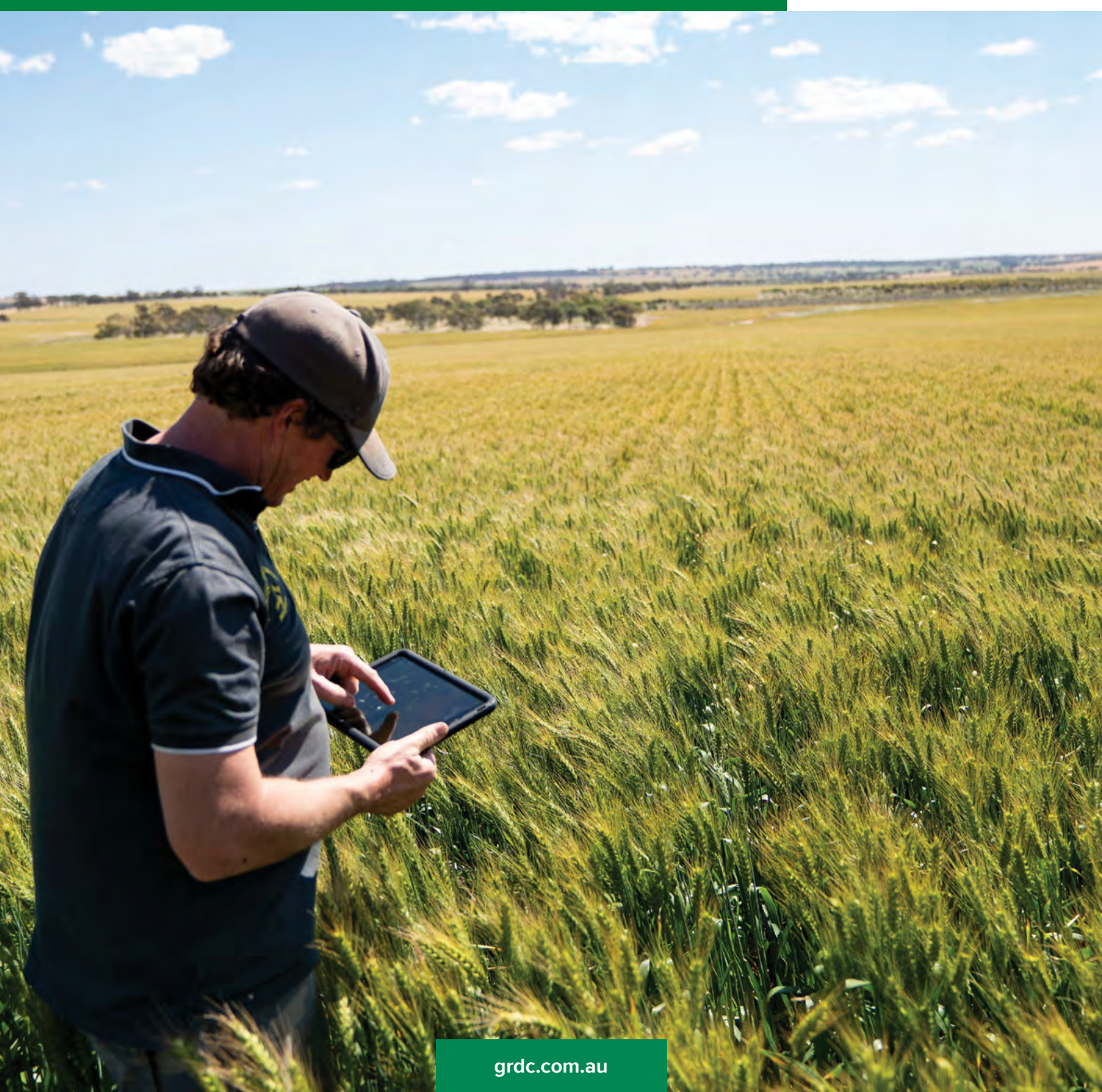


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Getting the best out of the new products for ryegrass control

Christopher Preston and Peter Boutsalis.

School of Agriculture, Food & Wine, University of Adelaide.

GRDC project codes: UCS00024, UA00158

Keywords

- herbicide resistance, annual ryegrass, pre-emergent herbicide.

Take home messages

- Resistance to herbicides is common in annual ryegrass in southern Eyre Peninsula including to the pre-emergent herbicides Trifluralin® and Avadex® Xtra.
- New pre-emergent herbicides are becoming available; however, it is vital that these are used appropriately to get the best results.
- Matching pre-emergent herbicides to soil types and seeding systems can help reduce crop damage.

Herbicide resistant weed survey Eyre Peninsula 2019

A weed resistance survey of 170 annual ryegrass samples randomly collected from the Eyre Peninsula at harvest in 2019 showed high frequencies of resistance to the Group A and Group B herbicides

(Table 1). Resistance to the Group A herbicides is higher in the Lower Eyre Peninsula (EP) compared to the Upper EP. In contrast, resistance to the Group B herbicides is high across the region. Resistance to Intervix® in annual ryegrass on the EP is as common as resistance to the sulfonylurea herbicides.

