SILVERGRASS ALLELOPATHY ON CROP AND PASTURES

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Summary. The allelopathic effects of two *Vulpia* spp. on wheat, lucerne, phalaris, and canola were investigated under glasshouse conditions. Germination of all species except canola was reduced. Root and top growth were also significantly affected although *V. myuros* had little effect on lucerne. In some cases, ultraviolet light and moisture pretreatment of the residue enhanced the effects.

INTRODUCTION

Silvergrass has become one of the major weed species in crops and pastures of southern Australia. In cereals, chemical control is not an option. In pastures, competition from *Vulpia myuros* seedlings has resulted in poor early growth of lucerne and phalaris(3). This, coupled with its poor feed value(1) and low palatability, allows silvergrass to proliferate and produce a bulk of residual material at the end of the growing season in early summer.

Previous work had indicated an allelopathic effect on wheat from silvergrass residues which had been weathered but not leached(2). This paper reports a further study on other species in relation to degree of residue breakdown.

METHODS

Residues of *Vulpia myuros* and *V. bromoides* were collected following seeding in December and stored in dry, dark conditions until commencement of the experiment. Pots were filled with a fine, sandy loam soil and residues from each species of *Vulpia* were chopped and placed on the soil surface at a rate equivalent to 2 t/ha. The experiment was conducted under glasshouse conditions. Treatments comprising four replications were imposed as follows for a period of 10 weeks:

(a) nil residue
(b) residue, no further treatment
(c) residue, ultraviolet light
(d) residue, ultraviolet light plus moisture.

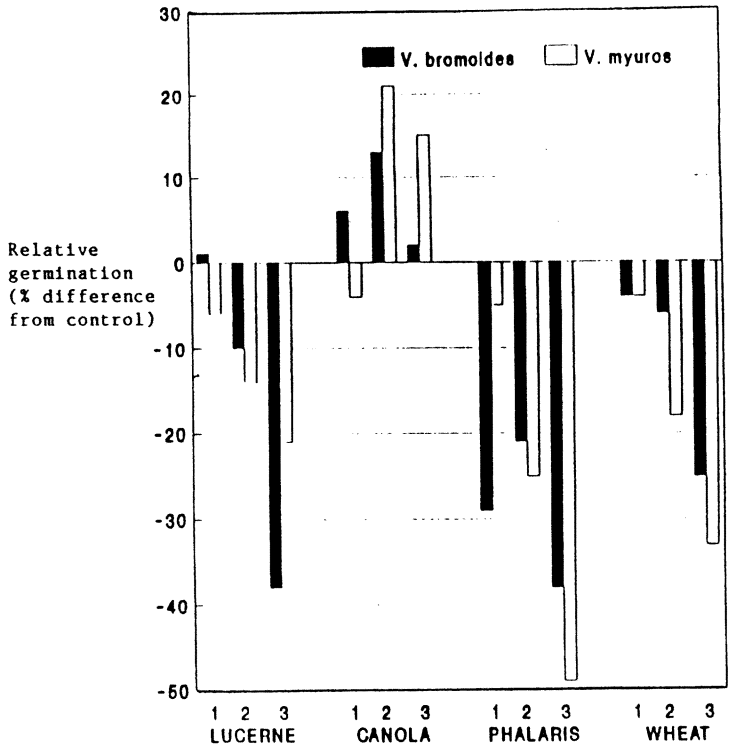
The ultraviolet light was applied from 6 p.m. to 6 a.m. daily, for safety purposes, and water, where required, was applied lightly every second day. Following the pretreatment period, all pots were lightly watered and then sown to 10 seeds per pot of the appropriate species, being one of canola (*Brassica campestris,* cv Jumbuck), wheat (*Triticum aestivum,* cv Vulcan), lucerne *(Medicago sativa,* cv Aurora) and phalaris *(Phalaris aquatica,* cv Sirolan).

Pots were lightly watered daily to provide sufficient moisture for growth but insufficient to leach any soluble allelochemicals from the pot. Freshly germinated seedlings of silvergrass were removed regularly from the pots during the course of the experiment.

After twelve days, germination percentage was recorded and pots were subsequently thinned to 3 plants per plot. A complete fertiliser (Aquasol$^{(R)}$) was provided and growth continued for a further 5 weeks. The dry matter yields of tops and roots were then recorded and statistically analysed.

