Protecting WA Crops

Issue: 47
Date: April 2025

Contents

The 2025 GRDC Grains Research Updates, showcases the latest research and results from across the grains industry.

Several Crop Protection researchers from the Department of Primary Industries and Regional Development (DPIRD) were among the industry experts presenting on a variety of topical issues.

In this issue of Protecting WA Crops, we spotlight the presentations delivered by DPIRD entomologist and 2025 Seed of Light winner, Svetlana Micic and DPIRD Senior Research Scientist, Ben Congdon.

Beneficial insects in canola

At a glance:

- Increasing restrictions on pesticide use is driving market demand for alternative pest control methods in canola.
- An integrated pest management strategy involving natural enemies of insect pests could be a promising strategy for pest control.
- We are investigating the factors that impact the arrival timing of natural enemies, their impact on pests and persistence in the field.

Pest management in canola has always been challenging due to the crop's high susceptibility to pests. Traditionally, control strategies have relied heavily on non-selective pesticides. However, growers are facing increasing restrictions on pesticide use, whether due to regulatory changes or market demands. As a result, alternative approaches to pest control are becoming necessary.

One promising strategy involves using natural enemy species (lacewings, ladybeetles, parasitoid wasps, carabid beetles and many other species) for suppress pest populations. However, for natural enemies to be effectively integrated into pest management, robust surveillance systems are needed. These systems must combine diverse monitoring techniques to determine when and where natural enemies are present in canola fields, providing growers with the confidence to rely on them for pest control. A surveillance system that incorporates natural enemies would allow growers to either delay spraying while monitoring population dynamics or opt for selective insecticides that preserve beneficial species.

DPIRD is participating in a 5-year project led by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and supported by the Grains Research and Development Corporation (GRDC). In partnership with the South Australian Research and Development Institute (SARDI), New South Wales Department of Primary Industries (NSW DPI), and Murdoch University, the project is focused on answering two key questions:

1. Do early-season pesticide applications affect the arrival time of natural enemies, thereby impacting their ability to control late-season pests?
2. Does the early arrival of natural enemies in the late season help reduce pest populations and minimize crop losses?

To answer these questions, the team developed a standardised trial protocol to be implemented across multiple locations over several years. They introduced contrasting treatments — some with common insecticide use and others without. This approach enables researchers to observe sites with different levels of pests each year and captures the diversity of natural enemies present in canola crops.

In 2024 (the first year), field trials were conducted across multiple locations, including Northam and Katanning in Western Australia (WA), Wagga Wagga and Tamworth in New South Wales (NSW), and Rosedale in South Australia (SA). The canola cultivar *Bonito* was used at the WA sites, while *43Y92CL* was sown at Tamworth and Rosedale, and *Renegade* was used at Wagga Wagga. Each site included two treatment groups: sprayed and unsprayed. The sprayed treatment involved multiple insecticide applications, including:

- Chlorpyrifos (500 gai/L) at 350 mL/ha, applied seven days prior to seeding
- Imidacloprid (600 gai/L) at 400 mL/100 kg of seed, applied as a seed dressing
- Bifenthrin (250 gai/L) at 820 mL/ha, applied at the time of seeding
- Alphacypermethrin (250 gai/L) at 160 mL/ha, applied at the stem elongation stage

These insecticide groups are useful for controlling pest species but are also considered to be very highly toxic or highly toxic to many natural enemy groups in controlled laboratory studies.

Additionally, at the Northam site, Cyantraniliprole (100 g/L) was applied once at 150 mL/ha during the flowering stage to target diamondback moth larvae that had reached threshold. The unsprayed plots did not receive any insecticide treatments (either via sprays or seed dressings). However, due to significant early damage from red legged earth mites, the unsprayed treatment at Northam required resowing to establish an adequate crop.

Notably, Northam was the only trial site with a pasture rotation in 2023, whereas all other locations had a cereal crop in the previous season. Multiple techniques were used to monitor crops for pests, predators and parasitoids on the ground, in the air and on plants. The date from 2024 has not yet been fully analysed but describe some patterns observed here.

Aphids and their parasitoid wasps

In both sprayed and unsprayed treatments, sticky traps captured parasitoid adults flying either at the same time as their host aphids-coinciding with crop germination (Northam and Rosedale) or after their host (Katanning and Tamworth). At Wagga Wagga, parasitoid wasps were detected three weeks later in the sprayed treatment on sticky traps. The sweep net results, which collect samples directly off the plant, showed no difference in the time of arrival of aphid parasitoids between sprayed and unsprayed at two locations (Northam, Tamworth), a delay in the sprayed treatment at two locations (Katanning and Wagga Wagga) and the opposite pattern at one site (Rosedale).

