

# Confirmed double-knock resistance in tall fleabane

■ By Cindy Benjamin, WeedSmart

**T**HE double knock is a widely-utilised and highly effective weed management tool but without monitoring and removal of survivor weeds, the commonly used ‘glyphosate followed by paraquat’ system is still open to failure.

For weeds that have a natural tolerance to glyphosate, the double-knock has provided growers with an excellent tool to take two swipes at weeds like fleabane, sowthistle and feathertop Rhodes grass and achieve a greater level of control.

NSW Department of Primary Industries weeds researcher, Dr Md Asaduzzaman (Asad) has uncovered disturbing evidence of double-knock resistance in tall fleabane (*Conyza sumatrensis*) samples collected during weed surveys funded by the Cotton Research and Development Corporation (CRDC).

“Our surveys in 2016 and 2017 showed that cotton fields were generally weed-free but herbicide resistance is building in weeds along farm roadsides, drains and channels and around infrastructure,” he said. “We identified two tall fleabane biotypes that have resistance to glyphosate, paraquat and the double-knock tactic of an initial glyphosate application followed with an application of paraquat seven days later.”

The rate response analysis showed that one of these biotypes is 4.9 times more resistant than the susceptible biotype, requiring 2.5 litres per hectare of Paraquat-250 to kill 50 per cent of the plants from the resistant population compared to just 0.5 litres per hectare to achieve the same result in the susceptible population (see Table 1).

While this level of resistance is generally considered ‘moderate’ it is clear that resistance is building and must be taken very seriously given the importance of the double-knock tactic in most cotton and grain production systems in Australia.

## First to be identified in Australia

These two populations, collected near Nandi, Queensland and Coleambally, NSW, are the first paraquat-resistant tall fleabane to be identified in Australia (Figure 2). Resistance to paraquat in this species has previously been recorded in Japan, Sri Lanka and Taiwan.

“Although the tall fleabane plants from these two populations showed signs of herbicide damage, such as narrowing of leaves and slow growth, when the double-knock was applied, they were able to survive and produce seed,” said Asad. “This species produces a large quantity of seed, germinates quickly and the seed can travel over 10 km in the wind so dispersal of paraquat/glyphosate resistance traits will be impossible to contain.”

**TABLE 1: Resistance levels of tall fleabane screened against paraquat, glyphosate and glyphosate + paraquat**

Tall fleabane biotype	Percentage of plant survival under:		
	Paraquat 250 @ 2.0 L/ha	Glyphosate 540 @ 1.2 L/ha	Glyphosate followed by paraquat (double knock)
TFB01	>75	100	75
TFB02	75	75	75
TFb-S	0	0	0

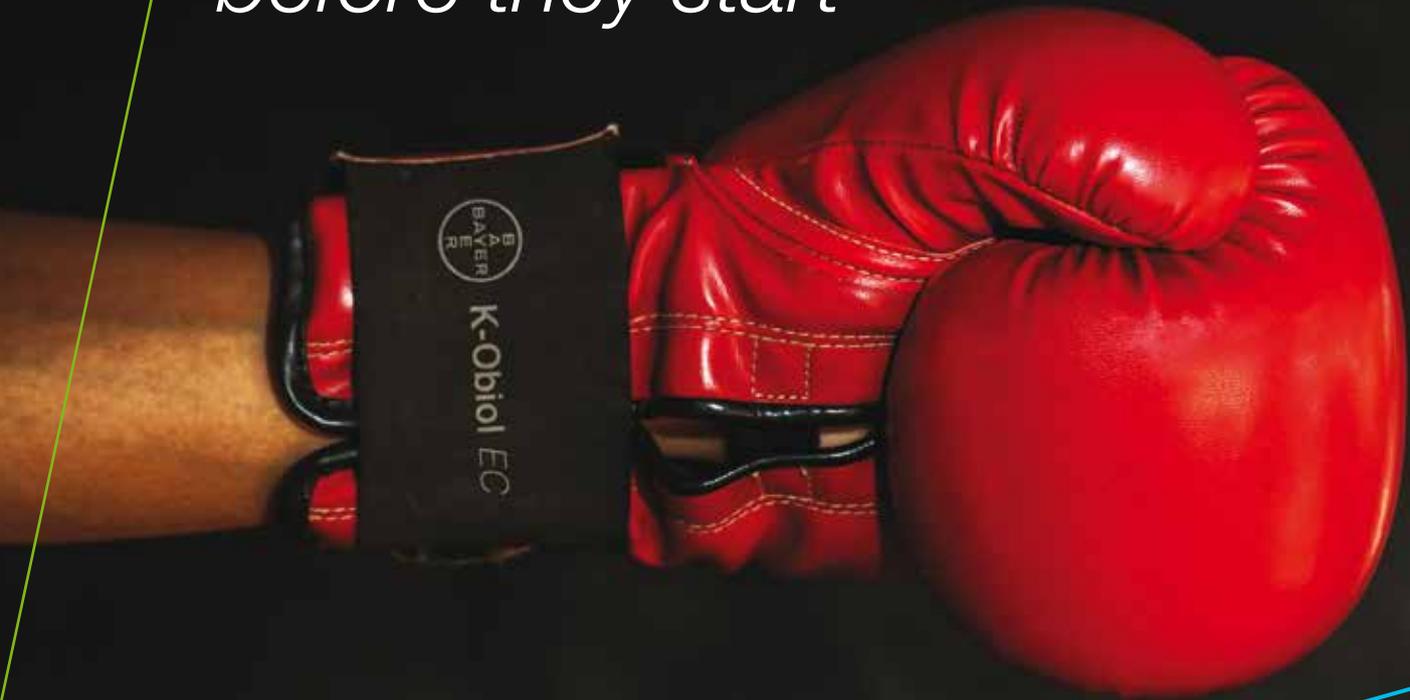
NOTE: (R-resistant > 50% survival; DR-developing resistance < 50% and > 20% survival; and, S-susceptible < 20% survival)



