

Researchers warn of global threat to crops as insecticide resistance emerges in bluegreen aphids

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Bluegreen Aphid on leaf. Credit: Cesar Australia

For the first time, researchers in Australia have documented insecticide resistance in field-collected populations of bluegreen aphids, *Acyrtosiphon kondoi*—a worldwide pest of pulses and other legume crops.

The study, [published](#) in *Pest Management Science*, serves as a warning to growers globally and highlights the need for new strategies to manage this pervasive [pest](#).

Evatt Chirgwin, [evolutionary biologist](#) at Cesar Australia and corresponding author of the study, explained that the research was prompted by reports of conventional insecticides failing to control *A. kondoi* populations.

"Our primary motivation was to help Australian growers understand an emerging pest management challenge," said Chirgwin. "Australian growers have traditionally relied upon two types of insecticides (organophosphate and carbamates) to protect their legume crops from *A. kondoi*. However, in recent years, multiple growers in Southern Australia reported these insecticide sprays were no longer controlling *A. kondoi*, which indicated this pest may have evolved insecticide [resistance](#) for the first time."

A. kondoi is an agricultural pest in the U.S., South America, Asia, Europe, Africa and Australia. Chirgwin explained that they damage crops by feeding on upper leaves, stems, and terminal buds. "*A. kondoi* also causes indirect damage by spreading plant viruses, including cucumber mosaic virus and bean yellow mosaic virus," he noted.



Bluegreen aphids on Petri dishes containing alfalfa leaves in 1% (w/v) agar.
Credit: Cesar Australia

The team collected *A. kondoi* populations from lentil and alfalfa paddocks where insecticide control failures have recently been reported across Victoria, South Australia, and New South Wales. The populations were exposed to different insecticides in bioassays, revealing moderate resistance to three insecticide groups: organophosphates, carbamates, and pyrethroids.

Explaining the impact of resistance at this level to Australian growers, Chirgwin said, "On a practical level, growers cannot rely on organophosphates and carbamates (at the registered rate) to confidently control these newly evolved *A. kondoi* populations. Still, the low-to-

moderate levels (20-40 fold) of resistance shown by *A. kondoi* in this study is less than some other aphid species (i.e., >100 fold) have been able to evolve to these chemicals."

Chirgwin noted that the discovery of pyrethroid-resistant *A. kondoi* populations was unexpected—the use of pyrethroids to control *A. kondoi* in Australia is relatively restricted and therefore the authors did not think the insects would be under enough selection pressure to evolve resistance.

"We now suspect that *A. kondoi* populations are regularly exposed to pyrethroid-based insecticides because this chemical is widely used in pulse and pasture seed crops to control other pests (e.g. mirids, *Helicoverpa*, and other aphids) that often occur alongside *A. kondoi*," he explained.

The researchers found no evidence of resistance to another insecticide—flupyradifurone. This was unsurprising given the chemical was only introduced into the Australian market in 2016 and is not registered against *A. kondoi* in the country.



Bluegreen aphids on leaf. Credit: Cesar Australia

The authors conclude that flupyradifurone may, therefore, provide a new chemical option for *A. kondoi* control in Australia, Chirgwin provided a note of caution and stressed the importance of integrated pest management strategies to restrict the emergence of further cases of insecticide resistance:

"If registered, flupyradifurone should only provide one part of the *A. kondoi* management strategy in Australia. Overreliance on one (or a small number of) insecticides will place *A. kondoi* populations under consistent and strong selection pressure that favors increased resistance to evolve."

"Rotating between different types of insecticides can help ease the selection pressure placed on pest populations. As such, growers require

multiple chemical options to rotate between for *A. kondoi* control and for these chemicals to be available at an economical rate."

"Greater support of non-chemical control options can also provide alternative avenues to manage *A. kondoi* and reduce selection for [insecticide resistance](#). Natural enemies (e.g., ladybirds & [parasitoid wasps](#)) provide an effective biocontrol option for many aphids. Alternatively, growers may use some crops (e.g., medics) where cultivars have been bred with plant resistance to aphid feeding."

"More novel endosymbionts (a type of bacteria hosted by many animals) have revolutionized how some mosquito disease vectors are managed, and similar endosymbiont-based interventions are currently being researched as a new avenue to manage agricultural pests."

"We are attempting to map where [insecticide](#)-resistant populations of *A. kondoi* have spread so we can provide growers with more regionally specific management recommendations. We are also exploring what naturally occurring biocontrol options available for this pest and how endosymbionts can offer a new avenue to mitigate the damage this pest causes to crops," noted Chirgwin.

More information: Evatt Chirgwin et al, Discovery of insecticide resistance in field-collected populations of the aphid pest, *Acyrtosiphon kondoi* Shinji, *Pest Management Science* (2023). [DOI: 10.1002/ps.7864](https://doi.org/10.1002/ps.7864)

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