Although parasitoids were generally present very early in the season in canola fields the insecticide applications appeared to affect their persistence and activity within the crop. Plant assessments detected parasitised aphids (mummies) at least four weeks earlier in the unsprayed treatments compared to the sprayed treatments. Overall, aphid numbers remained low, preventing an assessment of the parasitoids' impact on aphid populations across the season.

DBM patterns

Diamondback (DBM) adult moth arrival was monitored using pheromone traps at four locations, but only in WA was DBM a consistent problem for growers in 2024. At Tamworth and Wagga Wagga, the adults arrived at the same time in both treatments, but there were predators present before larvae were seen on the canola plants (in sweep nets). In WA the adults arrived earlier in the crop growth cycle, and earlier in the sprayed treatment in Katanning, and in the unsprayed treatment in Northam. The predators were then detected well after the larvae were found on the plants and there appeared to be a difference between the treatments.

Across all the sites we can see that natural enemies are present very early in the canola growth cycle, and insecticide applications do impact them but in inconsistent ways. Insecticide use may affect their ability to persist within the crop over time, but more data analysis is required to understand the different factors that are important in each location.

To learn more about beneficial insects refer to the GRDC Back Pocket Guide Beneficial Insects.

Attribution

Canola Allies: Tailoring Practices for Beneficials in Canola Systems (2023-2028). GRDC Investment CSP2309-004RTX Minimising damage of invertebrate pests in canola through a better understanding of the impact of beneficial insects. A collaborative research project led by CSIRO, in partnership with NSW DPIRD, SARDI, Murdoch University, DPIRD and Biological Services.

Turnip yellows virus impact in WA in 2024 and new insights into management using insecticides and host resistance

Canola crop displaying likely symptoms of turnip yellows virus infection. Image: Andrew Phillips (DPIRD).

At a glance:

- TuYV is transmitted by the GPA in a highly efficient manner; so even small inconspicuous populations of aphids can cause significant TuYV spread.
- High levels of turnip yellows virus (TuYV) infection occurred in canola crops the Geraldton port zone in 2024 associated with green peach aphid (GPA) activity beginning in July, early in crop development.
- In two field trials conducted in Western Australia, a neonicotinoid seed treatment was ineffective at suppressing TuYV.
- A foliar spray of sulfoxaflor was moderately effective when applied during the early stages of GPA colonisation. With the aid of routine crop monitoring, if both GPA and TuYV are present, foliar insecticides should be targeted early in crop development when the crop is most vulnerable to TuYV.
- Host resistance was highly effective at suppressing TuYV spread and offers a promising avenue for TuYV control.
- Combining control measures in an integrated disease management approach is likely to be more effective long-term than relying on just one control measure.

Turnip yellows virus (TuYV) is the most widespread and economically damaging virus of canola in Australia. It is transmitted by the green peach aphid (GPA), a highly efficient vector. As few as one to two aphids are sufficient to transmit the virus, meaning that even low aphid populations can lead to widespread infection across a crop. GPA can be challenging to find on a canola plant, due to their small size and green colour, meaning they can spread TuYV before they are even noticed in the crop.

In 2024, the Department of Primary Industries and Regional Development (DPIRD) virology team conducted green peach aphid and turnip yellows virus (TuYV) monitoring across several sites in the WA grainbelt. High levels of TuYV were detected in symptomatic canola crops within the Geraldton port zone (Figure 1) where GPA were initially observed colonizing small patches of crops in early July. TuYV was also first detected in GPA in early July, indicating that the virus was likely present in the initial colonizing populations.