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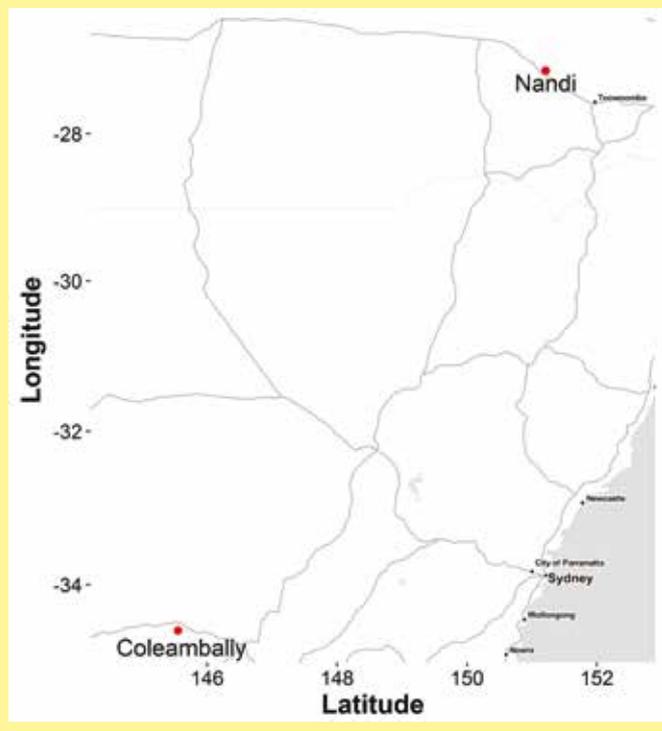
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**FIGURE 1: Nandi (southern Qld) and Coleambally (southern NSW) are the first conformed Australian locations for paraquat resistant tall fleabane**



This discovery makes tall fleabane the second species in Australia to have confirmed resistance to both glyphosate (Group M) and paraquat (Group L) – the first being a population of annual ryegrass identified in Western Australia in 2013.

Having demonstrated resistance to the dual application of

these herbicides in the otherwise effective double-knock tactic is cause for great concern.

Weed populations take longer to evolve resistance to paraquat and glyphosate compared to some other modes of action, but it will happen after years of regular applications without survivor control.

Like other fleabane species, tall fleabane is susceptible to crop competition but flourishes in poorly competitive, wide-row crops such as dryland cotton.

### Wider range of tactics needed

Combating herbicide resistance and keeping weed numbers low will require the implementation of a wider range of weed control tactics rather than relying heavily on the double knock tactic.

“Growing more competitive crops and using a wider range of pre- and post-emergence herbicides and strategic tillage will help manage this weed,” said Asad. “Above all is the need to monitor and remove any survivor weeds in line with the cotton industry’s weed control strategy of ‘2 + 2 and 0’ that recommends two non-glyphosate tactics in-crop plus two non-glyphosate tactics in the fallow and zero survivors.”

In other research Asad is testing the opportunities for growers to use cover crops to create additional opportunities for herbicide rotations, run down the seed bank and delay the adaption of weed populations by reducing the frequency of single modes of action herbicide use.

Paraquat resistance has previously been confirmed in 10 species in Australia, including flaxleaf fleabane (*Conyza bonariensis*).

For more information about managing herbicide resistant weeds, visit the Weedsmart website: [www.weedsmart.org.au](http://www.weedsmart.org.au)

**WeedSmart is an industry-led initiative aimed at enhancing on-farm practices and promoting the long term sustainability of herbicide use in Australian agriculture. Australian research partners, commercial entities, Government, advisers and growers have joined forces to ensure weed management remains at the forefront of global farming practice. Viable herbicide use will help secure the weed control productivity gains made by the current generation of Australian farmers.**



**Tall fleabane seedlings 28 days after the double knock (glyphosate + paraquat) tactic was applied.**