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POSTER SUMMARY

EFFICACY OF GLYPHOSATE APPLIED TO SHORT- AND LONG-STOLON *CYNODON DACTYLON* AND THE SEARCH FOR ALTERNATIVE POST-EMERGENCE HERBICIDES

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Abstract

Cynodon dactylon (cynodon, kweek, couch grass) is a major weed in the South African sugar industry. Current recommendations involve repeated applications of glyphosate. This poster describes a screening trial to identify non-glyphosate treatments, the effect of tillage prior to application of two herbicides, and the effect of two herbicides on crop yield.

Fluazifop-butyl, imazapyr and glyphosate all provided >95% control for up to 19 weeks after treatment (WAT). Imazapyr was selected for further consideration in the tillage and phytotoxicity trials. Treatment of long-stolon *C. dactylon* (without tillage) with glyphosate and imazapyr provided 90% control at 20 WAT for both herbicides. In short-stolon *C. dactylon* (with prior tillage), glyphosate efficacy was reduced to 60% at 12 WAT, whereas imazapyr provided 90% control for up to 20 WAT. Imazapyr was compared with glyphosate with respect to crop damage and in one trial was not significantly more phytotoxic than glyphosate to sugarcane planted at least 6 WAT.

Conclusions are that (a) imazapyr is a promising candidate for *C. dactylon* control, with further work required to provide recommendations for this product, and (b) minimum tillage using glyphosate for sugarcane eradication is preferred to ploughing out stools in *C. dactylon* infested fields.

Keywords: Cynodon dactylon, sugarcane, chemical control, tillage

Introduction

Cynodon dactylon is listed as the most common grass weed found in sugarcane worldwide. It is a major weed in the South African sugar industry, competing vigorously both with the establishment of plant cane and the regeneration of the following ratoon crops. The area infested with *C. dactylon* appears to be increasing at an unprecedented rate, particularly on sandy coastal soils. Furthermore, the loss of cane canopy in dry conditions allows spread of this shade-susceptible species (Leibbrandt, 1995). This situation is aggravated by a residual herbicide programme that effectively eliminates other weeds, but leads to more vigorous growth and spread of existing *C. dactylon* stands (Landrey *et. al*., 1993). Richard and Dalley (2005) found that *C. dactylon* biomass under sugarcane canopy could increase from 160 to 590 kg/ha (347%) from plant cane to ratoon crops. This could reduce gross cane yield from 5-21 tons/ha for plant cane and 5-14 tons/ha for first ratoon cane where the grass had not been controlled.

The effects of current control methods are short-lived, requiring repeated applications of glyphosate, or paraquat plus diuron, or labour-intensive hand hoeing. A further consideration was that the translocation of systemic herbicides in creeping grasses might be problematic due to inadequate coverage during spraying. Prior mechanical control that breaks grass stolons and rhizomes (subterranean stolons) into shorter lengths, with subsequent treatment of regrowth, might allow improved spray coverage and reduce the translocation distance of chemicals in the plant.

The aims of this study were (i) to identify a non-glyphosate candidate product with prolonged control compared with glyphosate, (ii) to investigate the effect of tillage prior to application of glyphosate and/or the best candidate product from (i) above, and (iii) to compare with glyphosate the phytotoxic effects on sugarcane of the candidate product applied at its optimum rate for *C. dactylon* control.

Methods and Materials

Three trials were conducted at La Mercy in the KwaZulu-Natal province of South Africa (29^{o} 36'S, 31^{o} 6'E, altitude 115 m, soil 5% clay, 91% sand, 0.84% organic matter). In the first trial, high rates of seven non-glyphosate products were tested with recommended adjuvants or in tank mixtures with paraquat, and were compared with a registered treatment (glyphosate) applied at 2.16 kg/ha + adjuvant. Treatments tested were (i) hexazinone (1.5 kg/ha) + paraquat (0.1 kg/ha) + adjuvant, (ii) fluazifop-butyl (0.75 kg/ha) + adjuvant, (iii) haloxyfop (0.43 kg/ha) + adjuvant, (iv) imazapyr (0.6 kg/ha), (v) cycloxydim (0.40 kg/ha), (vi) propaquizafop (0.35 kg/ha) + adjuvant, and (vii) cyanazine (1.5 kg/ha) + paraquat (0.6 kg/ha) + adjuvant. Treatments were compared with unsprayed controls.

In the second trial, half of a dense *C. dactylon* infestation was disced twice at right angles, to segment and bury rhizomes and stolons, with spraying commencing when vigorous regrowth had occurred around five weeks after the discing operation. Herbicides were applied with a gas-regulated sprayer fitted with a flat-fan nozzle, at 180 L/ha application volume. Treatment application rates for glyphosate and imazapyr are listed in Table 1.