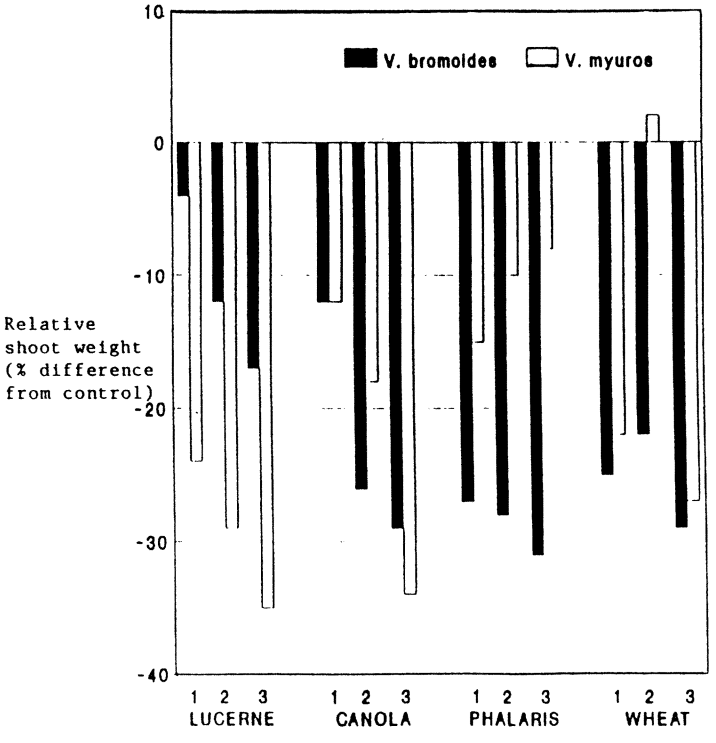
RESULTS AND DISCUSSION

The presence of *Vulpia* residues resulted in reduced germination of all species except for canola. The decline was accentuated by UV light and UV light + moisture, being up to 38% in lucerne, 33% in wheat and 49% in phalaris relative to control treatments (Figure 1).



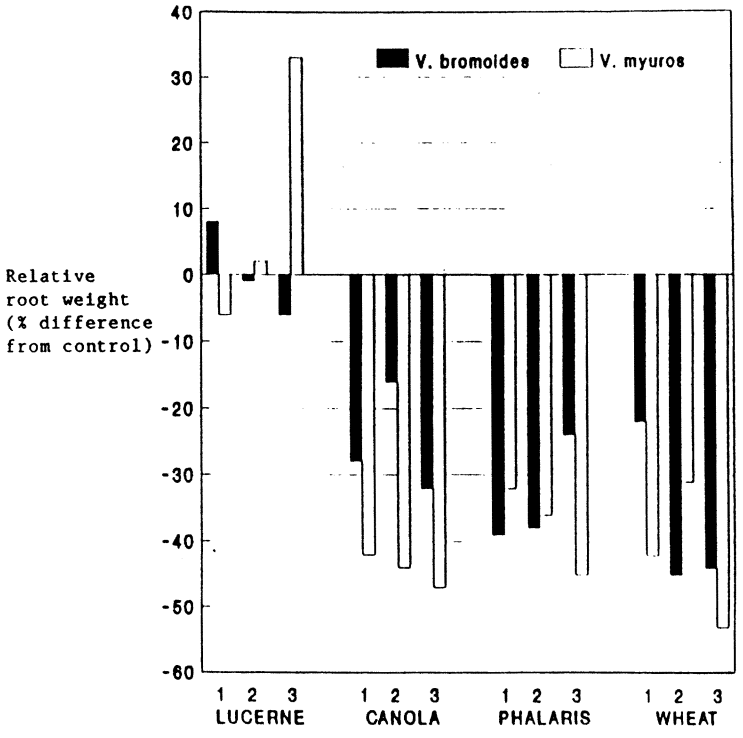
Vulpia cover	1	Nil	L.S.D.(P=0.05)	*V. bromoides*	25.4
	2	Light		*V. myuros*	31.0
	3	Light+water	(P=0.01)	*V. bromoides*	33.8

Figure 1. Germination as affected by *Vulpia* spp. relative to control treatment.



Vulpia cover	1	Nil	L.S.D.(P=0.05)	*V. bromoides*	6.9
	2	Light		*V. myuros*	5.9
	3	Light+water	(P=0.01)	*V. myuros*	8.0

Figure 2. Shoot weight as affected by *Vulpia* spp. relative to control treatment.



Vulpia cover	1	Nil	L.S.D.(P=0.05)	*V. bromoides*	15.2
	2	Light		*V. myuros*	9.8
	3	Light+water			

Figure 3. Root weight as affected by *Vulpia* spp. relative to control treatment.

A significant effect (P=0.05) of silvergrass residues on foliage production was recorded on all species (Figure 2). However, *V. myuros* effects on lucerne were not consistent with those of other species. The effect of residues on root development was also significant (P=0.01) (Figure 3). *V.bromoides* affected all species but *V. myuros* had little effect on lucerne.

From this experiment, it is clear that allelochemicals are present in the residues of both *V.bromoides* and *V. myuros*. Therefore potential exists in the field for residues of these species to reduce germination and production of both crop and pasture species.

The active form of the allelochemicals appears to result from ultraviolet breakdown to an easily leached form. The extent to which production is affected is likely to be a function of summer/autumn weather conditions to effect breakdown. The greatest impact is likely to occur in autumns following a dry summer where little opportunity has existed for leaching of the chemicals and subsequent breakdown prior to sowing or to natural regeneration of annual pastures.

Management practices which remove or restrict development of residues from the previous year's production of silvergrass are important. Such residues tend to accumulate because of the relative unpalatability of *Vulpia* spp, particularly at maturity. Practices, such as burning early in autumn, if suitable conditions exist, should be considered in order to remove large quantities of such residues in annual pastures to allow the regeneration process to take place without chemical impediment.

ACKNOWLEDGEMENT

Residues of pure swards of *V.myuros* and *V.bromoides* were provided by Dr A. Leys, Agricultural Research Institute, Wagga Wagga.

REFERENCES

1. Purser, D.B. 1981. In: Grazing Animals. (Ed. F.H.W. Morley) (Elsevier: Amsterdam). pp. 159-178.
2. Pratley, J.E. 1989. Proc. 5th Aust. Agron.Conf., Perth, p.472.
3. Scott, J.M. and Blair, G.J. 1987. Aust.J.Exp.Agric. 27(3), 367-375.