**CAN EXPOSURE TO LOW HERBICIDE RATES INCREASE RESISTANCE EVOLUTION IN WEEDS?**

Md Asaduzzaman1; Eric Koetz2 and Hanwen Wu3

1. Research scientist, Weeds Biosecurity, Weeds Research Unit, New South Wales Department of Primary Industries, Wagga Wagga Agricultural Institute, Wagga Wagga, NSW 2650, Australia. Email: md.asaduzzaman@dpi.nsw.gov.au
2. Research agronomist-Weeds, Southern Cropping, New South Wales Department of Primary Industries, Wagga Wagga Agricultural Institute, Wagga Wagga, NSW 2650, Australia. Email: eric.koetz@dpi.nsw.gov.au
3. Principal research scientist, Weeds Biosecurity, Weeds Research Unit, New South Wales Department of Primary Industries, Wagga Wagga Agricultural Institute, Wagga Wagga, NSW 2650, Australia. Email: hanwen.wu@dpi.nsw.gov.au

**SUMMARY**

There is growing evidence that the stimulation of weed fitness by low doses of herbicides, namely "hormesis," can change the sensitivity of weed populations to herbicides. We quantified the herbicide hormesis response of three key weed species: flaxleaf fleabane (*Conyza bonariensis* L), tall fleabane (*C. sumatrensis*) and awnless barnyard grass (*Echinochloa colona*). In our study, glyphosate at a rate of 0.36 kg a.e/ha was applied to plants at the rosette stage of 27 glyphosate-resistant flaxleaf fleabane populations. Seeds collected from the sprayed plants had higher germination in 75% of populations than the unsprayed control plants. However, the germination rate either declined or remained unchanged in 25% of populations that were categorised either as developing resistant or susceptible to glyphosate

Hormesis was observed in two paraquat-resistant tall fleabane populations (TB-1 and TB-6). Both populations had a hormetic growth increase at two lower doses (62.5 and 125 g a.e/ha) of paraquat, resulting in 17% to 31% and 11% to 19% higher plant biomass and 33% to 40% and 65% to 68% higher numbers of seed buds/plants, respectively when compared to untreated controls.

Hormetic effects were also found in awnless barnyard grass populations (2B21 and 2B37) where resistant phonotypes (R-2B21 and R-2B37) of these populations had a higher biomass, spikes/plant, and seeds/plant than that of their respective susceptible counterparts at 100 g a.e/ha or higher rate of glyphosate. The susceptible plants of these two populations accumulated more biomass (10%-20%) and produced more spikes/plant (32%-38%) than the resistant phenotypes at the hormetic dose range of rates 34 and 67.5 g a.e/ha of glyphosate. Our results suggest that herbicide hormesis may be common in weeds and low or inaccurate doses of herbicide could favour the resistant individuals, increasing the dominance of the resistant population.

**Keywords:** Dose;Stimulation; Biphasic; Endpoint; Fitness