.

New South Wales: to assist with providing information on spread of RWA, any detections in central or Northern NSW should be reported by sending images to biosecurity@dpi.nsw.gov.au.

Tasmania: The Entomology Team in Plant Diagnostic Services of DPIPWE will identify aphids suspected of being RWA at no fee. For an initial opinion, photos (with location) can be sent to 0429 852 886 or emailed to Guy Westmore@dpipwe.tas.gov.au.

Queensland: RWA has NOT been detected. Call Biosecurity Queensland on 13 25 23 or email photos of aphids or symptoms on plants to: plantpestdiagnostics@daf.qld.gov.au.

Western Australia: RWA has NOT been detected. Report the absence of aphids, rather than just the presence. For more information visit: https://www.agric.wa.gov.au/barley/biosecurity-alert-russian-wheat-aphid.

NEED TO KNOW FACTS


- The Russian wheat aphid (Diuraphis noxia) is a major pest found worldwide.
- The primary mode of aphid dispersal is by winged individuals, carried on prevailing winds and on live plant material.
- Like most other introduced aphid pests in Australia, invasive populations of RWA reproduce asexually with females giving birth to live female offspring. After their fourth moult, nymphs develop into either wingless or winged adults.
- Reproductive behaviour of RWA varies around the world, influenced by geography, winter temperature and day length. The aphid’s lifecycle can be asexual (anholocyclic; adults give birth to live, genetically identical nymphs), sexual (holocyclic), or a combination of both. RWA cause most crop damage in regions where they occurs with an anholocyclic lifecycle.
- RWA is able to survive across a broad range of temperatures, although development and reproductive rates are most prolific between 2°C and 25°C, with aphid numbers declining dramatically below and above these limits. The optimum temperature range, where population growth is most rapid, is around 18°C to 21°C. Like other aphid species, RWA populations can increase >10-fold in less than 10 days under favourable conditions.
- Unlike many other aphids, RWA does not seem to be a major vector of cereal viruses such as Barley yellow dwarf virus (BYDV). However, it is different from other aphids because it injects salivary toxins into the host plant during feeding. This kills the photosynthetic chloroplasts and causes chlorosis and necrosis of the infested leaves, sometimes leading to plant death.


REPORT RWA

EXOTIC PLANT PEST HOTLINE
1800 084 881
When in the crop cycle are my crops most at risk?
Timing of infestation is very important. The most at risk time for the crop is from stem elongation to when the flag leaves emerge (Zadoks 30–39).

Some pests transmit viruses; does the RWA?
Based on reports from South Africa, RWA does not seem to be a good vector of cereal viruses. The role of RWA as a cereal virus vector in Australia will be confirmed. Research is underway.

How effective are parasitoids against RWA?
Parasitoids are highly effective. International research suggests the main RWA parasitoid is *D. rapae*, which has the ability, along with *Aphidius* spp., to parasitise (mummify) 40–100 aphids per day and 212–532 aphids over their 7–21 day lifetime at 20°C. In another study, *D. rapae* produced up to 60 parasitised aphids per day at 21°C. This parasitoid is present in Australia and was recorded commonly parasitising RWA crops in a survey in SA in 2016 (Umina et al. 2017).

What should I do first?
Go through the FITE steps and, if you think you have the aphid on your property, call the Exotic Plant Pest Hotline on 1800 084 881.

Should I spray to manage RWA?
Prophylactic sprays for managing invading or dispersing RWA are not advised, and are generally ineffective in providing protectant activity. Refer to the Chemical management section on page 3.

What other controls might be available in the future?
GRDC and partners are investing in research to understand the biology and ecology of RWA in Australia with the aim to provide more locally relevant management strategies. This includes integrated pest management, insecticides that may be suitable for application to seeds before planting as well as exploring what genetic resistance may be available in Australian wheat and barley cultivars. To keep up to date with new information, Sign up to GrowNotes alerts https://grdc.com.au/resources-and-publications/grownotes/alerts to receive the latest information on outbreaks relevant to your area.

What yield losses can occur?
International literature suggests that the risk of economic yield loss caused by RWA feeding is greatly reduced once cereal crops reach the soft dough stage (GS85). According to GRDC (2016): 1) overseas data showed losses of 1 t/ha occurred in plants 95% infested with RWA at GS59, 2) in another overseas study, losses increased from 18% with 15–20 aphids per shoot to 79% with 185–205 aphids per shoot. Research is still underway specific to Australian varieties and growing conditions.

Is it likely to spread further?
Russian wheat aphid is able to thrive at a range of temperatures, surviving down to as low as -37°C and as high as 45°C. However, development and reproductive rates are most prolific between 2°C and 25°C. The aphid has been detected in South Australia, Victoria, New South Wales and Tasmania. Growers and advisers in all cereal growing areas nationally are encouraged to closely monitor their crops for signs of infestation and report to relevant government agencies. Good biosecurity practice is encouraged to minimise the risk of spreading the pest further.
MORE INFORMATION

Leigh Nelson
Manager – Pests, GRDC
02 6166 4500
leigh.nelson@grdc.com.au

Paul Umina, cesar and The University of Melbourne
03 9349 4723
pumina@cesaraustralia.com

Greg Baker, SARDI
08 8303 9544
greg.baker@sa.gov.au

Exotic Plant Pest Hotline:
1800 084 881

REFERENCES


RESOURCES

CAUTION: RESEARCH ON UNREGISTERED AGRICULTURAL CHEMICAL USE

Any research with unregistered agricultural chemicals or of unregistered products reported in this document does not constitute a recommendation for that particular use by the authors or the authors’ organisations. All agricultural chemicals must accord with the currently registered label for that particular agricultural chemical, crop, and region.