

Field performance of an annual medic tolerant of sulfonylurea herbicide residues

J.H. Howie and C.A. Bell

South Australian Research and Development Institute, Waite Campus, Urrbrae, SA 5064, Australia, Email: howie.jake@saugov.sa.gov.au

Keywords: *Medicago littoralis*, triasulfuron, residual effect

Introduction Sulfonylurea (SU) herbicides such as triasulfuron, chlorsulfuron and metsulfuron-methyl are used extensively in the cereal-livestock zones of temperate Australia. They are regarded by farmers as effective, cheap and safe-to-apply herbicides with useful levels of residual activity in the year of application. However these residues can persist into following years, particularly in areas with alkaline soils and low rainfall, where their breakdown by microbial action and chemical hydrolysis is significantly reduced. Regenerating pasture legumes typically used in Australian ley farming systems are highly intolerant of even very low residues of SU herbicides (e.g. < 1ppb; Heap, 2000) resulting in severe stunting, reduced dry matter production, lower seed yields, poor persistence and decreased N fixation. In this study we compare the field performance of an artificially induced mutant cultivar (FEH-1) of annual strand medic (*Medicago littoralis*) with putative tolerance to sulfonylurea herbicide residues (Heap, 2000) with the cultivar Herald, its intolerant strand medic parent.

Materials and methods Triasulfuron was applied as a pre-emergent herbicide at four rates (0, 7.5, 13 and 26 g.a.i./ha) to wheat in a low rainfall site at Waikerie, South Australia (sandy loam, pH 8.3_w) in May 2002. Herald and FEH-1 were subsequently sown (22/5/2003) into the wheat stubble containing the herbicide residues. Shoot dry weight was assessed at 15 weeks post sowing, seed yield at plant senescence and seedling regeneration on June 26 2004. The trial design was a randomised block with three replicates; plots were 8 x 1.2m.

Results Increasing rates of triasulfuron residues reduced Herald shoot dry weight, seed yield and seedling regeneration by > 50% (see Table 1). FEH-1 however demonstrated good tolerance to the triasulfuron residues from all application rates for all parameters measured.

Table 1 Shoot dry weight, seed yield (2003) and regeneration (2004) of Herald and FEH-1 in soil treated with triasulfuron at 0, 7.5, 13 and 26 g.a.i./ha (2002)

Rate	Shoot dry weight (kg/ha)		Seed yield (kg/ha)		Regeneration (plants/m ²)	
	Herald	FEH-1	Herald	FEH-1	Herald	FEH-1
0	3422	3022	652	678	1532	1472
7.5	2314	2868	564	690	1323	1488
13	2442	3192	511	690	945	1543
26	1618	2863	290	790	728	1549
LSD 5%		799		177		439

Conclusions These field results agree with the findings of Heap (2000) from in-vitro enzyme assays, soil and foliar dose response pot experiments and pilot field studies (Howie *et al.*, 2002) that FEH-1 has increased tolerance to a range of ALS inhibitors including SU herbicides. In the presence of SU residues, FEH-1 has greater dry matter production and seed yields. Improved seed yields (and thus seed reserves) result in improved regeneration, greater legume dominance and competitiveness with weeds. Where SU residues exist, the more vigorous root systems of SU tolerant medics are likely to have better nodulation and N fixation, increased tolerance of root diseases, increased ability to extract soil moisture and nutrients and an enhanced ability to take advantage of the residual weed control of SU herbicides. This increased pasture productivity and pasture legume dominance will benefit the livestock component of a cereal/pasture rotation as well as the cereal phase, which will benefit from improved organic N levels and reduced carryover of cereal root diseases. FEH-1 is scheduled to be released as Australia's first SU residue tolerant pasture legume in 2006.

Acknowledgments Funding by GRDC is gratefully acknowledged, as is the valuable technical assistance provided by Peter Schutz, SARDI.

References

- Heap, J. (2000). Increasing *Medicago* resistance to soil residues of ALS-inhibiting herbicides. PhD thesis, University of Adelaide.
- Howie, J.H., J. Heap, C. Preston & R.M. Nair (2002). Development of an annual medic tolerant of sulfonylurea herbicide residues. In: J.A. McComb (Ed.) Plant Breeding for the 11th Millennium. Proceedings of the 12th Australasian Plant Breeding Conference, Perth, WA, 15–20 September 2002, 767-769.