Department of Primary Industries and Regional Development
GOVERNMENT OF WESTERN AUSTRALIA

Dr Catherine Borger, Dr Harmohinder Dhammu and Dr Arslan Peerzada (left to right) working to control wireweed and other emerging species. Photo: Dave Nicholson (DPIRD).

Protecting WA crops

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Contents

Informed weed management strategies for emerging weeds

At a glance:

- Pre-emergent herbicides, whether used alone or in combination with post-emergent herbicides, are effective at controlling London rocket, wireweed and prickly lettuce.
- No-till planting systems can be effective in controlling wireweed, prickly lettuce and London rocket by burying weed seeds.

Weeds impose significant costs on Australian grain growers, not only through the expense of control measures but also by reducing crop yields from competition and causing price downgrades due to seed contamination.

Over time, weed pressures evolve as species adapt and spread. Identifying areas where specific weed species are becoming more prevalent is crucial, especially when existing control methods are insufficient or losing effectiveness. Problematic species such as button grass (*Dactyloctenium radulans*), London rocket (*Sisymbrium irio*), prickly lettuce (*Lactuca serriola*), fleabane (*Conyza sumatrensis*, *Conyza bonariensis*), and wireweed (*Polygonum aviculare*) pose challenges due to limited updated knowledge on integrated weed management strategies. While some of these weeds are well-established in certain regions, they remain emerging threats in others. Furthermore, climate changes are allowing some of these species to become increasingly invasive. As spring temperatures rise, species that grow in both winter crops and during the spring/summer are favoured and become more competitive. Understanding the biology and ecology of each weed species allows for the development of integrated weed management strategies.

A collaborative project between the Department of Primary Industries and Regional Development (DPIRD), the Grains Research and Development Corporation (GRDC), and led by the University of Queensland (UQ) is investigating biological and ecological traits of these five weed species to aid in the development of informed integrated weed management strategies. This 3-year project is focusing on traits such as seed dormancy and germination ecology, seed bank persistence, and optimal control programs in crops. Whilst this is a national project, the trials in the Western region are being run by DPIRD. The research conducted so far has focused on wireweed, London rocket, and prickly lettuce.

Herbicide tolerance and the effect that crop competition has on winter weed density (prickly lettuce, wireweed, and London rocket) were assessed in field trials at Wongan Hills and Northam. The dry autumn and late break in 2024, followed by cold, wet conditions after the break, reduced the early vigour of crops. As a result, crops were uncompetitive during the first 4 to 8 weeks after sowing, and it wasn’t until 12 weeks after sowing that crop competition started to reduce weeds’ populations. However, all the weed species experienced delayed emergence, diminishing their ability to compete with the crop. As a result, all 3 species had no impact on yield. The delayed emergence was largely attributed to their small seed size, which is particularly sensitive to burial by the minimum tillage system.

Weed seed burial was also assessed in field trials at Northam and Wongan Hills in 2024. The soil type at Northam was a brown sandy loam, while the Wongan Hills site had light, grey sandy loam soil. It was found at Wongan Hills for all three weed species (prickly lettuce, wireweed, and London rocket) that the optimum emergence depth was 0.5 cm. At Northam, where the soil was sifted and its structure reduced, no weed seed emerged from depths greater than 0.5 cm. This indicates that no-till systems, which bury weed seeds due to soil throw from the furrows, can help reduce weed emergence of these small-seeded weed species.

Delayed emergence of London rocket and wireweed in crops is also influenced by dormancy. For example, multiple London rocket populations emerged from May to June, even under controlled conditions where water was not a limiting factor (Figure 1).

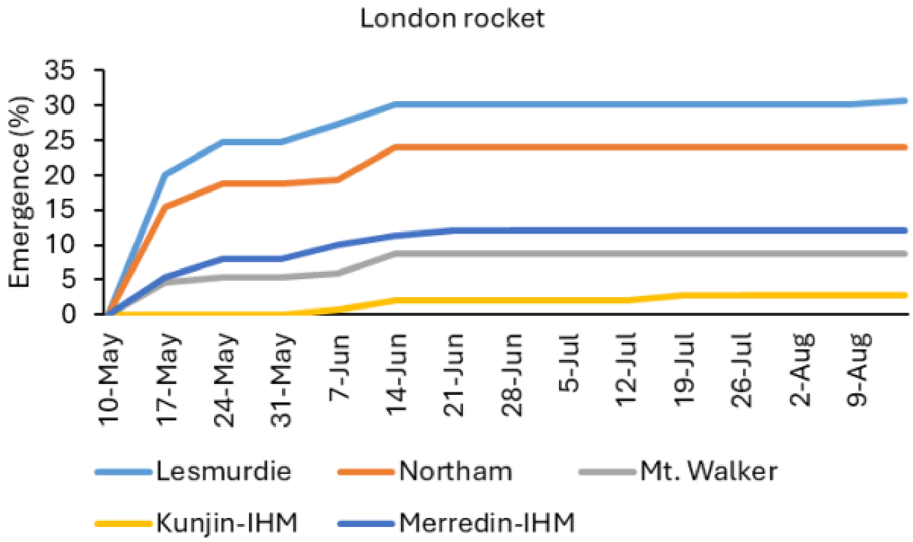

Figure 1. Emergence of London rocket seed sourced from five locations over time in an irrigated screenhouse from May to Aug 2024 at Northam. Image: DPIRD.

