MANAGEMENT PRACTICES ASSOCIATED WITH INCREASE OF VULPIA IN PASTURES - A SURVEY

P.M. Dowling[1], A.R. Leys[2] and B. Plater[3]
NSW Agriculture
[1] Agricultural Research & Veterinary Centre, Forest Road, Orange NSW 2800, Australia
[2] Locked Bag 21, Orange NSW 2800, Australia
[3] Agricultural Research Institute, PMB, Wagga Wagga NSW 2650, Australia

Summary. A survey of 49 farms from central and southern New South Wales Australia was undertaken in 1989 to identify factors responsible for the increase in incidence of vulpia in pastures. Reduced competition from other pasture plants was the main explanation given by farmers for this increase and this was confirmed by measurements taken from sample paddocks. Reasons for lack of competition differed with location (cropping zone or permanent pasture zone). Results suggest that long-term management of vulpia in pastures will involve the maintainence of a significant proportion of other competitive species in the sward.

INTRODUCTION

Vulpia, or silver grass, is a small, fine-leaved annual grass which occurs as a naturalised volunteer in most Australian temperate and Mediterranean pastures (4). It is an abundant weed of improved pastures in all regions of southern and central NSW, and is also a major problem on the Northern Tablelands and the South Coast, and in much of Victoria, South Australia, and Western Australia. Vulpia reduces profitability from pastures by contaminating the wool of grazing sheep, producing less winter forage than other annual grasses, and in late winter and spring, producing feed of low palatability. Results from various surveys indicate that many pastures contain >50% vulpia ((2); Leys and Dowling, unpublished data) indicating that voluntary intake in these situations is likely to be reduced. In addition, vulpia residues are low in nutritive value (3) providing a poor source of feed over summer.

METHODS

Forty nine farms from central and southern New South Wales were surveyed during October and December 1989. The survey involved an interview with each farmer to complete a questionnaire on farm management practices from two sample paddocks per farm. Detailed measurements of soil characteristics, pasture composition and the occurrence and density of vulpia species were also made in each sample paddock.

Farm selection. Farms were selected from two zones in central and southern New South Wales. Twenty seven farms were selected from the winter cropping zone of the western slopes between the 500 and 650 mm isohyets, and 22 farms were selected from pastoral areas of the tablelands between the 650 and 800 mm isohyets. Farms were selected from throughout each zone by NSW Agriculture District Agronomists. Four criteria were used to select the farms:

a. Only farms on which vulpia was known to be a problem were included;
b. The farm was at least 200 ha;
c. The farmer had been owner/manager for at least 5 years and kept good paddock records;
d. Only 2 to 4 farms were selected from any one Agronomy District, the aim being to have an even distribution of farms from Dubbo/Merriwa in the north to the Victorian border.

Paddock selection. Two paddocks were selected from each farm. Paddock 1 had a high incidence of vulpia, while Paddock 2 was nearby but had much less vulpia. Both paddocks had to be at least 10 ha (this eliminated small special purpose paddocks), and sown to pasture species for at least 2 years.

Pasture assessments. A uniform patch of vulpia (>50 m diameter), representative of the paddock, was selected in each sample paddock for soil and pasture sampling. Total pasture dry weight and botanical composition were estimated by the ranking method of 'T Mannetje and Haydock (1963). Vulpia plant densities were estimated by counting all plants in 30x4.5 cm diameter cores sampled in a W pattern from within the selected patch. Panicle densities were estimated by counting all vulpia panicles in 10 quadrats (7.5x7.5 cm) samples in a W pattern from within the patch. Thirty of these panicles were randomly selected to determine the proportion of each vulpia species in the sward.

Soil characteristics. Twenty soil cores (4.5 cm diameter by 7.5 cm deep) were randomly sampled from each vulpia patch. A sub-sample was removed to determine soil texture and the remainder was dried at 40°C for 48 h before grinding to pass a 2 mm sieve. A sub-sample was used to determine pH, organic matter, total exchangeable cations, total soil nitrogen, and soil phosphorus.

RESULTS

Most farmers suggested a general deterioration of pastures as the main reason for the widespread abundance of vulpia. This was reflected in the rankings given to the factors responsible for the greater prevalence of vulpia in Paddock 1 (*cf.* Paddock 2; Table 1).

In the cropping zone, 89% of farmers ranked "less vigorous pastures" one of the top 3 reasons for the greater prevalence of vulpia in Paddock 1. This was more than double the score for any other factor. Other reasons which ranked highly were: lower soil fertility (41%); lower soil pH (37%); and greater use of herbicides which removed competing species (37%). The herbicides responsible were diclofop-methyl (most frequently mentioned because of its widespread use for control of annual ryegrass during the 1980's), fluazifop-P (reduces the density of a range of annual grasses but not vulpia), and herbicides for broad-leaved weed control (reduced the density of broad-leaved weeds such as Paterson's curse). All of these factors reduce the ability of pastures to compete with vulpia, thus allowing it to invade more readily.

