RUSSIAN WHEAT APHID UPDATE

Maarten van Helden (PIRSA-SARDI, University of Adelaide), Thomas Heddle
and Bonnie Wake (PIRSA-SARDI), James Maino and Jess Lye (cesar)

TAKE HOME MESSAGES

- Despite December 2018 rain providing a green bridge, natural infestation of Russian wheat aphid was extremely low in 2019.
- Due to low numbers of RWA this season, seed treatments were not warranted.
- After artificial inoculation, RWA numbers increased to levels above the current suggested threshold levels but no effect on yield was observed.
- RWA should be managed using currently recommended thresholds. The US threshold of 10 per cent of tillers with aphids seems sufficiently conservative to avoid any yield loss.

BACKGROUND

Russian wheat aphid (RWA) was first reported in 2016 in South Australia (SA), and has since been detected widely throughout Victoria and in New South Wales (NSW), as far north as Coonamble and as far east as Tamworth. It has not been found in Queensland or Western Australia. Typical symptoms of RWA in cereal crops are streaking of leaves, which can appear white to pink in colour. Leaf curling may also be observed.

As part of the Grain Research and Development Corporation (GRDC) investment 'Russian wheat aphid risk assessment and regional thresholds', a field trial was run at Birchip for a second year to investigate the level of natural infestation of cereal crops and the effect of artificial inoculation on aphid numbers and yield loss. This was one of multiple trials undertaken in SA, Victoria, Tasmania and NSW as part of a wider project.

AIM

Determine the risk of RWA infestation in cereal crops in the southern Mallee in 2019 and observe the effect of high aphid numbers, achieved through artificial inoculation, on crop development and yield.

PADDOCK DETAILS

Location:	Karyrie
Crop year rainfall (Nov-Oct):	418mm
GSR (Apr-Oct):	197mm
Soil type:	Clay loam
Paddock history:	2018 fallow, 2017 lentils, 2016 oats

TRIAL DETAILS

Crop types:	Bread wheat, durum wheat and barley
Treatments:	See Table 1
Target plant density:	140 plants/m^2
Seeding equipment:	Knife points, press wheels, 30cm row spacing
Sowing date:	16 May 2019
Replicates:	Four
Harvest date:	25 November 2019

Table 1. Treatment outline. Trial split in to two parts a) natural infestation b) inoculated to remove change of RWA movement between plots.

Variety	RWA Infestation	Insecticide	Rate
Scepter	Natural population	Untreated control	-
Spartacus CL	Inoculated @ 50 RWA/m^2	Seed treatment	Imidacloprid 600 @ 120mL/100kg
Aurora (inoculated trial only)		Chlorpyrifos	600mL/ha

TRIAL INPUTS

Fertiliser:	Granulock® Supreme Z + Flutriafol (200mL/100kg) @60kg/ha @ sowing 24 June urea @ 100kg/ha 25 May urea @ 100kg/ha 26 August urea @ 100kg/ha
Herbicide:	Trial managed as per best practice
Insecticide:	See Table 1
Fungicide:	Trial managed as per best practice
Seed treatment:	Systiva® @150mL/100kg

METHOD

The trial was split into two areas (one inoculated, the other naturally infested) in randomised complete block designs. This split reduced movement of RWA from inoculated to naturally infested plots. Aphids (all species), natural enemies and symptoms were scored every two weeks by observing 25 random tillers in each plot until harvest. Yield and quality data were collected at harvest.

The artificial inoculation trial was inoculated (approximately 50 RWA/m^2) on 13 June 2019 at GS21.

Spraying of chlorpyrifos treatment plots occurred on 3 September at 600ml/ha using a five-nozzle hand boom.

RESULTS AND INTERPRETATION

RWA populations (Figure 1) were almost absent from the natural infestation areas during the whole trial (triangles), except for a small increase at the end of September when aphids start migrating. Some oat and corn aphids were observed but populations were not significant. In the inoculated area, RWA populations established on the untreated control (UTC) and chlorpyrifos treatment immediately after inoculation. On the imidacloprid treated plots that were also inoculated, aphids did not establish (four weeks after sowing).

