MANAGEMENT OF PASTURE WEEDS ON THOROUGHBRED HORSE STUD FARMS IN EASTERN AUSTRALIA

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Summary Weeds constitute a particular problem in horse pastures because of the severe sward damage by hooves, bare soil alongside fences, highly selective grazing and localized deposition of manure. These factors are major contributors to what is commonly termed 'horse-sick pasture'. We present results from a survey of 60 thoroughbred horse stud farms in five regions of eastern Australia in which weed management practices were investigated. A wide range of techniques were employed for weed management including: herbicides, slashing, manual removal, increasing pasture vigour, tillage and crop rotation, managing the grazing dynamics of horses, grazing with cattle and sheep, biological control, and fire. Despite the diversity of weed management techniques employed, herbicides were the most commonly used technique in four of the regions. Success of weed management was considered by individual property managers to range from 'very successful' to 'very unsuccessful'. No major differences in the perceived degree of success occurred between regions but the incidence of use for some techniques varied markedly. Reasons for these regional variations are discussed in relation to property size, stocking patterns and incidence of cropping. Conclusions provide an indication of some factors which slow the adoption of more integrated approaches to sustainable weed management in horse enterprises.

INTRODUCTION

Most information on weed management in Australian animal production systems has been derived in the context of the sheep or cattle industries, little research having been conducted on pastures grazed by horses. This situation has led to the horse industry being forced to work with recommendations which are not fully applicable to their grazing system, or from 'anecdotal and observational evidence' (Kelleher in press). A similar problem has been reported for the British industry (McCarthy 1987). This situation is less than ideal since horses differ markedly from sheep and cattle in various aspects of physiology and their grazing, socializing, defecation, and exercise behaviours. These factors frequently lead to the creation of areas of bare ground which constitute windows (*sensu* Medd *et al.* 1987) for weed invasion. Further, horses commonly receive supplementary feeds and this practice has the associated risk of introducing weed seeds into a paddock which commonly survive transit through the equine gut (St. John-Sweeting and Morris 1990).

The aim of this paper is to present the weed management related results from a broader survey of thoroughbred horse stud properties (Gurr *et al.* 1996) and, in doing so, illustrate the challenges faced by weeds researchers and extension agents so as to better serve this industry.

MATERIALS AND METHODS

To reflect the wide geographical range of the thoroughbred stud industry in Australia and to determine the magnitude of any regional differences, five regions were surveyed: outer Sydney, the Hunter Valley, the Darling Downs, the Riverina and south-west slopes region of New South Wales, and the Euroa area of Victoria. Data were captured from twelve thoroughbred studs in each of these regions.

The survey was conducted from February to April 1994, after the conduct of three local pilot surveys, which were used to refine the survey protocol. Confidentiality was ensured by using a coding system for both region and property. The survey consisted of an interview conducted during a visit to each property during which a comprehensive questionnaire was completed in consultation with the property manager or owner.

The questionnaire recorded information on property size, physical characteristics, management of crops, pastures and animal enterprises. Data were analysed by analysis of variance where appropriate and, for proportional data, this was preceded by angular transformation of raw data.

RESULTS

A wide range of weed management practices were reported from properties in all five regions and most properties used more than one technique (Table 1). With the exception of Euroa, however, herbicide application was the most commonly reported approach in all regions. Herbicide applications were used by the majority of properties in the Euroa region but slashing and manual removal were more widely reported. These non-chemical techniques were used least frequently in the Riverina/south-west slopes region. Weed suppression by promotion of pasture vigour was employed on between two and seven properties per region, a range also evident for use of tillage and crop rotation. A wider range of responses was

Table 1. Reported weed management practices and success (mean ± SEM and range in parentheses) on thoroughbred horse studs surveyed in five regions of eastern Australia.

