Herbicide research study shows capacity of weeds to evolve resistance

Research completed before a new herbicide’s commercial release has reinforced the importance of using diverse strategies for weed control in efforts to stop weed herbicide resistance.

Researchers from the Australian Herbicide Resistance Initiative at the University of WA — in collaboration with Kumiai Chemical Co, and with support from the Australian Research Council and the Grains Research and Development Corporation — assessed the risk and likelihood of annual ryegrass evolving resistance to a new herbicide, Sakura (pyroxasulfone).

AHRI Assistant Professor Roberto Busi said the study aimed to understand how weeds could evolve and “quickly learn” to defend themselves against the lethal effects of herbicides.

“The evolution of herbicide resistance makes it more difficult for farmers to achieve good weed control,” he said.

“Some herbicide groups have been pushed to redundancy and in certain regions of the Australian wheatbelt, farmers can’t use particular herbicides that once delivered very effective and cheap weed control.

“Our research aims to promote more efficient herbicide use by assessing the evolutionary risks and consequences of sole reliance on herbicides.”

Professor Busi and his colleagues observed the effect of persistent use of new herbicide Sakura on annual ryegrass Lolium rigidum, a widespread weed in southern Australia cropping systems.

They found recurrent selection at less than label rates of Sakura could rapidly lead to resistance evolution in ryegrass.

After only three generations of selection under controlled conditions, one ryegrass population with resistance to multiple other herbicide groups showed a clear capacity to evolve resistance to Sakura.

“Sakura, like all herbicides, should only be used at full label rate and in conjunction with a range of other weed control strategies. It is vital to rotate Sakura with other herbicides and use diverse strategies for weed control, such as incorporating non-herbicide tools, to reduce the risk of resistance,” Professor Busi said.

Strategies include harvest weed seed control, crop competition, and pre-seeding knockdown glyphosate sprays and paraquat after a break.

Professor Busi hoped the research results would help promote sustainable herbicide use.

“We hope to sustain the longevity of herbicides,” he said.

“Use as many tools as possible to minimise the number of weed seeds that escape into the seed bank.”

Dr Roberto Busi says Sakura is only one tool to control multi-herbicide-resistant ryegrass.