Initial populations in the control were about 15 RWA per 100 tillers, rising to about 125 aphids per 100 tillers at the end of September. In the chlorpyrifos treatment, aphid numbers were nearly identical, but spraying on 3 September cut the population to less than 10 aphids per 100 tillers (Figure 1).

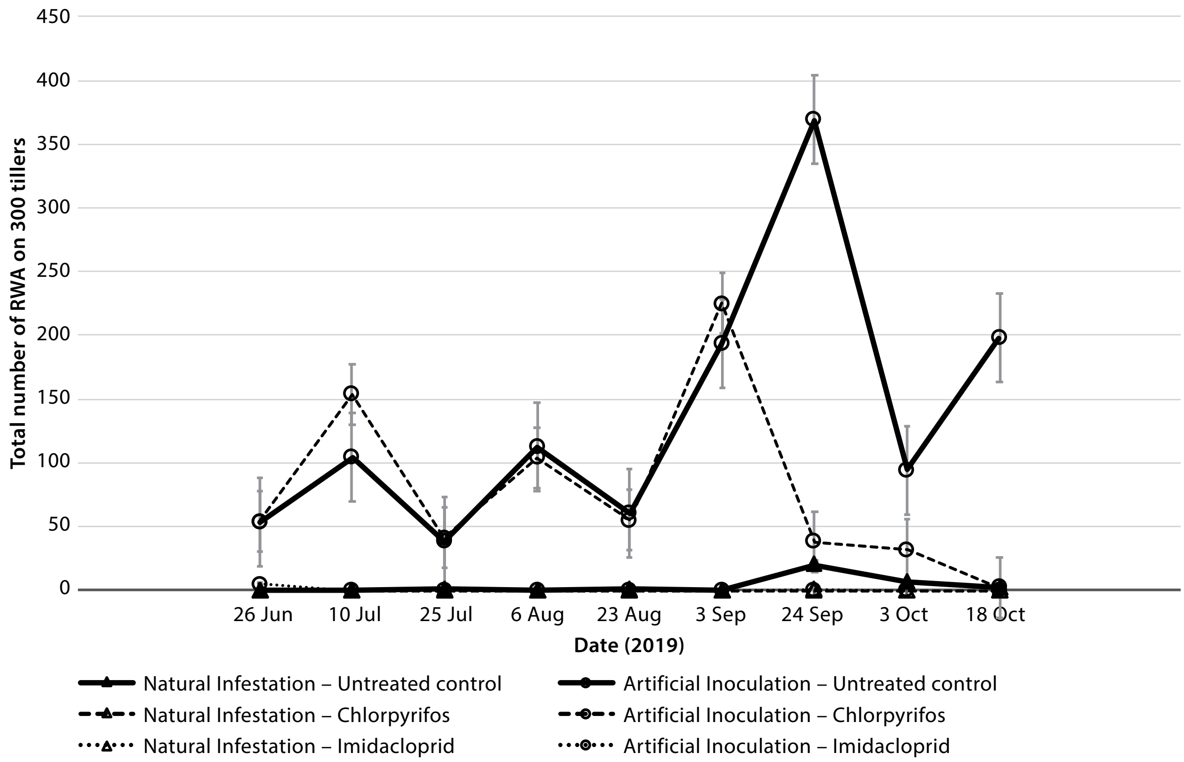

Figure 1. Total number of RWA on 300 tillers across all varieties. Bars display standard error.

There was no difference in aphid numbers between varieties in the trial.

The percentage of tillers with symptoms (Figure 2) shows a slow build-up on the treatments with aphid populations, reaching about 30 per cent at the start of September. This falls to about 10 per cent because symptoms are less obvious in a maturing crop. Symptoms do not fluctuate as much as aphid numbers and can persist after aphids are eliminated. This explains why symptom expression was similar between the UTC and the chlorpyrifos treatment, despite the aphids being eliminated by spraying on 3 September (GS33).