In the third trial, glyphosate (2.16 kg/ha), imazapyr (0.2 and 0.4 kg/ha) or no treatment was applied to bare soil at 6, 12 and 18 weeks before planting the herbicide-sensitive sugarcane variety N31. The crop was harvested at 12 months after planting.

Results and Discussion

Screening non-glyphosate candidates

Fluazifop-butyl, imazapyr and glyphosate all provided >95% control for up to 19 weeks after treatment (WAT). Other candidate herbicides resulted in less than 90% control, and these were not considered for further trial work. Based on these results, glyphosate and imazapyr were compared in the second trial. Although equally effective, fluazifop-butyl was not selected as this product is already registered for short-stolon *C. dactylon*, and imazapyr has greater residual activity.

Efficacy of glyphosate and imazapyr

For the second trial, results (Table 1) showed that there was a slight but not statistically significant dosage response from the application of glyphosate to long-stolon *C. dactylon* (without tillage), with more than 80% control for all treatments at 20 WAT. However, with prior tillage (short-stolon *C. dactylon*) glyphosate efficacy was reduced to 36 and 59% at 12

WAT, for 2.16 and 2.88 kg/ha, respectively. By 20 WAT, the registered rate of 2.16 kg/ha provided only 29% control. In contrast to glyphosate, application of imazapyr at the three higher rates provided more than 90% control for up to 20 WAT, irrespective of prior tillage.

Table 1. Effect of glyphosate and imazapyr on percentage control of long- and short-stolon *Cynodon dactylon* at 12 and 20 weeks after application.

Treatment		% contol of *Cynodon dactylon*			
		Long-stolon		Short-stolon	
		12 wks	20 wks	12 wks	20 wks
Unsprayed control		10	6	-32	-26
Glyphosate	1.44 kg/ha	71	83	33	27
	2.16 kg/ha	83	89	36	29
	2.88 kg/ha	95	97	59	62
Imazapyr	0.1 kg/ha	78	66	61	30
	0.2 kg/ha	95	98	90	90
	0.3 kg/ha	97	99	91	91
	0.6 kg/ha	97	99	98	98
LSD 5%		20			
CV%		23			

Since glyphosate has limited soil action it is postulated that, after the discing operation, late emerging grass rhizomes were protected at time of spraying and survived treatment. In contrast, imazapyr has more residual activity than glyphosate (Vencill, 2002) and therefore provided effective control of late-emerging rhizomes that were buried during the discing procedure.

Implications from these data are that in *C. dactylon*-infested fields, where old sugarcane stools require eradication prior to replanting, minimum tillage is recommended, with application of glyphosate to both sugarcane and *C. dactylon*. Thereafter, repeated glyphosate application to emerging grass rhizomes at 3-4 week intervals is required prior to land preparation operations. A long fallow period is therefore recommended for *C. dactylon* control in the South African sugar industry. The plough-out husbandry practice for removal of old sugarcane stools that involves ploughing and discing should be avoided, as delayed emergence of *C. dactylon* rhizomes ensures its survival.

Phytotoxicity

Imazapyr is classified an 'industrial herbicide' and, as such, high application rates are non-selective and are used for controlling vegetation along fence lines, at roadsides and in servitudes. Previous work in South Africa has excluded this chemical because, although it is a potent grass-killer, it is harmful to the sugarcane crop. However, in a preliminary phytotoxicity trial, there were no statistically significant differences between imazapyr and glyphosate with respect to stalk height, population, sugarcane yield (fresh mass) and sucrose yield, where the waiting period was at least six weeks prior to replanting the crop.

Conclusions

Conclusions are that (a) imazapyr is a promising candidate for *C. dactylon* control, with further work required to provide recommendations for this product, and (b) minimum tillage using glyphosate for sugarcane eradication is preferred to ploughing out stools in fields infested with *C. dactylon*.

REFERENCES

Landrey OP, Eichler GG and Chedzy J (1993). Control of creeping grasses in small grower cane in the Umbumbulu district. *Proc S Afr Sug Technol Ass* 67: 34-38.

Leibbrandt NB (1995). Recent research findings for improved control of some creeping grass species in sugarcane fields in South Africa. *Proc S Afr Sug Technol Ass* 69: 35-40.

Richard EP Jr and Dalley CD (2005). Bermudagrass interference in a three-year sugarcane production cycle. *Sugar Cane International* 23: 3-7.

Vencill WK (Ed.) (2002). Herbicide Handbook. 8th Edition, Published by the Weed Science Society of America, Lawrence, Massachusetts, USA.