In the pastoral zone, 68% of farmers ranked "less vigorous pastures" one of the top 3 factors responsible for the greater prevalence of vulpia in Paddock 1. As in the cropping zone, other reasons which ranked highly were lower soil fertility (41%) and lower soil pH (41%). The occurrence of droughts was also thought to contribute to the higher incidence of vulpia (41%). Droughts would also reduce the density of pastures in Paddock 2, and although some of the pastures in this second paddock have been replanted after the major drought in 1982-83, the average age of pastures in the two paddocks were similar (8.2 and 7.8 years in Paddocks 1 and 2, respectively). Thus, the reliability of the rankings given to this factor is questionable.

In the pastoral zone, herbicide use did not rate among the top 3 factors affecting vulpia. This contrasts with the cropping zone where it had a relatively high ranking. Cultivation was the only other factor which farmers thought contributed to greater prevalence of vulpia. Twenty two percent of farmers in the cropping zone, and 18% of farmers in the pastoral zone, considered

less cultivation, especially less use of disc implements, to have contributed to the difference in vulpia levels in the two paddocks.

Table 1. Factors responsible, and the percentage of farmers who ranked them as one of the top three causes, for the greater prevalence of vulpia in Paddock 1 compared with Paddock 2[ab]

Factors	Cropping zone	Permanent pasture zone
Less vigorous pasture	89	68
Lower soil fertility	41	41
Lower soil pH	37	41
Greater use of herbicides which reduced competition from other species	37	0
Droughts which reduced the persistence of sown species	7	41
Less cultivation	22	18
Different stocking rate	7	9
Different agronomic practice	0	0
Different livestock practice	0	0
Other	0	5

[a] Paddock 1 = dense vulpia; Paddock 2 = less vulpia)

[b] Percentage of farmers who ranked each factor as 1, 2, or 3 (where 1 = most likely cause for the greater prevalence of vulpia in Paddock 1 than Paddock 2)

Our measurements of soil characteristics, pasture composition, and various parameters of vulpia abundance taken in the sample paddocks, confirm the farmers' opinions that lack of pasture competition is the main reason for the greater prevalence of vulpia in pastures. In the cropping zone vulpia was four times more abundant in Paddock 1 than Paddock 2, while in the pastoral zone there was a 3.5 fold difference in the vulpia content (as measured by plant density, panicle density, or percentage DW; Table 2).

The incidence of vulpia is inversely correlated with the proportion of other pasture species, especially annual, or perennial grasses. This was most obvious in the pastoral zone where annual grasses comprised 4 and 14%, and perennial grasses 16 and 39% of the total DW of the pastures in Paddocks 1 and 2, respectively, while the corresponding vulpia contents were 49 and 14%. Similar, but less pronounced effects, occured in the cropping zone. However, in this zone an increase in the legume component (from 32% in Paddock 1 to 54% in Paddock 2) may have been just as important as an increase in the grass component.

Soil pH, soil P, and total soil N levels were similar in the two sample paddocks and probably only indirectly influence vulpia through their effect on pasture vigour (Table 2). In both zones OM and CEC levels in the soil were slightly higher in Paddock 2 than Paddock 1.

Although there are at least five species of vulpia in Australia, *V. bromoides*, is by far the most prevalent in southern and central New South Wales (73% of the sward in the cropping zone, and 76% of the sward in the pastoral zone - similar to a previous survey (1)). *V. myuros* was the only other species of any consequence (26% of the sward in the cropping zone, and 24% of the sward in the pastoral zone). *V. muralis* occurred as a very minor component in the western part of the cropping zone in central New South Wales, while *V. ciliata* and *V. fasciculata* were not recorded.

Table 2. Mean abundance of vulpia, soil characteristics, and pasture composition in the two sample paddocks from the cropping zone and the pastoral zone[a]

Parameter	Cropping zone		Pastoral zone	
	Paddock 1	Paddock 2	Paddock 1	Paddock 2
Vulpia abundance				
Plant density (plants/m^2)	4,289	1,054	7,325	2,110
Panicle density (panicles/m^2	5,928	1,223	10,485	3,235
Vulpia DW (% of total DW)	48	12	49	14
Soil characteristics				
Soil pH	4.5	4.6	4.4	4.5
Soil P (ug/g)	9.7	9.9	12.0	10.3
Total soil N (%)	0.11	0.13	0.17	0.18
Soil OM (%)	1.84	2.16	2.94	3.06
CEC (cmol(+)/kg)	5.4	6.4	4.8	6.4
Botanical composition				
Other annual grasses (% of total DW)	12	25	4	14
Perennial grasses (% of total DW)	1	5	16	39
Pasture legume content (% of total DW)	32	54	22	27

[a] Paddock 1 = dense vulpia; Paddock 2 = less vulpia)

The results of both the personal interviews with the farmers, and measurements taken from the sample paddocks, suggest that the abundance of vulpia is least where pastures contain a significant grass component. For example, in Paddock 2 pastures in the cropping zone contained 30% grass, while those in the pastoral zone contained 53% grass. However, it is impossible to conclude from the survey alone, whether the higher grass content of pastures in Paddock 2 was the cause, or the effect, of the lower vulpia content.

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