Chemical weed management of vulpia

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Introduction

The use of chemicals to control vulpia (*Vulpia* spp.) is a relatively recent innovation. Consequently there is a general paucity of information on its control and registration of chemicals for use on this weed. One of the characteristics of vulpia which can make it such a difficult weed to handle is its tolerance to the selective grass herbicides which belong to the aryloxyphenoxypropionate and cyclohexanedione families. Their use in the absence of any other control measures can quickly lead to vulpia dominance.

Pre-seeding treatments

Vulpia is usually included under the general heading of annual grasses for the major knockdown herbicides glyphosate and paraquat. These herbicides can provide effective control of the major vulpia species at label rates. However it is not common to find poor control of vulpia with these herbicides despite the sensitivity of the species. Leys and Plater (1993) showed that while paraquat could reduce vulpia numbers substantially, up to 33% of vulpia plants remained at one site where paraquat was sprayed post-emergence. The survival of vulpia from the pre-seeding knockdown treatments is probably a function of three factors: the relatively small leaf area for herbicide capture; the large numbers of seedlings; and the desire of farmers to use reduced rates of herbicide and water volumes. More recently Purba *et al.* (1993) have shown that it is possible for vulpia to develop resistance to paraquat. Herbicide resistance is now one other factor to be considered in failure to control vulpia with a knockdown such as paraquat.

In-crop control

Cereals

There are no herbicides currently registered for the control of vulpia in any cereal crop. Despite this, many farmers in Western Australia successfully achieve control of vulpia with diuron applied pre-emergent of the crop at rates of 375–500 g a.i. ha^{-1}. Matic and Black (1992) showed that diuron applied before seeding gave up to 70% control of sand fescue (*Vulpia fasciculata* (Forssk.) Samp.) and if combined with trifluralin, this could be increased to 93%. Bowran and Peirce (unpublished data) in experiments to compare the effect of herbicides in no-till versus conventional systems, applied diuron at up to 1.0 kg a.i. ha^{-1} post sowing pre-emergence of wheat and achieved almost complete vulpia control in both sowing systems. Holmes (1982) indicated that trifluralin + oryzalin (Yield®) could provide effective control of vulpia and that up to 90% control could be achieved. The effect of dinitroaniline herbicides such as trifluralin on vulpia observed by Matic and Black, and Holmes was also seen by Dowling and Wong (1993) where in the absence of any pre-season management vulpia numbers in crop could be reduced by 70% at rates of trifluralin normally used for ryegrass control. Chlorsulfuron had no effect on vulpia numbers in their experiment.

Pulses

Unlike cereals, pulse crops have a number of options available which generally means that vulpia is not a common weed infesting these crops. Nearly all pulse crops have a triazine herbicide registered for use in a particular pulse crop e.g. simazine in lupins, chickpeas and faba beans; cyanazine in lentil and field pea. As will be seen for pasture, triazines are highly effective in controlling vulpia. In most cases where a triazine is used, no specific mention is made of vulpia on the label, but it may be included as a weed under annual grass weeds, for example, as in lupins with simazine. Diuron is registered for use on lupins and field peas in Western Australia and gives very good control when used in these crops (Gilbey personal communication).

Oilseeds

No herbicides are currently registered for vulpia control in either canola or linseed (linola). The introduction of triazine tolerant canola would see the triazine option become available. Vulpia remains a major problem in no-till canola in southern Western Australia and various options have been tried in order to achieve control. These have mainly involved the use of simazine at early growth stages, but achieving a balance between crop tolerance and efficacy has been the greatest obstacle (Gilbey personal communication). 2,2-DPA is relatively well tolerated by canola and has been found to provide effective control of vulpia in this crop (Gilbey 1995).

Pasture

By far the greatest effort in recent years into chemical management of vulpia has occurred in pasture. Paraquat is registered for use in all states for annual grasses in annual and perennial clover (but not medics) as early as the 6-leaf stage (Dellow 1995). However, as has already been pointed out, the level of control with such a treatment is not always high and the number of vulpia plants surviving may still produce appreciable seed. Selective herbicides such as propyzamide and carbetamide are effective at controlling vulpia (Holmes personal communication, Code 1990), but as pointed out by Leys (1990), their cost for general pasture use is prohibitive.

To date, the most cost effective control measure for vulpia in pasture is simazine. This herbicide is currently registered in all states except Queensland for vulpia and sand fescue control in subterranean clover, established lucerne and perennial grass pasture (Dellow 1995). The addition of paraquat is registered for New South Wales, Victoria and South Australia. Leys *et al.* (1991b) showed clearly that for eastern Australia, the best time for simazine application was June and that with appropriate rates of application at this time, close to 100% control of vulpia could be achieved. Such results have been repeated in experimental work and farmers paddocks many times since, and this is now most probably the most widely used technique for vulpia removal. The mixtures with either paraquat or a grass selective, are also widely used, but pasture tolerance can be a problem on sandy surfaced soils or where red-legged earth mite control is not practised. Medic tolerance to simazine is variable and while simazine is used on medic, damage may occur on sandy surfaced soils. Serradella shows even less tolerance to simazine than medics and vulpia will remain a major problem for this pasture species.

