Chilean needle grass (*Nassella neesiana*) management options

Jeff Lowien[1], Mark Gardener[2] and Archie Cameron[3]

[1]*NSW Agriculture, Agricultural Research & Advisory Station, Glen Innes, NSW, 2370*
[2]*Botany Department, University of New England, Armidale, NSW, 2351*
[3]*GLENRAC(Matheson Landcare Group) Chairperson, Archie Cameron, "Kalanga", Matheson, NSW, 2370*

Chilean Needle Grass (*Nassella neesiana*, previously *Stipa neesiana*) is perceived as an increasing weed problem on the Northern Tablelands of NSW. Chilean needle grass is a tussocky perennial grass, very invasive and forms a dense stand in pastures, bushland and parkland. It was first identified in Melbourne, Victoria in 1934 and in Glen Innes, NSW in 1944. Since then it has become naturalised in many areas of south eastern Australia that receive more than 500 mm of annual rainfall. Chilean needle grass is found along the Great Dividing Range and its western slopes between the Queensland border (Northern, Central and Southern Tablelands of NSW), through central Victoria and in south eastern South Australia.

The main reason for the success of Chilean needle grass in pastures is the large persistent store of viable seeds in the soil seedbank (Gardener *et al.* 1996). The outcome of any long term management strategy must be to reduce the number of seeds in the soil seedbank. This can be done by reducing the production of new seeds and/or by increasing the rate of decline of seeds in the seedbank.

The aim of this study is to evaluate the effectiveness of five management options of cropping and grazing at reducing the seedbank of Chilean Needle Grass (CNG).

Methods

A trial site was established at "Rosehill" 10 km west of Glen Innes on the Northern Tablelands in spring 1996. The five management options to reduce the seedbank of CNG were:

- conventional cultivation/pre-emergent herbicides (Trifluralin)/soybeans;
- minimum tillage/pre-emergent herbicide (Trifluralin)/soybeans;
- direct drill/post-emergent herbicide (Fluazifop-P)/soybeans;
- direct drilled pasture [spraytopped in spring (Glyphosate)]/sown in autumn;
- grazed at a heavy stocking rate (cattle) for short periods followed by a long rest.

Table 1: The average seedbanks (+ standard error) of the five treatments in 1996 and 1997.

Treatment	Seedbank	
	1996 (seeds/m^2)	1997 (seeds/m^2)
Conventional crop	2376 ± 244a	176 ± 44b
Minimum tillage crop	2728± 337a	147 ± 46b
Direct drill crop	2552 ± 222a	264 ± 114b
Direct drill pasture	2053 ± 253a	572 ± 125b
Grazing	1804 ± 208a	2728 ± 344c

a b c represents significant differences within and between years and treatments (P<0.0001)

The CNG seedbanks were measured by collecting 15 random (75 mm diameter x 50 mm deep) soil cores before beginning treatments (1996) and 12 months after the commencement of treat-ments. These soil cores were crumbled and dried then passed through a 1 mm sieve. Seeds that did not crush between forceps were recorded as viable.

Results and discussion

Cropping treatments reduced the soil seedbank by 92.6, 94.6 and 89.7% respectively (Table 1). The direct drill pasture treatment had a lesser reduction (72.1%) but still greatly impacted on the seedbank, whereas the grazing strategy resulted in an increase (51.2%) in seedbank size.

In the cropping treatments the large decline in seedbank was the result of several factors. Firstly, the adult plants were killed so there was no subsequent seed production. Secondly, the combination of cultivation and ideal seasonal conditions increased output from the seedbank through decomposition and germination of CNG seeds. The use of herbicides and competition from the soybeans also resulted in significant seedling mortality. This is consistent with other work which indicates that "low re-infestation levels for soil seedbank are expected within relatively few years if seed input is continuously prevented by herbicide or cultivation" (Bourdôt and Hurrell 1992). Since soil disturbance promotes germination, the smaller reduction of seedbank in the direct drill cropping treatment was probably due to the minimal soil disturbance

Similarly, the lesser reduction of the seedbank by the direct drill pasture treatment is also a result of minimal soil disturbance. Furthermore, after one year approximately 2% of the pasture was CNG which produced some seed adding to the soil seedbank.

The seedbank in the grazing treatment increased significantly. In November 1997 heavy grazing pressure was unable to prevent seed production due to favourable seasonal conditions. This highlights the difficulties in grazing management alone as being a suitable option for controlling CNG.

References

Bourdôt, G.W. and Hurrell, G.A. (1992). Aspects of the ecology of Stipa neesiana Trin. & Rupr. seeds. *New Zealand Journal of Agricultural Research*, **35**, 101-108.

Gardener, M.R., Whalley, R.D.B. and Sindel, B.M. (1996) The failure of management technology for reproductively efficient grassy weeds: the Chilean needle grass example. *11th Australian Weeds Conference Proceedings*, Melbourne, 1996, 243-246.