HALOSULFURON-METHYL AND IMAZETHAPYR for the SELECTIVE CONTROL OF KYLLINGA (*CYPERUS BREVIFOLIUS* ROTTB.) IN IRRIGATED PASTURE

F.L.F. Henskens[1], K.O. Fallow[2], and R.H. Slarke[1]

[1]Agriculture Victoria, Kyabram Dairy Centre, I.S.I.A., RMB 3010, Kyabram, Vic 3620

[2]Monsanto Australia Limited, PO Box 156, Golden Square, Bendigo, Vic 3555

Summary. Kyllinga (*Cyperus brevifolius* Rottb.) is a weed of increasing importance in irrigated pastures throughout northern Victoria. It is unpalatable and stock avoid otherwise productive swards in which it is present. Kyllinga spreads rapidly in pasture and displaces sown species. There are no known means of controlling kyllinga in pasture. This paper reports on the potential of halosulfuron-methyl and imazethapyr to selectively control kyllinga in irrigated pasture. Halosulfuron-methyl applied at 50.0 and 97.5 g a.i./ha and imazethapyr at 192 g a.i./ha significantly suppressed kyllinga as a proportion of sward DM. Seed was an important source of weed reinfestation. Effective control must therefore reduce seed production. Unlike imazethapyr, all rates of halosulfuron-methyl suppressed seed head formation. Halosufuron-methyl, has the greatest potential for selective control of kyllinga. Since halosulfuron-methyl is not registered for use in pasture, other weed management tools need to be investigated.

INTRODUCTION

Kyllinga (*Cyperus brevifolius* Rottb.) is a perennial, rhizomatous sedge that produces large quantities of seed (5). Although probably native to Australia, kyllinga has been identified as an increasing weed problem in northern Victoria over the last 5 years (2). Kyllinga is unpalatable to dairy cows and according to anecdotal evidence, avoid grazing swards in which it is present (2). In irrigated pastures it is highly invasive and displaces sown species and forms dense patches in pasture, where it has been observed to double in size and number each year (1, 2). It has the potential to reduce the productivity of individual paddocks and entire dairy farms.

Currently, there is no practical means of controlling kyllinga in pasture. Herbicide and non-chemical methods have failed to control infestations or prevent re-infestation (2). Seven of the 8 herbicides that are registered for use on kyllinga in Victoria contain arsenic or arsenic derivatives and are not registered for use in pasture. The remaining product (based on bentazone) is registered for turf and has a prohibitively expensive recommended application rate of 20 L/ha (approximately $560/ ha).

Preliminary field trials conducted in irrigated pastures in 1992/93 indicated that control could be achieved using halosulfuron-methyl (Fallow, unpubl. data) and imazethapyr (Bell, unpubl. data). Halosulfuron-methyl is currently registered in Australia to control kyllinga in turf. It is not registered for use in pasture and its impact on pasture species is not known. Imazethapyr is a broad spectrum herbicide with activity on a range of broad-leaved weeds and several annual grasses. There are no data on the impact of imazethapyr on white clover-perennial ryegrass mixtures, however it suppresses growth, nodulation and seed yield in subterranean clover cultivars, and retards lucerne growth (3, 4). The current study was designed to evaluate the effects of halosulfuron-methyl and imazethapyr on kyllinga in irrigated pastures.

MATERIALS AND METHODS

A randomised complete block experiment with three replicates was conducted in well established pasture on a Lemnos loam soil, on a farm in northern Victoria (Harston, 25 km S of Kyabram) between October 1994 and April 1995. The site was not grazed but mowed to a height of 6-8 cm every 3-4 weeks at the same time as the rest of the paddock weeks. During the summer the site was flood-irrigated on a 7-8 day cycle. Five treatments were imposed; i) untreated control, ii) and iii) halosulfuron-methyl applied once at 50.0 g a.i./ha and 97.5 g a.i./ha respectively, iv) halosulfuron-methyl applied twice at 50.0 g a.i./ha, and v) imazethapyr applied once at 192.0 g a.i./ha. Plots measured 3x15 m. The single and or initial halosulfuron-methyl applications were made on 23 November when kyllinga rhizome buds had emerged and formed rapidly growing vegetative rosettes. Plots receiving the second halosulfuron-methyl application were treated again 7 weeks later. Imazethapyr was applied on 9 December.

The botanical composition of plots was assessed 6 times at approximate three week intervals, from 6, 1x0.1 m quadrats, hand-cut using electric shears to a height of no less than 1-3 cm above the soil surface. These samples were bulked in pairs then subsampled and divided into clover, perennial ryegrass, kyllinga and other plant fractions. At each harvest the number of seed-heads in the kyllinga fractions were counted and these data used to estimate seed production in the plots. Data were analysed using genstat anova procedures.

RESULTS AND DISCUSSION

All rates of halosulfuron-methyl and imazethapyr significantly ($P>0.05$) suppressed the percentage of kyllinga in pasture DM (Fig. 1a). In late March 1995, 120 days after the initial herbicide application, kyllinga accounted for about 20% pasture DM in untreated plots, but only 2-6% DM in those treated with herbicide (Fig. 1a). There were no differences between the efficacies of the various herbicides and rates in terms of measured % DM (Fig. 1a). Visual scores of % kyllinga suppression, however, indicate that the split application of halosulfuron-methyl provided better control than single applications of either herbicide. The visual assessments showed there was little or no difference between rates of halosulfuron-methyl. Imazethapyr gave the least control of kyllinga.