Table 1. Extent of resistance in annual ryegrass populations from Eyre Peninsula in 2019. Resistant populations are those with >20% survival to the field rate of the herbicide.

| Herbicide | Group | Lower EP | Upper EP | Total |
|-----------------|-------|-------------------------------|----------|-------|
| | | Resistance (% of populations) | | |
| Diclofop-methyl | A | 84 | 19 | 61 |
| Axial® | A | 71 | 8 | 49 |
| Clethodim | A | 14 | 0 | 9 |
| Oust® | B | 97 | 79 | 90 |
| Intervix® | B | 97 | 88 | 94 |
| Glyphosate | M | 1 | 8 | 3 |
| Paraquat | L | 0 | 0 | 0 |
| Trifluralin® | D | 66 | 17 | 49 |
| Propyzamide | D | 0 | 0 | 0 |
| Avadex® Xtra | J | 33 | 3 | 23 |
| Arcade® | J | 10 | 0 | 7 |
| Boxer Gold® | J + K | 4 | 0 | 3 |
| Sakura® | K | 1 | 0 | 1 |



For the pre-emergent herbicides, resistance is highest to trifluralin and then the Group J herbicides, Avadex® Xtra and Arcade®. Resistance to the pre-emergent herbicides is higher in the Lower EP. There is less resistance to Boxer Gold® and Sakura® and no resistance found to propyzamide (Table 1). The extent of resistance to herbicides in annual ryegrass, particularly in the lower EP means herbicide rotations and other weed management strategies need to be used to delay the resistance to existing and new herbicide modes of action.

New pre-emergent grass herbicides for annual ryegrass

There are several new pre-emergent herbicides that have been released or will be released in the next few years. It is important to understand their behaviour to get the best use out of these herbicides.

Devrinol-C®

Devrinol-C®, active ingredient napropamide, is a Group K herbicide from UPL registered in 2019. Devrinol-C® is registered for annual grass weed control in canola.

Its active ingredient, napropamide, is not as water soluble as metazachlor (Butisan®) and has less movement through the soil. Canola has much greater tolerance to napropamide compared to metazachlor making it much safer in the high rainfall zone. Devrinol-C® offers an alternative pre-emergent herbicide to propyzamide or trifluralin for canola.

Luximax®

Luximax®, active ingredient cinmethylin, is a new mode of action herbicide (Group Z) from BASF registered in 2020. Luximax® is a pre-emergent herbicide for annual ryegrass control in wheat, but not durum. It will also provide some suppression of brome grass and wild oats. In our trials, control of ryegrass is as good as with Sakura®.

Its active ingredient, cinmethylin, has higher water solubility than many other wheat pre-emergent herbicides. This means cinmethylin will move readily into the soil with rainfall events. Less rainfall will be required to activate the herbicide similar to Boxer Gold® (profluroxypyr + S-metolachlor). Persistence of Luximax® is generally good.

Cinmethylin has quite high binding capacity to soil organic matter and this is important in achieving crop safety. Wheat is not inherently tolerant of cinmethylin, so positional selectivity (keeping the herbicide and the crop seed separate) is crucial.

Knife-points with press-wheels is the only safe seeding system and the crop seed needs to be sown 3cm or deeper. Heavy rainfall in the first few days after application can also result in the herbicide causing crop damage. Mixtures with trifluralin, triallate and profluroxypyr are good and can provide some additional ryegrass control; however, mixtures with Sakura®, Boxer Gold® or Dual Gold® are likely to cause crop damage and need to be avoided.

Overwatch®

Overwatch®, active ingredient bixlozone, from FMC is a Group Q herbicide that will be available for sowing in 2021. Overwatch® controls annual ryegrass and some broadleaf weeds and will be registered in wheat, barley and canola. Some suppression of barley grass, brome grass and wild oats may occur.

Wheat is most tolerant to bixlozone, followed by barley and then canola. The safest use pattern will be incorporation by sowing (IBS) with knife-points and press wheels to maximise positional selectivity, particularly with canola. Some bleaching of the emerging crop occurs often, but in our trials, this has never resulted in yield loss. In situations where the crop grows poorly, for example, water logging, high root disease, etc., the crop may have more difficulty growing away from the initial bleaching effect.

Overwatch® has a little more water solubility than Sakura®. The level of ryegrass control in our trials has been just behind Sakura®. Mixtures with other herbicides can increase control levels and in our trials in the high rainfall zones, the mixture of Overwatch® plus Sakura® has been very good.

Ultro®

Ultro®, active ingredient carbetamide, from Adama is a Group E herbicide that will be available from 2021. Ultro® will be registered for the control of annual ryegrass, barley grass and brome grass in all pulse crops.

Pulses have reasonable tolerance to Ultro®, so crop damage should be rare. Ultro® provides the best control of annual ryegrass when used pre-emergent. Ultro® has relatively high water solubility, so is more effective on weeds like brome grass that tend to bury themselves in the soil. Persistence of Ultro® is shorter than Sakura®.

Mateno® Complete (BAY167)

Mateno® Complete is a new product from Bayer containing the active ingredient aclonifen. It will be a new mode of action pre-emergent and early post-emergent herbicide for the control of grass



and some broadleaf weeds in wheat and barley. Registration is expected in 2022.

The behaviour of this herbicide in the soil will be more similar to Sakura® than Boxer Gold®. It will require more rainfall to activate and will have similar persistence to Sakura®. It will most likely work best for annual ryegrass as a pre-emergent IBS herbicide. The timing of the early post-emergent application will be similar to Boxer Gold®, at the 1 to 2-leaf stage of annual ryegrass. The post-emergent timing will require more rainfall after application than Boxer Gold® does, so will suit higher rainfall regions.

Managing crop safety risk with pre-emergent herbicides

Due to their nature of being soil active herbicides, pre-emergent herbicides can be prone to causing crop damage. This is one reason why knife-point and press wheel seeding systems are recommended for many pre-emergent herbicides. These seeding systems move herbicide treated soil out of the crop row and reduce the potential for herbicide to move into the crop root zone.