Region	Number of properties (of twelve) using the methods below									Success[A]
	HA	S	MR	PV	T/C	S/C	GM	BC	F	
Outer Sydney	8	8	8	3	1	1	2	2	0	2.58 ± 0.336 (1–4)
Hunter Valley	11	10	5	7	7	4	2	0	1	2.50 ± 0.289 (1–4)
Darling Downs	12	7	6	3	6	0	1	0	1	2.58 ± 0.336 (1–5)
Riverina/south-west slopes	11	5	1	2	4	6	1	2	0	2.67 ± 0.414 (1–5)
Euroa	7	9	8	6	2	8	1	1	0	2.00 ± 0.326 (1–5)

HA = herbicide application, S = slashing, MR = manual removal, PV = pasture vigour, T/C = tillage/ cropping, S/C = sheep and cattle, GM = grazing management (horses alone), BC = biological control, F = fire.
[A] Success of weed control: 1 = very successful, 2 = successful, 3 = fair, 4 = unsuccessful, 5 = very unsuccessful.

Table 2. Property statistics (mean ± SEM and range in parentheses) relating to the horse enterprise of thoroughbred horse studs surveyed in five regions of eastern Australia.

Region	Total area (ha)	Horse area[A] (ha)	Horse proportion[B] (%)	Stocking rate (horse per ha)[C]
Outer Sydney	136.1 ± 31.9 (28.4–405.0)	102.9 ± 18.8 (25.5–243.0)	83.95[a] ± 5.67 (35.71–100.0)	1.18 ± 0.132 (0.66–2.08)
Hunter Valley	1159.0 ± 286.0 (7.0–2835.0)	882.0 ± 235.0 (7.0–2693.0)	81.61[a] ± 5.00 (49.61–100.0)	1.43 ± 0.752 (0.23–9.64)
Darling Downs	375.0 ± 127.0 (87.5–1620.0)	231.2 ± 35.9 (87.5–428.3)	89.07[a] ± 7.66 (17.50–100.0)	0.91 ± 0.146 (0.28–1.78)
Riverina/south-west slopes	720.0 ± 161 (16.2–1458.0)	307.7 ± 72.3 (16.2–850.5)	61.50[b] ± 10.5 (1.70–100.0)	1.14 ± 0.355 (0.17–4.18)
Euroa	160.9 ± 29.3 (21.5–344.3)	150.2 ± 29.2 (21.5–344.3)	92.56[a] ± 2.73 (75.00–100.0)	2.41 ± 0.595 (0.60–7.94)
LSD (P=0.05)	450.62	318.89	–	NS

[A] Other livestock species may also use this area in a rotational fashion.
[B] Values retransformed (arcsin). Values followed by the same letter not significantly different (P=0.05).
[C] (Stud season horse number × 0.33) + (off season horse number × 0.66) + foal number.

Table 3. Property statistics (mean: ± SEM and range in parentheses) relating to non-horse enterprise of thoroughbred horse studs surveyed in five regions of eastern Australia.

Region	Cattle per property	Sheep per property	Rotational grazing incidence[A]	Mixed grazing incidence[B]	Crops and pasture rotation incidence	Rotation length (years)
Outer Sydney	53.9 ± 28.7	1.2 ± 1.2	6	3	1	9.0 NA (9–9)
Hunter Valley	454.0 ± 140.0	80.2 ± 74.6	10	8	4	6.2 ± 0.63 (5–8)
Darling Downs	158.0 ± 101.0	125.0 ± 125.0	3	4	4	7.7 ± 0.88 (6–9)
Riverina/ south-west slopes	156.7 ± 55.8	1542.0 ± 698.0	10	7	5	6.3 ± 0.62 (5–9)
Euroa	12.1 ± 6.8	64.2 ± 42.9	10	5	0	NA (0–0)
LSD	233.92	907.05	–	–	–	–

[A] Horses followed by cattle or sheep.
[B] Horses at same time as cattle or sheep.

observed for the use of other (non-horse) livestock for weed control with no properties in the Darling Downs region reporting this approach and eight using it in the Euroa region. Management of horse grazing was not widely viewed as a weed control approach in any region. Biological control and fire were the least commonly reported weed management methods.

The success of weed control reported by individual properties varied markedly in all regions, ranging from 'very unsuccessful' to 'successful' in outer Sydney and the Hunter Valley and extending to 'very successful' in the remaining regions. Differences in the mean success reported for each region did not differ significantly ($P>0.05$).

Regional means for total property area, the absolute area used by horses, and the proportion of area used by horses all differed significantly ($P<0.05$) (Table 2). The Hunter Valley had the highest mean property area and absolute horse area. When horse area was expressed as a proportion of the total property area, however, the Hunter Valley properties were not found to differ significantly from the majority of other regions, all using between 81 and 93 per cent of land for horses. Only the Riverina/ south-west slopes region used a significantly ($P<0.05$) lower mean proportion of property area (61.5%) for horses. No significant differences were evident for horse stocking rate. Other enterprises reported in all regions were cattle and sheep as well as cropping (Table 3).