The emergence of prickly lettuce was also delayed in the field trials because its ideal temperatures for germination are slightly higher than those of other winter-dominant weed species. Late emergence made all the weed species highly uncompetitive, despite reduced early crop vigour.

It was found in the herbicide tolerance trials at Wongan Hills that either pre-emergent herbicides or a combination of pre-emergent and post-emergent herbicides successfully controlled wireweed, London Rocket and prickly lettuce, leaving no weeds remaining at crop maturity (Figure 2). However, due to the very poor competitive ability of these weeds, their density in the no herbicide control plots was also very low at the end of the season.

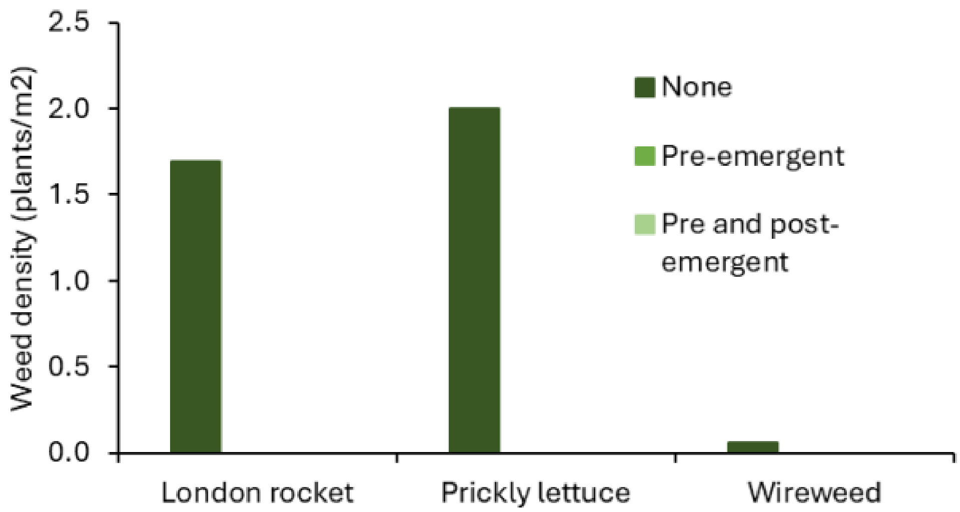

Figure 2. Final density of London rocket, prickly lettuce and wireweed following pre-emergent or pre and post emergent herbicide application.

Despite their very low density at harvest, prickly lettuce and wireweed were still actively growing, as they are both spring/summer weeds as well as winter weeds. Further trials are planned for the next 2 seasons to investigate these results, with additional research looking at the control of these species during the summer fallow. Watch this space for updates.

For more information refer to GRDC's webpage **Ecology of emerging weeds.**

Meet Crop protection team member – Christiaan Valentine

Crop protection team member Christiaan Valentine. Image: David Nicholson, DPIRD.

Christiaan Valentine is a Research Scientist based at DPIRD's Northam office. Christiaan grew up on a farm east of Geraldton, near Morawa, and after graduating from Curtin University at Muresk, he returned to the farm for 2 years. Looking for a break from the sparse surroundings and associated bush flies, Christiaan joined the department in Northam in 2000 as a technician, working with the entomology group establishing threshold limits for aphids and diamondback moth in canola.

Christiaan spent most of the mid-2000s to early 2010s evaluating the department's new legume pasture species for herbicide tolerance and developing weed management strategies for legume pastures such as Biserrula, Serradella, sub clover and medic species. He also worked on the integration of some of these species with perennial grasses such as Rhodes grass and Panic grass.

As you can imagine, working in the field with summer active perennial grasses allowed a general disgust of the Australian bush fly to evolve into bitter animosity, but that didn't deter him from rejoining the entomology group to pursue options for improving the trapping and detection of some of our other problematic insects. Using 3D modelling, 3D printing and a general love for spending time on electronics store web pages, Christiaan developed some new and innovative traps for monitoring budworm, diamondback moth, aphids and disease spores.

Currently, Christiaan is developing a novel way of using solar powered, high-resolution cameras to monitor crawling insects in the field. This will help DPIRD to more accurately model redlegged earth mite and lucerne flea life cycles.

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