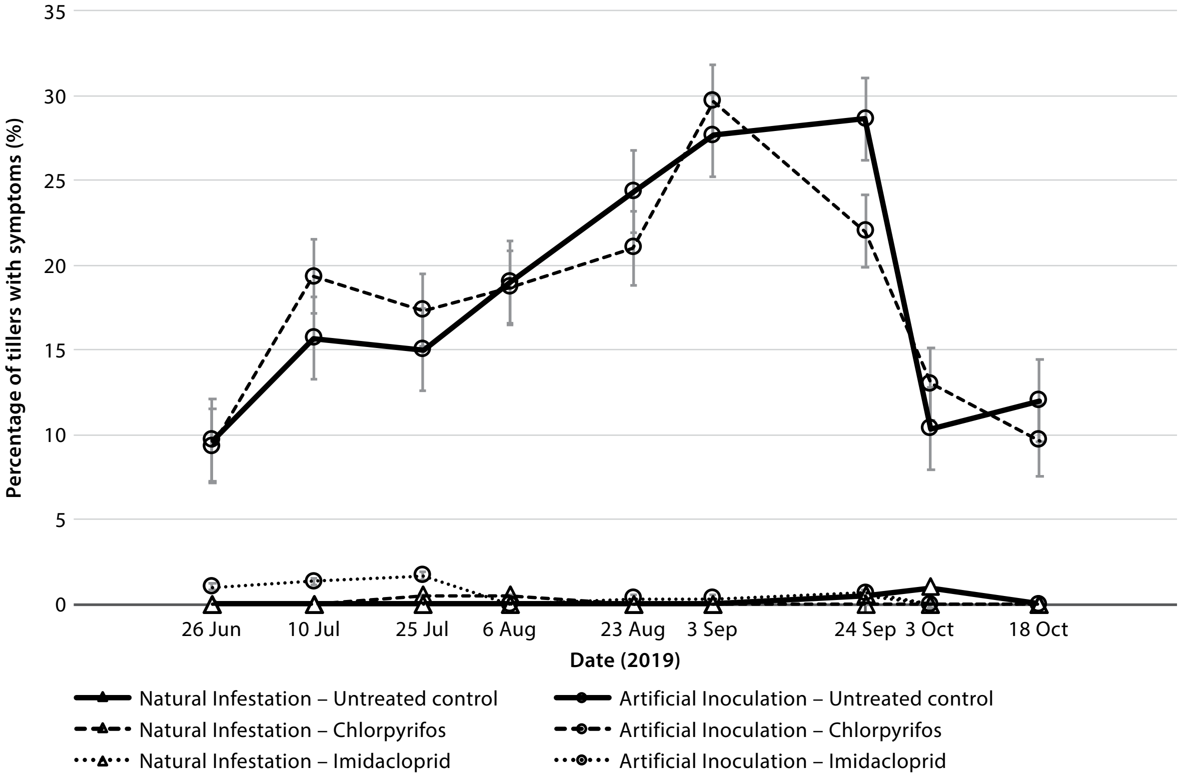

Figure 2. Percentage (%) of tillers with RWA symptoms averaged across all varieties at observation dates. Bars display standard error.