The main features of pre-emergent herbicides that need to be considered are water solubility, binding to organic matter and the inherent tolerance of the crop to the herbicide. Herbicides with higher water solubility, lower binding to organic matter and lower inherent crop tolerance are more likely to cause crop damage.

Soil type and rainfall patterns are also important in understanding crop damage from pre-emergent herbicides. Soil types low in organic matter and with coarser particles will allow herbicides to move further in the soil. Herbicides applied when the soil is dry will move further with the opening rainfall event, than if the soil is already moist. Finally, many pre-emergent herbicides lead to root pruning if they come into contact with the crop roots. Any soil constraints that lead to reduced crop growth can magnify the effect of the herbicide on the crop. Even herbicides that we traditionally consider to have high safety on the crop, such as Sakura® in wheat, can result in crop damage under the wrong conditions. In certain soil types with low organic matter, Sakura® can move into the crop root zone and cause damage.

Managing for crop safety has several aspects. The first is ensuring the right pre-emergent herbicide is being used for the crop, soil type and expected rainfall. Secondly, is ensuring that the herbicide treated soil is not dragged or thrown into the crop row by the seeding or subsequent operations. The

third component is choosing the appropriate rate. Where a rate range is present on the label, choose the lowest rate for problem soil types. This may require a mixing partner to be added to achieve the desired level of weed control. The final component is good agronomy. Make sure the crop is sown at the correct depth, has the right nutrition and protection from pathogens and insects.

Acknowledgements

The research undertaken as part of this project is made possible by the significant contributions of growers through both trial cooperation and the support of the GRDC, the author would like to thank them for their continued support.

Useful resources

<https://grdc.com.au/resources-and-publications/all-publications/publications/2018/soil-behaviour-of-pre-emergent-herbicides>

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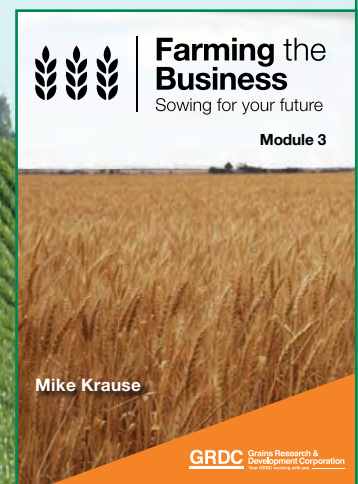
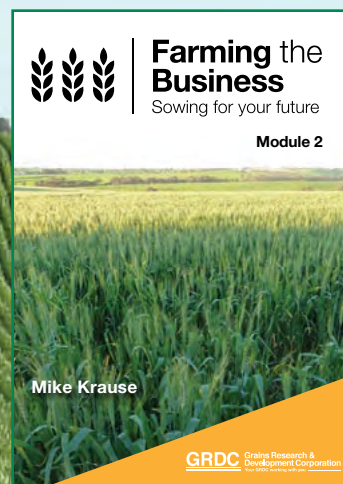
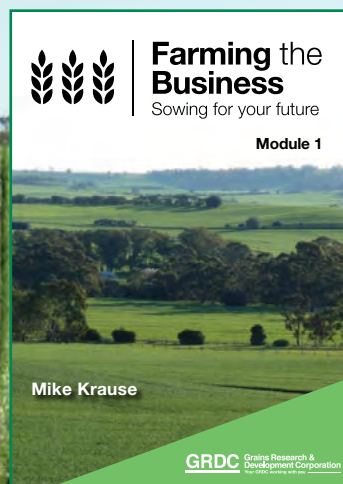
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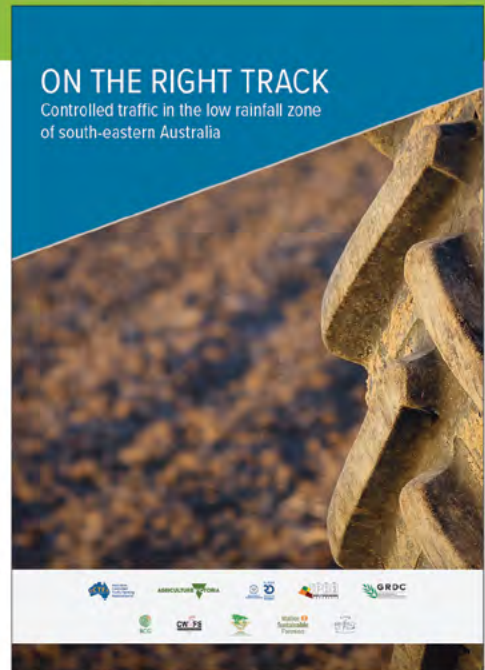


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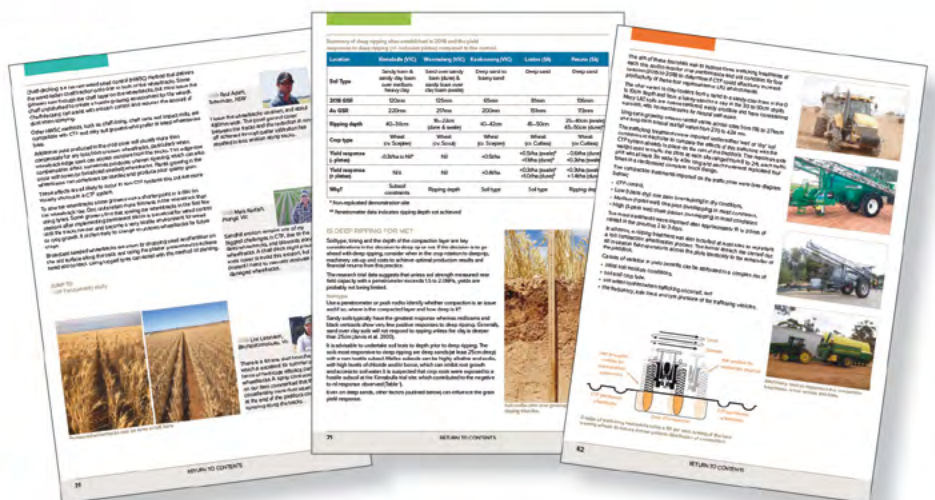
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Establishment pests in 2020, and how to manage risks

Kym Perry, Rebecca Hamdorf and Maarten van Helden.

