Vulpia management in temperate perennial pastures of SE Australia: A change in direction and emphasis

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Introduction

Vulpia (*V. bromoides* and *V. myuros*) is a naturalized free-seeding annual grass weed of Australian temperate pastures. It can rapidly invade pastures because of its high fecundity (Code, 1996), effectively out-competing the more highly regarded species present (Freckleton *et al.*, 2000). With its shorter growing season and poorer quality forage over late spring and summer, livestock productivity is substantially reduced. In addition, it has a high allelopathic potential (An *et al.*, 1996), and readily contaminates wool.

Previous approaches to controlling vulpia have emphasized the use of herbicides applied in late winter and spring to reduce current seed production (e.g., Leys *et al.*, 1991). But without activities that discourage vulpia presence, control has been short-term. The work reported here evaluates the effect of intensive heavy grazing pressure, and grazing deferment over summer, on vulpia density and biomass production.

Material and methods

The experiment commenced in 1997 and was located on a sown degraded pasture near Orange in central New South Wales (Lat. 33°06′ S; Long. 148°37′ E). Annual average rainfall (AAR) is 650 - 700 mm; elevation is 595 m. Rainfall received in 1997, 1998, 1999 and 2000 was approx. 70%, 140%, 110% and 120% of AAR, respectively. The main species present were vulpia and phalaris (*Phalaris aquatica* L.), plus sub clover (*Trifolium subterraneum* L.).

Three grazing treatments were compared: Control – continuous grazing with sheep at a stocking rate of 7.5 dry sheep equivalents (DSE) ha^{-1}; Defer – grazing exclusion for approx. 4 months until the end of summer; Strategic – a short period of heavy stocking (200 DSE ha^{-1} for 5 days) imposed when 50% of vulpia seedheads had appeared, followed by grazing exclusion as in Defer above. At the end of summer, continuous grazing was resumed on all treatments until the following spring, when the grazing treatments were reimposed. Treatments were applied in 1997, 1998 and 1999. Experimental layout was a RBD and replicated three times. Data were analysed by ANOVA.

Biomass and botanical composition was estimated using BOTANAL (Tothill *et al.*, 1992) and was assessed in early spring, just prior to the treatments being imposed. Seedling numbers were assessed in mid-winter from 20 soil cores (4 cm diam.) per plot (10 × 6 m). Basal cover was estimated from 10 locations/plot using mesh quadrats (40 × 40 cm, 10 cm grid size).

Results and discussion

Vulpia biomass was increased by deferred and strategic grazing in the first year after imposing the treatments (1998), but was decreased by these treatments in 1999 and 2000, particularly deferred grazing (Fig. 1c). The decline in vulpia was associated with increasing perennial grass biomass, where management and especially deferred grazing promoted greater perenniality in 1999 and 2000 (Fig. 1b). As a percentage of total biomass (Fig. 1a), deferred grazing resulted in 47% and 83% perennial grass, and 39% and 8% vulpia in 1999 and 2000.

Vulpia plants m^{-2} were significantly lower where grazing was deferred ($P < 0.001$) compared with continuous grazing in 1999 (6320 vs. 15030) and 2000 (1370 vs. 8100). Final

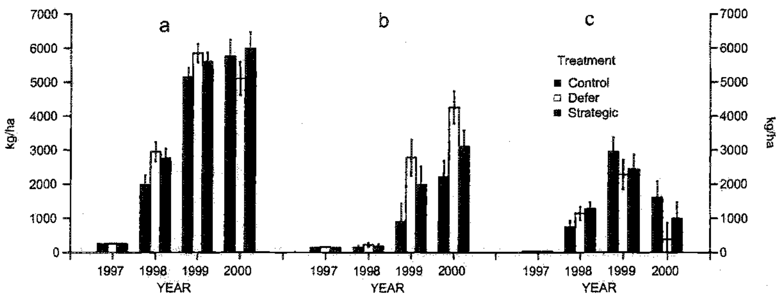

Figure 1. Effect of grazing management on available spring biomass (kg ha^{-1}) of (a) total, (b) perennial grass, and (c) vulpia components during 1997, 1998, 1999 and 2000.

basal area of the perennial grass in 2000 was significantly higher ($P < 0.001$) where deferred, compared with where continuously grazed (14.2 vs. 4.5%).

The reduction in vulpia biomass in 1999 and 2000, and the associated increase of perennial grass (mostly phalaris) where grazing was deferred, suggests that herbicide-free inputs can reduce vulpia in a pasture system (both on a biomass and % basis). But more than a single grazing deferral may be required, and seasonal conditions probably need to be better than average. A likely mechanism for such a response is the greater basal area and biomass of the perennial grass providing fewer opportunities for vulpia to recruit in the following autumn.

It appears that longer-term control needs to place greater emphasis on the recruitment phase, explore avenues for integrating herbicides into the management process and, importantly, the effect of these strategies on the more desirable non-target species as well as the weedy species, as suggested by Michalk & Dowling (1996). It was concluded that vulpia in pasture can be managed to acceptably low levels and maintained at these levels, provided that the perennial grass component can be correspondingly increased and maintained. The economics of such strategies now need to be evaluated.

References

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