In this instance kyllinga was a minor component of sward DM (Fig. 1). Pasture losses due to kyllinga may, however, be much greater than suggested by these data. Observations of areas adjacent to the experimental site, and anecdotal evidence (2) show that cows avoid grazing where it is present and leave patches of ungrazed pasture around the weed. Kyllinga infestations may thus, reduce pasture productivity by contaminating the sward and displacing desirable species.

None of the herbicides significantly suppressed clover or perennial ryegrass percentage in pasture (Figs. 1b, 1c). Although the leaves of ryegrass treated with imazethapyr appeared to be scorched there was no apparent reduction in % DM (Fig. 1c). The other species fraction was composed principally of paspalum (*Paspalum dilatatum* Poiret), umbrella sedge (*Cyperus eragrostis* L.), *Rumex* spp. and summer grasses. This fraction was the major component of the pasture in all plots and was not significantly affected by the herbicides (Fig. 1d).

At 60 days after herbicide application (January), all plots were reinfested with kyllinga seedlings that had since germinated. The seedlings originated either from seed present in the soil, from surviving plants or, introduced from outside the plots, probably when the paddock was topped and/or irrigated. These findings demonstrate the importance of seed and dispersal to kyllinga persistence. Seed production must be suppressed if infestations are to be reduced. Multiple, strategically timed applications of herbicide may be required to kill growth from rhizomes in spring and seedlings later in the year. The impact of pasture management practices such as topping on kyllinga growth , seed production and dispersal requires further investigation.

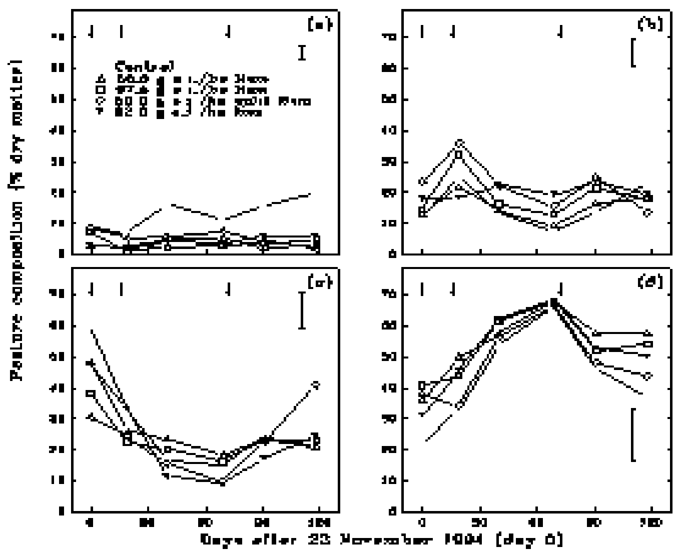

Figure 1. The effect of halosulfuron-methyl (Hsm) and imazethapyr (imz) on the pasturecomposition (% DM) of (a) kyllinga, (b) clover, (c) perennial ryegrass and (d) other species. The arrows indicate the application dates of halosulfuron-methyl, imazethapyr and the second (split) halosulfuron-methyl treatment, respectively. Vertical bars indicate the l.s.d. (P>0.05).

Kyllinga produced prolific quantities of seed heads in all treatments (Fig. 2). Cumulative seed head production in untreated plots was around 500/m^2. Each seed head contains 100-120 seeds (6), so potentially the untreated populations produced 50,000-60,000 seeds/m^2. Although halosulfuron-methyl significantly reduced cumulative seed head formation, plants in these treatments produced 120-260 seed heads/m^2 or potentially 12,000-31,200 seeds/m^2 during the growing season. These data indicate that small populations of kyllinga produce large quantities of seed thus generating a sizeable bank of viable seed in the soil that may be a source for future infestations. Imazethapyr did not suppress seed head formation (Fig. 2).

Halosulfuron-methyl has the greatest potential to control kyllinga. Neither herbicide alone, however, will provide the total solution to controlling kyllinga and other management practices

need to be identified and investigated.

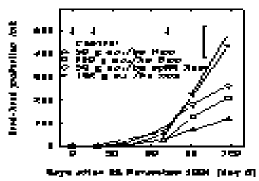

Figure 2. The effect of halosulfuron-methyl (Hs-m) and imazethapyr on cumulative seed-head production in kyllinga. The arrows indicate the application dates for halosulfuron-methyl, imazethapyr and the second (split) halosulfuron-methyl treatment, respectively. The vertical bar indicates the l.s.d. (P>0.05).

CONCLUSIONS

Halosulfuron-methyl and imazethapyr provided good control (>85% and >70% kill respectively) of kyllinga during the growing season. Seedling germination was a major source of reinfestation. Effective control or management strategies must reduce seed production, dispersal and soil seed population. Strategic, multiple applications of herbicide may be necessary to suppress kyllinga throughout the growing season. Further research is needed to identify other effective management practices. There is a need to investigate methods of reducing the size of weed populations between seasons and to determine the impact of other pasture management practices on kyllinga.

ACKNOWLEDGMENTS

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