SARDI Entomology.

GRDC project code: 9177115

Keywords

- risk assessment, monitor, resident and transient pests, migration.

Take home messages

- High populations of redlegged earth mite and migratory moth/caterpillar pests attacked Eyre Peninsula crops during establishment in 2020.
- Every season is different. Don't chase this year's pest issues next year – make decisions on merit each year.
- Assess risk first, make informed decisions, then monitor afterwards.

Background

Establishing crops are attacked by a variety of invertebrate pests that fall into two broad categories:

Resident pests

Resident pests live entirely within paddocks or paddock edges, in association with soil and their populations are present in similar locations, but different densities, from year to year. Resident pest groups are generally flightless species including earth mites, lucerne flea, weevils, other beetles, millipedes, earwigs, slaters, slugs and snails. Resident beneficial insect species that attack these pests include carabid beetles, rove beetles, spiders and predatory mites.

Transient pests

Transient pests live on short-lived host plants within or outside paddocks, either short or long distances away. They are highly mobile species and regularly move into crops from these alternative host plants. Transient pests include moth/caterpillar pests and aphids. Transient beneficial insects move into crops and attack these pests and become most abundant in spring. Transient beneficial insects include ladybirds, hoverflies, lacewings, and parasitoid wasps.

These two categories of pests require slightly different approaches to management. However, for all pests, the key to successful management is assessing risk first, and then making informed decisions. Blanket pest management approaches are not sustainable, often ineffective, and should be avoided. This paper discusses how to assess risk and manage pests strategically in future seasons.

Key Question 1 - what were the main insects causing damage in early 2020?

The crop establishment period on Eyre Peninsula in 2020 was characterised by unusually high populations of moth/caterpillar pests of several species attacking crops and pastures. Additionally, high densities of redlegged earth mite attacked emerging crops on Lower Eyre Peninsula.

The moth/caterpillar pests were: (transient species)

Native budworm, *Helicoverpa punctigera*, attacked early sown crops around Upper Eyre Peninsula. This insect is a major pest of pulse and canola crops in spring but crop damage early in the season is relatively uncommon.

Weed web moth, *Achyra affinalis*, was particularly widespread and attacked medic



pastures, emerging cereals and canola crop on northern Eyre Peninsula. Some pastures required treatment to control caterpillars in early May. The larvae were fast-moving and spun webs in foliage.

Pasture webworm, *Hednota sp.*, attacked pastures and some canola crops in lower densities than weed web moth. This pest resides in silk-lined tunnels in the soil and emerges at night to feed. They chew off leaves and drag them back to their tunnels. Typically, this pest is only problematic in paddocks following pasture phases but was more widespread this season.

Pink/brown cutworm, *Agrotis munda*, attacked cereal crops from northern to central Eyre Peninsula. Larger larvae (>25 to 40 mm) chewed off leaves and stems near ground level. Damage occurred primarily in crops sown into paddock areas with heavier stubble. Paddocks grazed or windrow-burned, removing most stubble, suffered less damage. Female moths prefer to lay eggs into stubble. This species occurs relatively commonly during crop establishment on Eyre Peninsula.

Herringbone cutworms were observed at lower densities in canola, recognisable by their variegated colour patterns. They are less damaging than pink cutworm and have only one generation per year.

Armyworms have been observed in vegetative cereal crops on Eyre Peninsula, causing patches of missing plants. Larger larvae (>25mm to 40mm) cause defoliation and sever plant stems near ground level. Armyworm are most problematic when large larvae occur in cereal crops near harvest; in vegetative crops, they can also damage flag leaves.

These pests commonly occurred in mixed populations with two or more species. These insects feed more actively at night and are more difficult to find during the day.

The 'common' establishment pests were:
(resident species)

Redlegged earth mite (RLEM), *Halotydeus destructor*, occurred in high densities in crops and pastures around Lower Eyre Peninsula from late May onwards, but generally at lower densities further north. Some pastures that received a well-timed TimeRite® insecticide treatment in spring 2019 experienced substantially lower densities than untreated pastures and crops. Whilst a good decision on those paddocks last spring, this alone should **not** be used as a basis for implementing TimeRite® across the whole farm in 2020/21! In most years, crops following a relatively weed-free crop rotation will not require TimeRite®. We further discuss risk assessment below.

Bryobia (clover) mite, *Brobyia spp.*, occurred early in canola crops at typical densities. This mite moves from weeds onto seedlings during warmer conditions of early autumn.

Lucerne flea, *Sminthurus viridus*, has reportedly been less problematic in recent seasons compared to some years.

Vegetable weevil, *Listroderes difficolus*, and spotted vegetable weevil, *Steriphys diversipes*, damaged canola crops in patches around the west coast. Capeweed is a preferred host for vegetable weevil.

Russian wheat aphid (RWA), *Diuraphis noxia*, has remained at low overall densities. A dry summer in most areas led to very low seasonal risk. Isolated patches of RWA were observed in cereals around Eyre Peninsula, even in areas that experienced a very dry summer. It is possible that some aphids were transported into cropping areas on the same winds as the moths (see following section), although this is difficult to verify. Low RWA populations on young plants will not cause significant yield loss unless there is a significant build-up of populations in spring. Economic thresholds for RWA will soon be available through the GRDC Investment "Russian Wheat Aphid Risk Assessment and Regional Thresholds".

