Figure 1. Parasitoid wasp on canola flower. Image: Amber Balfour-Cunningham.

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The 2026 Grains Research and Development Corporation (GRDC) Grains Research Update event in Perth, showcased 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 presentation delivered by DPIRD Research Scientist and current University of Western Australia (UWA) PhD student, Amber Balfour-Cunningham.

When could less spray mean more pay? Monitoring beneficial parasitoid wasps working to benefit your farm

At a glance

- Parasitoid wasps are important natural enemies of many crop pests. The developing larvae of parasitoid wasps kill their host by consuming them from the inside. A number of species of diamondback moth (DBM) larvae parasitoid wasps are present in WA canola systems. However, their activity varies between regions, seasons, and within individual paddocks.

- Careful monitoring of DBM larvae and beneficial insect numbers across both healthy and stressed areas of a canola paddock improves accuracy of monitoring DBM numbers and the beneficial insects already helping to control them.

Parasitoid wasps are important natural enemies of many crop pests. The adult waps lay eggs in living hosts and the developing larvae of parasitoid wasps kill their host by consuming them from the inside. Although commercially produced parasitoids are widely released for biological control in irrigated cropping systems, much less is known about the abundance and role of naturally occurring parasitoid wasps in Australian grain production landscapes.

A PhD project supported by a GRDC Research Scholarship, DPIRD and the University of Western Australia (UWA) is addressing this gap through the first regionwide surveys of parasitoid wasps attacking diamondback moth (DBM) larvae in Western Australian canola crops. The surveys are monitoring crops for the presence of parasitoid presence, activity and potential management options to contribute to the control of DBM.

DBM infestations in canola are often sporadic, and unpredictable and due to survival of eggs and some small larvae following insecticide application, two spray applications a fortnight apart is recommended if chemical control is used. Adding to this challenge, DBM has the highest number of documented cases of insecticide resistance worldwide. While parasitoid wasps can be highly effective biological control agents against DBM, their activity and impact in Australian broadacre cropping systems remain poorly understood.

Monitoring parasitoid wasps

The small size of parasitoid wasps can make them difficult to detect during routine crop inspections without knowledge on what to look for. Many species are black, less than 4 mm long and move quickly, meaning they can be overlooked or mistaken for insects such as midges. Detection is further complicated by the fact that DBM larvae that have been parasitised look no different from healthy larvae. The egg and pupal stages of DBM can also be parasitised.

Sometimes parasitoids wasps may be observed resting on canola leaves, particularly on cool mornings. Once active, studies on *Cotesia* wasps by Wanner et al (2006) indicate one female wasp will search at least 400m^2 of crop per day for host caterpillars.

Parasitoids also have indirect impacts on pests, such as reducing the time the pests spend on plants or feeding on leaves, as they hide to escape becoming a host when parasitoids are present.

Sometimes parasitised larvae may be eaten by predators before the parasitoid completes its development, even though the wasp has already attacked the pest. Further to this, there are also no commercially available pheromone lures for monitoring parasitoid wasps.

For these reasons, not seeing parasitoid wasps in crops or obvious signs of parasitoids does not mean they are absent or that they are not helping to suppress pest populations.

Several monitoring methods were tested during this research including sticky dates, sweep net sampling, visual inspection methods such as the squish test, and sentinel plants exposed to natural enemies. While it was found that all these methods detect the presence of parasitoids, population levels were generally underestimated.

A more accurate measure of parasitoid activity, although more labour intensive, was to rear DBM larvae collected from the sweep net samples. The larvae, reared on canola

leaves, could be identified as a beneficial parasitoid wasp or a pest moth after 1-2 weeks. Parasitoids can generally be identified prior to emergence by their rounded ‘gherkin’ shaped pupae, that may be light brown, tan, white or light yellow in colour, as opposed to the white or grey ‘cigar’ shaped pupae casings of DBM.

Regional patterns of parasitoid activity

Parasitoid wasps were consistently detected at most monitoring sites in the Albany and Esperance port zone across all years of the study. In other regions, parasitoids were more likely to be detected in years, such as 2024, when DBM activity was higher than usual. The surveys suggests that parasitoid wasps are present across all canola growing areas, but their detectability depends on factors such as location, host pest abundance, and insecticide spray history.

As parasitoids were monitored through sampling and rearing of DBM larvae, if no larvae were collected in sweeps, then no parasitoids could be detected. However, this does not mean that parasitoids and other natural enemies were not active at the site.

What happens within a paddock?

DBM are commonly monitored through sweep net monitoring.

In 2024, two canola sites, at Cunderdin and York, were monitored for DBM and parasitoid wasps, and sweep net samples were analysed to determine their distribution across the site in relation to one another and other crop variables

As may be expected, at the Cunderdin site, it was found that areas where plant density was moderate to high, indicating good emergence and plant health, correlated with high numbers of beneficial insects and lower population densities of DBM. Alternatively, areas with high numbers of both pests and natural enemies were linked to lower plant density, where factors such as soil type and moisture were likely causing plant stress

These differences aligned with variations in soil type, plant stress, crop emergence, and canopy density earlier in the season, and ultimately corresponded with yield differences at harvest. In addition, most parasitoid wasps were collected close to crop edges, rather than within the crop, indicating that there may be regular movement between the canola crop and remnant vegetation or non-crop areas outside the paddock.

However, at the York site, it was found that overall, there was less DBM present and natural enemies were more evenly abundant across the site, with no associations with plant density or other paddock variables.

These results suggest that stressed and healthy patches within a canola paddock may function as distinct sub-sites for insect activity and when sweep netting should be considered separate.

What this means for crop monitoring

The results from this research indicate that paddock sampling across different crop conditions, such as in denser or more stressed areas, may provide a more accurate indication of the presence or absence of both DBM and beneficial insects. This supports more informed management decisions.

For more information on parasitoid wasps refer to GRDC’s Groundcover article Researcher champions ‘free pest control for growers’.

Meet Crop Protection team member - Amber Balfour-Cunningham

Amber is a DPIRD Research scientist based in Northam. She began her career with DPIRD in 2017, working in entomology.

Amber graduated with a BSc (Hons) from the University of Western Australia (UWA) and started working for the department in 2017, initially on integrated pest management of fruit fly in Carnarvon. She moved to Northam in 2018 and gained research experience in plant pathology, agronomy, and soil nutrition before commencing her current entomology role.

As of 2023, Amber is completing a PhD supported by UWA, the Grains Research and Development Corporation, the Department, and CSIRO on monitoring techniques and the impacts of natural enemies of key invertebrate pests in Australian canola.

Amber's PhD aligns with her passion of improving understanding of the often misunderstood and underutilised 'workforce' that is beneficial insects. Amber grew up in Fremantle and developed her strong passion for science from being outdoors and spending time with her parents, who worked as consultants in forestry and related industries.

In her spare time, Amber enjoys bushwalking and attending incidents and fundraising events with the Northam Volunteer Fire and Rescue Service.