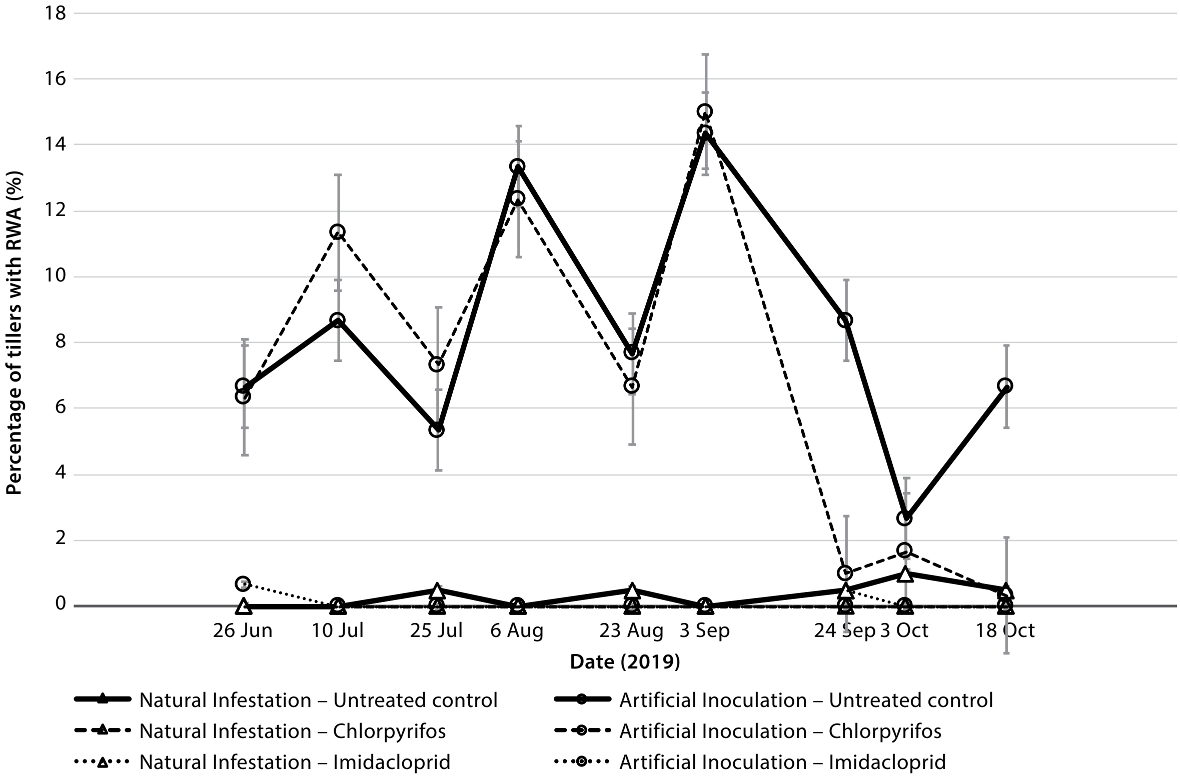

Figure 3. Percentage (%) of tillers with RWA across all varieties. Bars display standard error.

The US intervention thresholds for RWA are based on the percentage of tillers with symptoms. The intervention threshold is 10 per cent of tillers with aphids after tillering (GS32/3). The percentage of tillers is presented in Figure 3. Maximum frequency of occurrence (15 per cent of tillers with RWA) is observed in early September and then falls in the chlorpyrifos treatment to approximately 1 per cent after insecticide application. In the UTC a slower, more gradual drop occurs later in season, showing that aphids leave the maturing crop at this stage. This makes the aphid population slightly higher than the US intervention threshold for both the inoculated UTC and the chlorpyrifos treatments.

With aphid populations higher than the intervention threshold, yield differences were expected. However, there were no significant differences per treatment for any of the commodities (wheat, barley, durum wheat) (Figure 4).