Key Question 2 -what conditions lead to these pests being such a problem for growers?

Moths/caterpillars (transient pests)

It is likely that unusually high moth and caterpillar activity in early 2020 resulted from a significant moth migration event/s in early autumn. This can occur when rainfall in inland source areas causes growth of insect host plants, warm temperatures support population build-up and flight, and suitable wind systems transport the insects into cropping zones. Evidence for migration included the sudden appearance of several migratory moth species in crops around the same time. Large flights of weed web moth and other species were recorded on Eyre Peninsula, Adelaide and the South East region in late March and early April.

Weed web moth is a native insect and, although little is known of its biology, it is likely to feed on native plants. Large populations of weed web moth caterpillars were reported attacking crops in southern and central NSW in March 2020. This followed significant rainfall in parts of southern Queensland and NSW during February, which could have supported population growth and migration



of this insect. Weed web moths observed on Eyre Peninsula in April had tattered wings, suggesting they originated from pastoral zones some distance away. These same wind systems likely transported the other moth species, including native budworm, cutworms, webworms and armyworms, and possibly some Russian wheat aphid, into cropping areas.

Redlegged earth mite (resident pest)

Large populations of RLEM in early 2020 may have resulted from suitable weather conditions in spring 2019 and autumn 2020. RLEM typically undergoes three generations per year. In the third generation (after 15th September at Cummins, based on TimeRite® spray date) mites produce over-summering diapause eggs retained in the body of the female. Mites survive summer as diapause eggs and hatch the following autumn when suitable conditions occur; over 5mm rainfall coinciding with mean daytime temperatures under 16°C for 10 days.

Parts of the Eyre Peninsula received substantial rainfall in spring 2019 (Figure 1). Moisture around the TimeRite® date can lengthen the spring growing season and lead to more over-summering mite eggs produced. In autumn 2020, high rainfall coinciding with cool temperatures occurred in late April, particularly on Lower Eyre Peninsula (Figure 1). Suitable hatching conditions over the region may have caused a synchronous hatching of RLEM

coinciding with emerging crops. In years with a less synchronous autumn break, RLEM hatching can occur in a more staggered fashion, leading to lower initial densities and allowing crops to out-grow some early damage.

Key Question 3 -what can we learn from 2020 and how will this shape management decisions for 2021?

Recommended approach

The key message is not to assume pest issues in 2021 will be the same as those experienced in 2020. While it can be tempting to implement more blanket and widespread control measures following a higher pest pressure year, chasing last year's pest problems the following season is rarely successful. Every season brings different pest issues and blanket approaches are not sustainable.

We advise making strategic decisions by **assessing risk** on a seasonal basis. New resources are available to assist growers assess risks in advance of sowing, and throughout the season. 'Best Management Practice Guides' were recently developed for [redlegged earth mite](#), [green peach aphid](#) and [diamondback moth](#) (see Useful Resources). Each of these guides include a Risk Assessment Guide and podcast. Growers and agronomists are strongly encouraged to familiarise

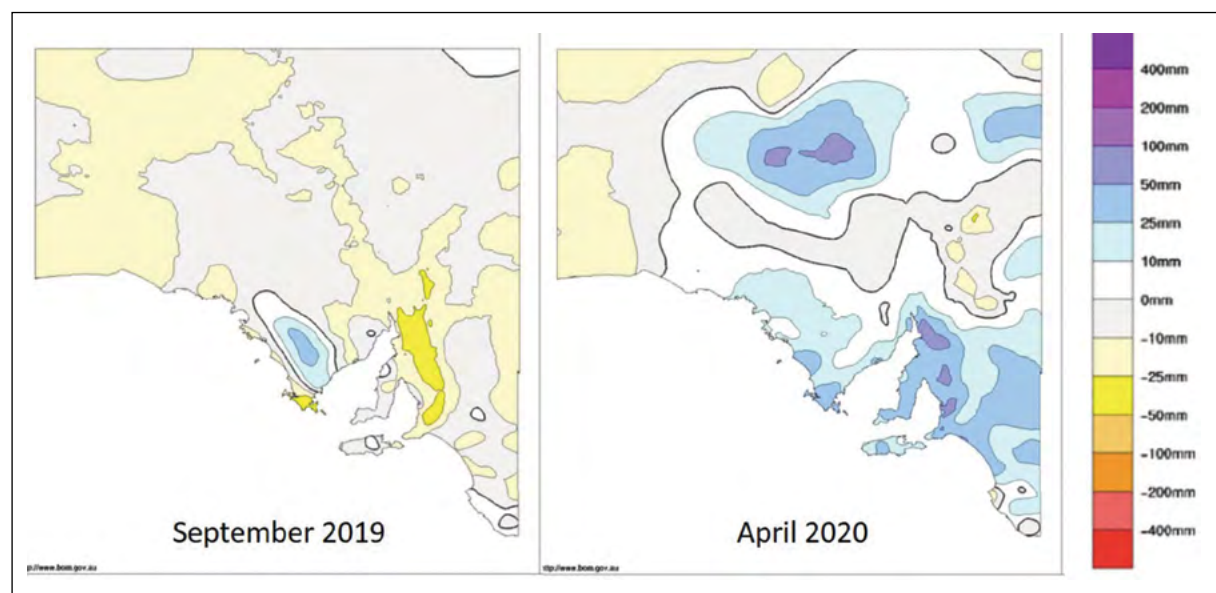


Figure 1. Monthly rainfall anomalies (rain compared to long term-average rain) showed above-average rainfall on parts of Eyre Peninsula during spring 2019 and April 2020, contributing to high populations of redlegged earth mite in autumn 2020. Source: Modified from the Australian Bureau of Meteorology <http://www.bom.gov.au/climate/maps/>.