The herbicide 2,2-DPA is well tolerated by medics and serradella and can provide good control of vulpia in medic pasture (Bowran unpublished data). Asulam is registered for vulpia control in perennial ryegrass seed crops (Dellow 1995).

Seed set control

The use of non-selective herbicides to prevent seed set in weeds and grasses in particular, is a widely practised technique. Glyphosate and paraquat are all registered for use in pasture for vulpia seed set control (Dellow 1995). For vulpia, Leys *et al.* (1991a) showed that application of either glyphosate or paraquat at anthesis gave the lowest number of seedlings regenerating in the following year. The lack of synchrony between the major grass weeds in ear emergence can create difficulty in determining just when to apply the seed set

treatment. Vulpia can show ear emergence up to four weeks earlier than other species in some environments and if spray timing is set for a later emerging species then vulpia will not be adequately controlled.

The cost of reduced seed set as a consequence of using a non-selective herbicide on the pasture legume may be great even in subterranean clover which is generally more tolerant to these herbicides (Dowling *et al.* 1990). Medics are very sensitive to glyphosate. The flowering of early medics often coincides with vulpia ear emergence in Western Australia (Gill and Stewart 1989).

Directions for future research

A number of areas still require further research if vulpia is to be successfully controlled in all phases of the rotation.

- Oilseed crops such as canola and linseed require a reliable herbicide especially for the no-till situation where these crops are sown after pasture.
- A full characterization of the ability of diuron to control vulpia in cereals is needed with subsequent registration.
- Pasture species such as medic and serradella require a reliable herbicide package, while new pasture species need to be investigated for their tolerance to existing herbicides.
- The effectiveness of other triazine and triazinone herbicides (such as terbutryne and metribuzin) on vulpia control needs investigation.

References

Code, G.R. (1990). The effect of grass control measures in pasture on weed populations and grain yield in following wheat crops. Proceedings of the 9th Australian Weeds Conference, pp. 30-4.

Dellow, J. (1995). Weed control in lucerne and pastures. NSW Agriculture, Agdex 130/640.

Dowling, P.M., Milne, B.R. and Kelso, H.G. (1990). Timing of spraytopping and it's effects on subterranean clover regeneration. Proceedings of the 9th Australian Weeds Conference, Adelaide, p. 377.

Dowling, P.M. and Wong, P.T.W. (1993). Influence of pre-season weed management and in-crop treatments in two successive wheat crops. 1. Weed seedling numbers and wheat grain yield. *Australian Journal of Experimental Agriculture* 33, 167-72.

Gilbey, D.J. (1995). Silver grass control in canola – Kellerberin. *In* 'Summary of Herbicide Efficacy and Tolerance Research Results 1995', pp. 56-7. (Weed Science Section, Agriculture Western Australia).

Gill, G.S. and Stewart, P. (1989). Phenology of grass weeds and its interaction with seed set control herbicides. *In* 'Grass Control In Pastures For The Wheat/Sheep Zone', compiled by I. Maling and R. Madin. Miscellaneous Publication No. 41/90, Department of Agriculture Western Australia.

Holmes, J.E.H. (1982). Silver grass control. *In* 'Experimental Summaries, 1982'. (Division of Plant Industry, WA Department of Agriculture).

Leys, A.R. (1990). The control of annual grasses in pastures of southern Australia and implications for agriculture. Proceedings of the 9th Australian Weeds Conference, Adelaide, pp. 354-64.

Leys, A.R., Cullis, B.R. and Plater, B. (1991a). Effect of spraytopping applications of paraquat and glyphosate on the nutritive value and regeneration of vulpia (*Vulpia bromoides* (L.) S.F. Gray). *Australian Journal of Agricultural Research* 42, 1405-15.

Leys, A.R. and Plater, B. (1993). Simazine mixtures for control of annual grasses in pastures. *Australian Journal of Experimental Agriculture* 33, 319-26.

Leys, A.R., Plater, B and Lill, W.J. (1991b). Response of vulpia [*Vulpia bromoides* (L.) S.F. Gray and *V. myuros* (L.) C.C. Gmelin] and subterranean clover to rate and time of application of simazine. *Australian Journal of Experimental Agriculture* 31, 785-91.

Matic, R. and Black, I.D. (1992). Integrated weed management systems for the control of sand fescue (*Vulpia fasciculata*) in barley in South Australia. Proceedings of the 1st International Weed Control Congress, Melbourne, Volume 2, pp. 315-7.

Purba, E., Preston, C. and Powles, S.B. (1993). Paraquat resistance in a biotype of *Vulpia bromoides* (L.) S.F. Gray. *Weed Research*, 33, 409-13.