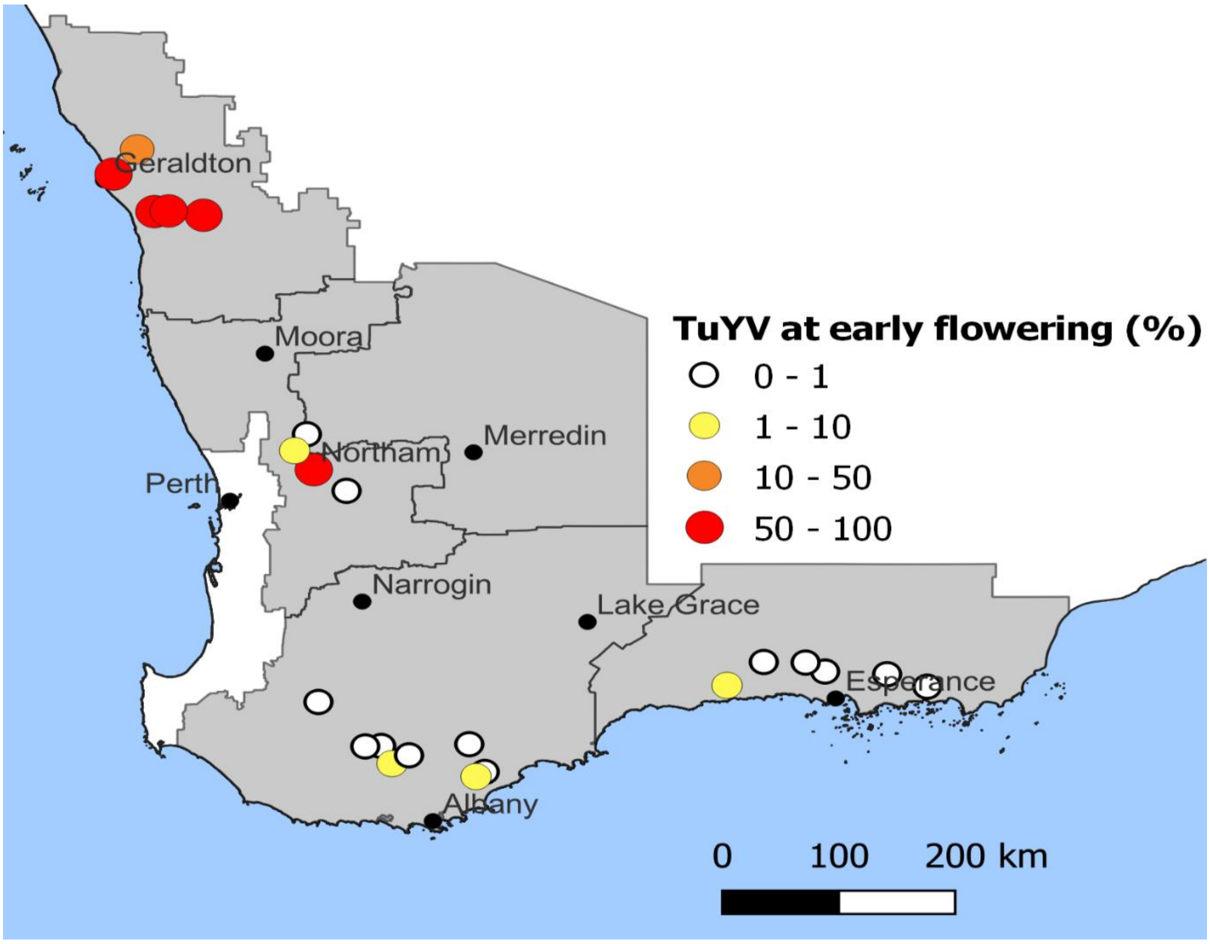

Figure 1. Map showing the amount in TuYV (%) infection at early flowering in canola crops monitored by DPIRD in 2024.

The GPA population increased rapidly over the July period with many crops reaching over 70% infestation by the end of the month. Subsequently, TuYV also exploded to >70% infection around the epicenter of the outbreak whilst also reaching significant levels in surrounding areas. Based on harvest data, yield losses were estimated to range between 10 to 50% depending on the timing of infection, infection severity, and the presence of other stressors.

TuYV management involves preventing high levels of spread during the vegetative stage of the crop through neonicotinoid-based seed treatments which has been the primary method of GPA control. Imidacloprid, clothianidin and thiamethoxam are three neonicotinoids currently used in registered formulations however GPA has developed resistance to these seed treatments over the past decade.

Growers also have the choice of several foliar insecticides registered for GPA in canola crops including sulfoxaflor (registered as Transform® in 2014), flonicamid (MainMan®, 2021) and afidopyropen (Versys®, 2021).

Resistant varieties are considered the most cost-effective and reliable approach to managing plant viruses. Canola varieties screened in 2020/2021 for TuYV showed that most varieties were highly susceptible, but resistance was present in some e.g. Stingray.

Two field experiments conducted at Muresk in 2023 and 2024 by DPIRD, investigated the effectiveness of a neonicotinoid-based seed treatment, foliar insecticide (sulfoxaflor) applied at different timings, and TuYV-resistance in Stingray, alone and in combination, to control TuYV.

The results from these trials showed that neonicotinoid-based seed treatment offered only mild reduction in GPA population and infestation rate compared to the untreated plots, and little to no reduction in TuYV spread. The sulfoxaflor application was found to be moderately effective when sprayed during the early stages of GPA infestation, subsequently reducing the spread of TuYV. However later applications of sulfoxaflor were less effective at reducing TuYV spread. In high virus pressure scenarios with significant primary spread (large numbers of aphids flying into the crop for longer periods of time), a second spray with a different mode of action 2-3 weeks after the first spray may be required to adequately suppress TuYV spread.