themselves with the guides and incorporate them into pre-season farm/paddock planning. Factors that contribute to seasonal risk of establishment pests include:

- Green bridge vegetation during February to May, driven by rainfall, supports transient pests such as aphids and diamondback moth. More green bridge increases risk, and scarce green bridge leads to low pest risk. Summer weeds also support earth mites and other resident pests and must be controlled as early as possible.
- Paddock history. For resident pests, previous pest problems, crop rotations, weed control, insecticide use and seasonal conditions, all contribute to risk.

Moth/caterpillars and aphids (transient pests)

Transient species are difficult to predict in advance but easy to manage if detected early. Standard insecticides can be applied to infested areas as warranted.

Moths/caterpillars: Moth flights indicate potential for caterpillar activity in crops several weeks later and are a prompt to start monitoring. Ensure early detection is achieved by monitoring emerging crops, and freely subscribing yourself (or ensuring your adviser is subscribed to) to regional notification services such as PestFacts South Australia newsletter (Useful Resources). This service relies on your reports.

Will these caterpillars be a problem next year? By their very nature, issues with transient pests are often ... transient. Migratory species, such as moths, tend to occur in boom/bust cycles. Typically, they arrive suddenly in large numbers, breed locally through one generation, then newly emerged adults disperse elsewhere. Immigrant populations often do not persist locally in any substantial numbers for more than a single generation, as their primary habitat occurs in source areas. It is unlikely these moth species will be problematic again in 2020 or 2021 unless further immigration events occur. Migrations of the scale observed in 2020 are relatively uncommon, but monitoring is the key.

Aphids: The abundance of green bridge vegetation is important. Dry conditions and lack of green bridge during late summer and autumn indicates low seasonal risk. Under these conditions, seed treatments for RWA control in cereals are not warranted in most instances. If build-up occurs after emergence, this pest can be easily controlled using standard registered insecticides.

Redlegged earth mite (resident pest)

By contrast, resident pests are somewhat easier to predict but more challenging to manage. The key is assessing paddock risk before sowing, monitoring crops in the first 3-5 weeks after emergence, and correct identification before deciding on control. For earth mites, correct identification is particularly important, as different mite species display differences in tolerance to insecticides. Additionally, TimeRite® is only effective on redlegged earth mite, and not effective on other mites or Lucerne flea.

For RLEM, risk of high mite populations depends on last year's crop/pasture type, weed status, seasonal conditions and RLEM numbers, and the susceptibility of the next planned crop. A well-timed spring spray according to the TimeRite® strategy can be an effective option but should be reserved only for high-risk situations (e.g. planting canola after a legume-based pasture). Some crops, such as lentils and chickpeas, are poor RLEM host plants. In weed-free paddocks, low RLEM numbers can typically be expected the year following these rotations. In autumn, plan insecticide strategies according to paddock risk, based on the RLEM Risk Assessment Guide (Useful Resources).

Avoid pre-emergent insecticides in low risk situations. Monitor susceptible crops closely in the first 3-5 weeks after emergence. If insecticides are warranted, follow guidelines in the Resistance Management Strategy for Redlegged earth mite (Useful Resources).

Conclusion

Every season brings different pest management challenges. The key to successful pest management is effectively assessing and managing risk. It is important to avoid chasing this year's pest issues next year – assess each season on its own merits.

Acknowledgements

I would like to thank GRDC for their continued support, Helen Brodie for help with insect identifications, and agronomists and growers for their observations.

Useful resources

PestFacts South Australia e-newsletter, and Twitter @PestFactsSARDI https://www.pir.sa.gov.au/research/services/reports_and_newsletters/pestfacts_newsletter



Redlegged earth mite, Best Management Practice and Risk Assessment Guide <https://grdc.com.au/news-and-media/audio/podcast/using-all-our-tools-for-pest-management-redlegged-earth-mite>

Redlegged earth mite, Resistance Management Strategy

<https://grdc.com.au/FS-RLEM-Resistance-strategy>

Green peach aphid, Best Management Practice and Risk Assessment Guide <https://grdc.com.au/news-and-media/audio/podcast/using-all-our-tools-for-pest-management-green-peach-aphid>

Diamondback moth, Best Management Practice and Risk Assessment Guide: <https://grdc.com.au/news-and-media/audio/podcast/using-all-our-tools-for-pest-management-diamondback-moth>

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Notes



Notes



NVT tools

CANOLA | WHEAT | BARLEY | CHICKPEA | FABA BEAN | FIELD PEA |
 LENTIL | LUPIN | OAT | SORGHUM

Long Term Yield Reporter

New web-based high speed Yield Reporting tool, easy-to-use means of accessing and interpreting the NVT Long Term MET (Multi Environment Trial) results.



Crop Disease Au App



Access to current disease resistance ratings & disease information.

Long Term Yield App



Easy access to the analysed NVT Multi Environment Trial (MET) data.

SPRAY APPLICATION GROWNOTES™ MANUAL



Module 17
Pulse width modulation systems
How they work and set-up considerations



SPRAY APPLICATION MANUAL FOR GRAIN GROWERS

The Spray Application GrowNotes™ Manual is a comprehensive digital publication containing all the information a spray operator needs to know when it comes to using spray application technology.