DISCUSSION

Findings show that the thoroughbred stud industry employs a broad range of weed management techniques. Where marked differences in weed management occurred between regions these can be explained in relation to the other characteristics of properties. For example, the low reported use of herbicides in the Euroa region may be associated with the fact that, here, properties were significantly smaller than in several other regions and tended to be the most dedicated to horses and most heavily stocked. As a consequence it is unlikely that horses could be readily accommodated within other available paddocks to allow spraying to take place. The widespread use of slashing and manual removal of weeds may thus be viewed as compensatory techniques, made possible by the relatively small property sizes within this region. Use of tillage and crop rotation was also rare in this region, as was the case for the outer Sydney area where properties were of a similar small size.

A contrasting situation was evident for the Riverina/ south-west slopes region where average property size was amongst the largest. Here, slashing and manual removal of weeds were least frequently reported as would be expected for larger properties. However, this size would make relocation of horses more achievable, hence, allow the relatively common use of herbicides. Tillage and cropping would also be more readily accommodated by the large available areas and lower horse stocking rates. The use of other livestock species for weed control was also commonly reported within this region, an option made possible by the carrying of large numbers of sheep. Cattle were also used, especially in the Hunter Valley. Paradoxically, though, the region in which non-horse livestock were most commonly employed for weed control was Euroa, where, though sheep and cattle numbers were low in absolute terms they were used by eight of the twelve properties.

When interviewees were questioned about the incidence, within a given paddock, of mixed grazing (sheep and cattle alongside horses), and of complementary grazing (following horse with other livestock species), both practices were reported far more commonly than was indicated by responses to the use of cattle and sheep livestock for weed control. This apparent discrepancy may result from the fact that using cattle or sheep in the horse industry is generally viewed as a means of managing animal parasites rather than as a weed control strategy. Consequently, some weed management may be resulting as a side-effect of animal health management practices. This does, however, suggest an opportunity to improve the degree of weed control achieved by more explicitly recognising its value and by adopting practices which would maximize weed suppression. Timing the grazing by cattle or sheep after horses specifically to prevent weed species from reproducing is an example of how management may be improved. Such grazing strategies are likely to have other advantages (including more uniform pasture utilization and return of nutrients) which would avoid the development of horse sickness in pastures.

Overall, these findings suggest a plasticity in the integration and implementation of weed management methods for different situations leading to control success tending to fall between 'fair' and 'successful'. However, the fact that some individual properties in all regions reported 'very unsuccessful' weed control, coupled with the heavy reliance on herbicides (and seemingly low recognition of the potential for biological control) indicates considerable scope for improvements in weed management for this industry. There is, therefore, a need to develop improved weed management systems for horse-grazed pastures and extension of such technologies to practitioners. New weed management systems will need to recognise the heterogeneity which is apparent in many aspects of the Australian thoroughbred stud industry and should seek to protect the useful life of herbicide active ingredients against resistance by lessening dependence on chemical control.

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REFERENCES

Gurr, G.M., Aston, S.C., Hunt, E.R., Morrison, C.G., Wheatley, W.M. and Woodward, R.A. (1996). 'Survey of agronomic practices on thoroughbred horse stud farms'. RIRDC Research Paper No 96/2. (Department of Primary Industries, Canberra).

Kelleher, F. (In press). The ecology and management of horse pastures. Proceedings of the RIRDC Equine Nutrition and Pastures for Horses Workshop.

McCarthy, G. (1987). 'Pasture management for horses and ponies'. (Collins, London).

Medd, R.W., Kemp, D.R. and Auld, B.A. (1987). Management of weeds in perennial pastures. *In* 'Temperate pastures, their production, use and management', eds. J.L Wheeler, C.J. Pearson and G.E. Robards, pp. 253-61. (CSIRO, Canberra).

St. John-Sweeting, R.S. and Morris, K.A. (1990). Seed transmission through the digestive tract of the horse. Proceedings of the 9th Australian Weeds Conference, pp. 137-9.