In contrast to insecticides, host resistance in canola variety Stingray was highly effective at suppressing TuYV spread. In the long term, it was found that host resistance offers a more efficient and sustainable basis of TuYV control to and will reduce the requirement for insecticide application.

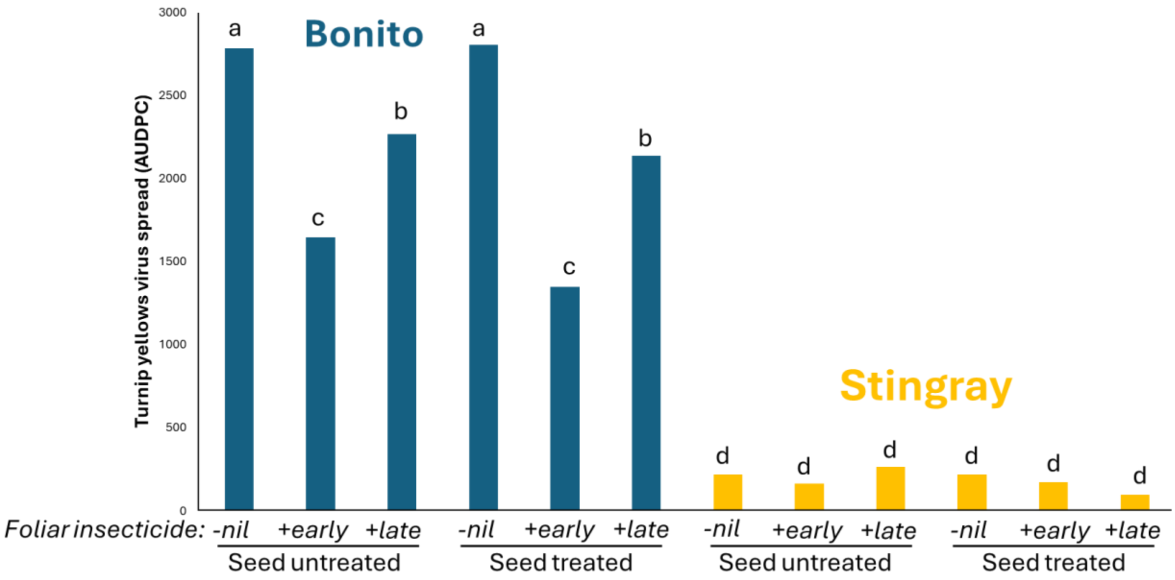

Figure 2. The impact of a foliar insecticide application, seed treatment and resistant variety on turnip yellows virus spread (area under the disease progress curve - AUDPC)). Letters denote statistical significance.

Further research is currently underway through a GRDC-supported project to better understand the TuYV resistance phenotype and its potential economic benefits—so stay tuned for upcoming findings.

For further details, see DPIRD Research Scientist Ben Congdon's GRDC Research Updates paper, titled "Turnip yellows virus and its vector, the green peach aphid, in canola: the 2024 epidemic in southern New South Wales and management options."

Meet Crop protection team member - Sharmin Rahman

Dr. Sharmin Rahman is a DPIRD research scientist working with the Virology team, where her focus is on managing Turnip yellows virus (TuYV) in canola. In collaboration with the University of Queensland, she is evaluating the efficacy of topical double-stranded RNA (dsRNA) applications as a novel virus control strategy. Additionally, Sharmin is involved in research on soil-borne fungal diseases, such as Rhizoctonia, and contributes to project management and reporting activities.

Sharmin's academic journey began in Bangladesh, where she earned a bachelor's degree in Agricultural Science and a master's degree in Genetics and Plant Breeding. She worked as a Scientific Officer in the Biotechnology Division of the Bangladesh Rice Research Institute (BRRI), before joining the Plant Breeding Division at the Bangladesh Agricultural Research Institute (BARI).

In 2013, Sharmin moved to Australia to pursue a PhD at Murdoch University investigating RNA interference (RNAi)-mediated gene silencing of neuronal genes in the green peach aphid (GPA) as a pest control strategy.

Sharmin began working at the DPIRD Merredin office in 2017, working as a technical officer on a national soil salinity project. Following a period of parental leave, she worked as a research officer at the University of Western Australia (UWA), before recently returning to work at DPIRD.

Outside of work, Sharmin enjoys reading, spending quality time with family and friends, and exploring new places.