It explains how various spraying systems and components work, along with those factors that the operator should consider to ensure the sprayer is operating to its full potential.

This new manual focuses on issues that will assist in maintaining the accuracy of the sprayer output while improving the efficiency and safety of spraying operations. It contains many useful tips for growers and spray operators and includes practical information – backed by science – on sprayer set-up, including self-

propelled sprayers, new tools for determining sprayer outputs, advice for assessing spray coverage in the field, improving droplet capture by the target, drift-reducing equipment and techniques, the effects of adjuvant and nozzle type on drift potential, and surface temperature inversion research.

It comprises 23 modules accompanied by a series of videos which deliver ‘how-to’ advice to growers and spray operators in a visual easy-to-digest manner. Lead author and editor is Bill Gordon and other contributors include key industry players from Australia and overseas.

Spray Application GrowNotes™ Manual – go to:
<https://grdc.com.au/Resources/GrowNotes-technical>
 Also go to <https://grdc.com.au/Resources/GrowNotes>
 and check out the latest versions of the Regional Agronomy Crop GrowNotes™ titles.



TOP 10 TIPS

FOR REDUCING SPRAY DRIFT

01

Choose all products in the tank mix carefully, which includes the choice of active ingredient, the formulation type and the adjuvant used.

02

Understand how product uptake and translocation may impact on coverage requirements for the target. Read the label and technical literature for guidance on spray quality, buffer (no-spray) zones and wind speed requirements.

03

Select the coarsest spray quality that will provide an acceptable level of control. Be prepared to increase application volumes when coarser spray qualities are used, or when the delta T value approaches 10 to 12. Use water-sensitive paper and the Snapcard app to assess the impact of coarser spray qualities on coverage at the target.

04

Always expect that surface temperature inversions will form later in the day, as sunset approaches, and that they are likely to persist overnight and beyond sunrise on many occasions. If the spray operator cannot determine that an inversion is not present, spraying should NOT occur.

05

Use weather forecasting information to plan the application. BoM meteograms and forecasting websites can provide information on likely wind speed and direction for 5 to 7 days in advance of the intended day of spraying. Indications of the likely presence of a hazardous surface inversion include: variation between maximum and minimum daily temperatures are greater than 5°C, delta T values are below 2 and low overnight wind speeds (less than 11km/h).

06

Only start spraying after the sun has risen more than 20 degrees above the horizon and the wind speed has been above 4 to 5km/h for more than 20 to 30 minutes, with a clear direction that is away from adjacent sensitive areas.

07

Higher booms increase drift. Set the boom height to achieve double overlap of the spray pattern, with a 110-degree nozzle using a 50cm nozzle spacing (this is 50cm above the top of the stubble or crop canopy). Boom height and stability are critical. Use height control systems for wider booms or reduce the spraying speed to maintain boom height. An increase in boom height from 50 to 70cm above the target can increase drift fourfold.

08

Avoid high spraying speeds, particularly when ground cover is minimal. Spraying speeds more than 16 to 18km/h with trailing rigs and more than 20 to 22km/h with self-propelled sprayers greatly increase losses due to effects at the nozzle and the aerodynamics of the machine.

09

Be prepared to leave unsprayed buffers when the label requires, or when the wind direction is towards sensitive areas. Always refer to the spray drift restraints on the product label.

10

Continually monitor the conditions at the site of application. Where wind direction is a concern move operations to another paddock. Always stop spraying if the weather conditions become unfavourable. Always record the date, start and finish times, wind direction and speed, temperature and relative humidity, product(s) and rate(s), nozzle details and spray system pressure for every tank load. Plus any additional record keeping requirements according to the label.

THE 2017-2020 GRDC SOUTHERN REGIONAL PANEL

JANUARY 2020

CHAIR - JOHN BENNETT



Based at Lawloit, between Nhill and Kaniva in Victoria's West Wimmera, John, his wife Allison and family run a mixed farming operation across diverse soil types. The farming system is 70 to 80 percent cropping, with cereals, oilseeds, legumes and hay grown. John believes in the science-based research, new technologies and opportunities that the GRDC delivers to grain growers. He wants to see RD&E investments promote resilient and sustainable farming systems that deliver more profit to growers and ultimately make agriculture an exciting career path for young people.

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Mike is a researcher with the University of Adelaide, based at the Waite campus in South Australia. He specialises in soil fertility and crop nutrition, contaminants in fertilisers, wastes, soils and crops. Mike manages the Fertiliser Technology Research Centre at the University of Adelaide and has a wide network of contacts and collaborators nationally and internationally in the fertiliser industry and in soil fertility research.

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Peter is a farmer at Mudamuckla near Ceduna on South Australia's Western Eyre Peninsula. He uses liquid fertiliser, no-till and variable rate technology to assist in the challenge of dealing with low rainfall and subsoil constraints. Peter has been a board member of and chaired the Eyre Peninsula Agricultural Research Foundation and the South Australian Grain Industry Trust.

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Jon has worked in agriculture for the past three decades, both in the UK and in Australia. In 2004 he moved to Geelong, Victoria, and managed Grainsearch, a grower-funded company evaluating European wheat and barley varieties for the high rainfall zone. In 2007, his consultancy managed the commercial contract trials for Southern Farming Systems (SFS). In 2010 he became Chief Executive of SFS, which has five branches covering southern Victoria and Tasmania. In 2012, Jon became a member of the GRDC's HRZ Regional Cropping Solutions Network.

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Fiona has been farming with her husband Craig for 21 years at Mulwala in the Southern Riverina. They are broadacre, dryland grain producers and also operate a sheep enterprise. Fiona has a background in applied science and education and is currently serving as a committee member of Riverine Plains Inc, an independent farming systems group. She is passionate about improving the profile and profitability of Australian grain growers.