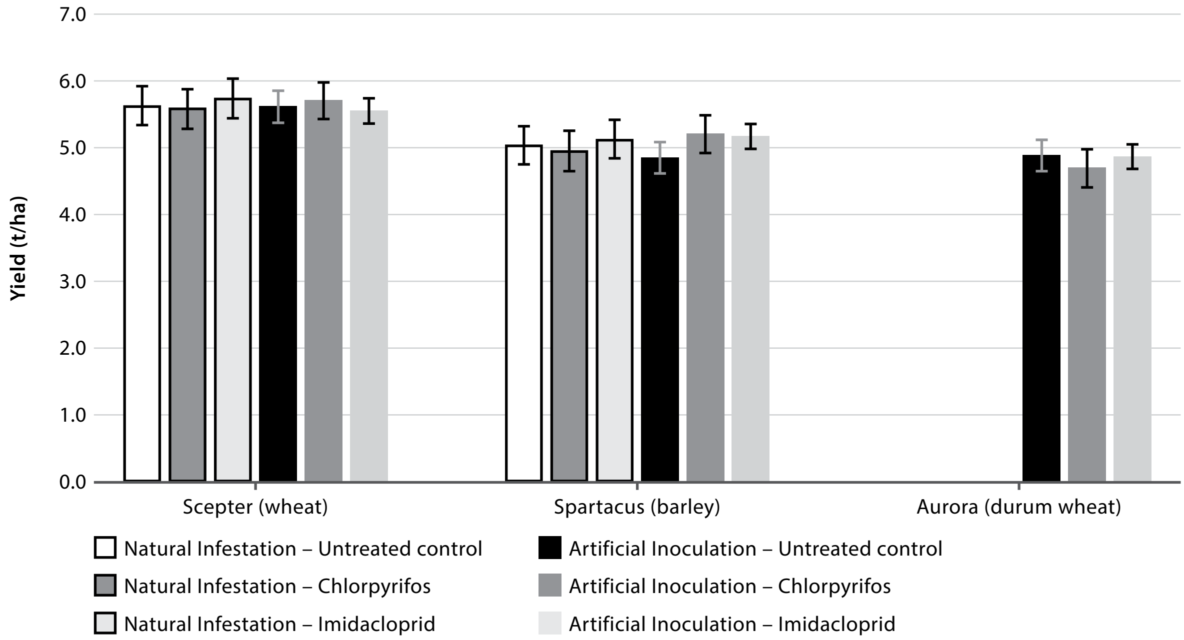

Figure 4. Yield (t/ha) of treatments for each variety. Bars display standard error (P >0.05 NS).

This shows the US threshold is sufficiently conservative to be adopted in cropping situations as shown here (in a 5 t/ha environment). Fourteen similar trials were run elsewhere across Australia and combined analysis of the data will allow the intervention threshold for RWA to be refined.

The absence of RWA in the natural infestation trial showed there was very little pressure around sowing time (May) in the Birchip area. This was the case in most other trials in the project, showing that RWA pressure in 2019 was very low. RWA survival is strongly dependent on the presence of host grasses over summer (green bridge), which support large populations and faciliate migration to establishing crops. Overall dry conditions were observed in south-eastern Australia this summer, but Birchip had an exceptional rainfall event in December 2018 (more than 200mm, Decile 10 of upper soil moisture). This was followed by a dry January (Decile 1 of upper soil moisture). These conditions supported the growth of grasses for several months over summer. During a green bridge sampling tour in the area in early April 2019, few RWA were observed on these grasses, so it seems not to have caused any issues for the following crop.

COMMERCIAL PRACTICE

Results from this trial (and others) show that RWA risk in Australia in 2019 was very low (cesar 2019). From the limited information collected to date, RWA seems to have been rarely present in cereal crops in damaging numbers. The use of prophylactic seed coatings containing neonicotinoids (imidacloprid eg. Gaucho® or thiamethoxam eg. Cruiser®) as an insurance treatment for RWA seems unnecessary for Australian cropping conditions observed to date. Therefore, growers are advised to adopt the FITE strategy (Find, Identify, Threshold, Enact). This is preferable because:

- RWA is probably only an occasional problem, heavily influenced by seasonal climate (green bridge)
- Symptoms are easy to observe
- Growers/advisors have a large time period to check for symptoms and aphid numbers before a decision is needed (after GS30-40)
- Treatments, if needed, will efficiently reduce RWA.
- This approach will be more economical, cause less off-target effects and reduce the risk of selecting for resistance to insecticides.

REFERENCES

cesar, 2019, RWA Portal, http://cesaraustralia.com/sustainable-agriculture/rwa-portal/), [Accessed 9 January 2020]

ACKNOWLEDGEMENTS

A GRDC investment 'Russian wheat aphid risk assessment and regional thresholds' (project UOA1805-018RTX), seeks to deliver information on Russian wheat aphid management for grain growers. This project is being undertaken by SARDI and cesar.