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Lou is a farmer based at Lameroo in the Southern Mallee of South Australia. Along with her parents and partner, she runs a mixed farming enterprise including export oaten hay, wheat, barley a variety of legumes and a self-replacing Merino flock. After graduating Lou spent 3 years as a sales agronomist where she gained valuable on-farm experience about the retail industry and then returned to her home town of Lameroo. She started her own consultancy business three years ago and is passionate about upskilling women working on farms.

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RICHARD MURDOCH



Richard along with wife Lee-Anne, son Will and staff, grow wheat, canola, lentils and faba beans on some challenging soil types at Warooka on South Australia's Yorke Peninsula. They also operate a self-replacing Murray Grey cattle herd and Merino sheep flock. Sharing knowledge and strategies with the next generation is important to Richard whose passion for agriculture has extended beyond the farm to include involvement in the Agricultural Bureau of SA, Advisory Board of Agriculture SA, Agribusiness Council of Australia SA, the YP Alkaline Soils Group and grain marketing groups.

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MICHAEL CHILVERS



Michael runs a collaborative family farming enterprise at Nile in the Northern Midlands of Tasmania (with property also in northern NSW) having transitioned the business from a dryland grazing enterprise to an intensive mixed farming enterprise. He has a broad range of experience from resource management, strategic planning and risk profiling to human resource management and operational logistics, and has served as a member of the the High Rainfall Zone Regional Cropping Solutions Network for the past seven years.

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KATE WILSON



Kate is a partner in a large grain producing operation in Victoria's Southern Mallee region. Kate and husband Grant are fourth generation farmers producing wheat, canola, lentils, lupins and field peas. Kate has been an agronomic consultant for more than 20 years, servicing clients throughout the Mallee and northern Wimmera. Having witnessed and implemented much change in farming practices over the past two decades, Kate is passionate about RD&E to bring about positive practice change to growers.

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ANDREW RUSSELL



Andrew is a fourth generation grain grower and is currently the Managing Director and Shareholder of Lilliput AG and a Director and Shareholder of the affiliated Baker Seed Co - a family owned farming and seed cleaning business. He manages the family farm in the Rutherglen area, a 2,500 ha mixed cropping enterprise and also runs 2000 cross bred ewes. Lilliput AG consists of wheat, canola, lupin, faba bean, triticale and oats and clover for seed, along with hay cropping operations. Andrew has been a member of GRDC's Medium Rainfall Zone Regional Cropping Solutions Network and has a passion for rural communities, sustainable and profitable agriculture and small business resilience.

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Nicole Jensen is GRDC General Manager for the newly created Genetics and Enabling Technologies business group. Nicole brings a wealth of experience in plant breeding and related activities arising from several roles she has held in Australia and internationally in the seed industry including positions as Supply Innovation Lead with the Climate Corporation - Monsanto's digital agricultural flagship, Global Trait Integration Breeding Lead for Monsanto.

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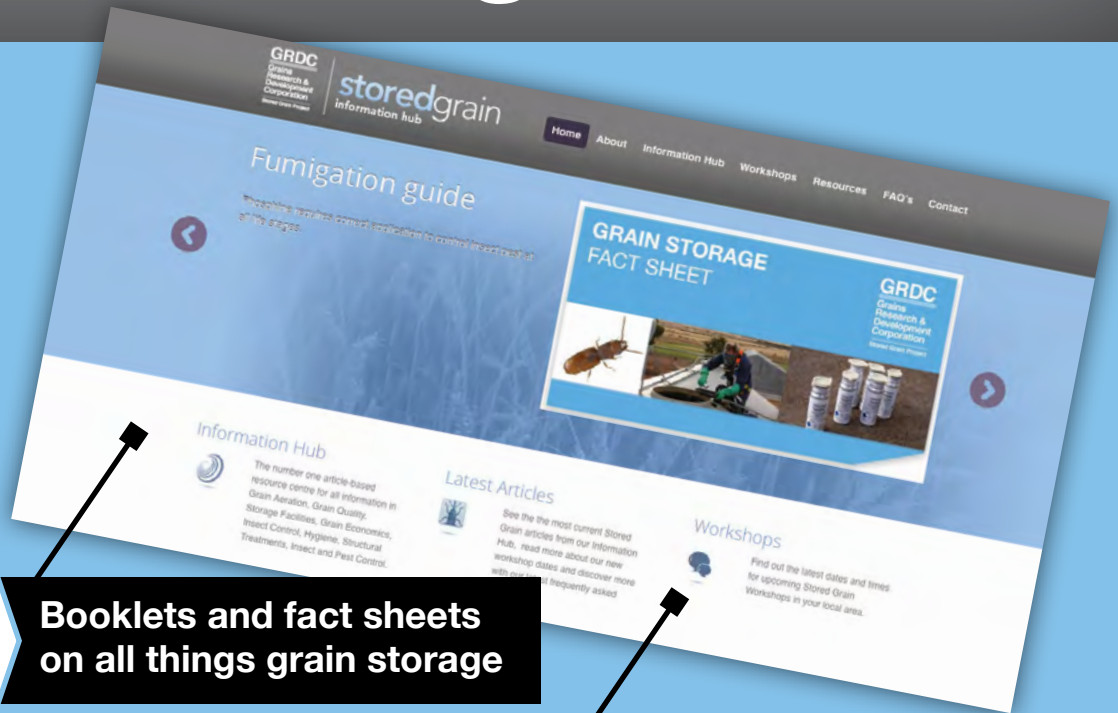
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