

Use of Roundup^(R) (glyphosate) for Control of Tussock Sedge (*Carex appressa*)

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Tussock sedge (*Carex appressa* R.Br.), a native perennial weed of wet situations in New South Wales (NSW) and Victoria, is now spreading to drier areas and replacing valuable pasture species. A heavy infestation can substantially reduce animal production as sheep and cattle only graze the plant when other feed is scarce.

Tussock sedge is difficult to control on arable land because its massive stump (leaf bases and roots) makes ploughing ineffective unless very large implements are used. Burning and slashing only reduce the top growth for short periods but have no long-term effect. Herbicides have been tried on non-arable land in New Zealand (Fitzgerald, 1956; Allen, 1960; Meeklah and Mitchell, 1979) on other *Carex* spp. and in Victoria on tussock sedge (Shovelton *et al.*, 1985) with varying success.

Of the herbicides tested, Roundup^(R) has proved to be the most promising. However, since it has not been tested in NSW, a series of experiments were set down near Bigga NSW to evaluate the effect of spot-spraying and overall

spraying Roundup^(R) on the control of tussock sedge.

METHOD

Experiments were conducted on Don Burbidge's property "Burnafahes" near Bigga NSW where the soil is derived from granite. The experiments were sited on a grassed waterway that had free water flowing over the surface for part of winter. Tussock sedge plants were mature, up to 1 m high. Flowering and seed production began in November and continued through December and January.

Spot-spraying experiment

Individual tussock sedge plants were sprayed with three rates of Roundup CT^(R) plus the adjuvant Turbo^(R) (Table 1), applied from a gas powered (200 kpa) back-pack sprayer. Plants were sprayed to run-off in November 1990, January 1991 and April 1991 (Table 1). Between 27 to 55 plants were sprayed per treatment and there were four replications.

Table 1: Effect of spot-spraying tussock sedge with Roundup^(R): results recorded on February 20, 1992.

Treatment		% kill of plants sprayed on:		
Rate in ml/100 L water		22.11.90	29.01.91	22.04.91
Roundup CT ^(R)	Turbo ^(R)			
250	200	86	0	7
500	200	100	0	72
750	200	100	11	72
1000	200	100	39	91

The plants were growing vigorously in November but in January and April were severely retarded by drought (107 mm rain in summer and 66 mm in autumn). Effect of herbicides was assessed on February 20, 1992 by recording the number of plants alive and dead.

Overall spraying

Overall spraying

Rate of water carrier had no effect ($P < 0.05$) on herbicide efficiency. The split applications of Roundup CT^(R) (March + May) were more ($P < 0.05$) effective than the single application in May; *ie.* split application of 1.6 kg a.i./ha was more effective ($P < 0.05$) than single applications of 1.4 or 1.8 kg a.i./ha (Table 2). Although high percentage kills were obtained from the single applications of Roundup CT^(R) these kills would not be commercially acceptable because too many plants remained per ha after spraying (Table 2) to be controlled by other methods. A commercially acceptable kill would be over 99% where the remaining 50 or less plants/ha could be controlled by chipping or spot-spraying. Despite an abundance of soil moisture, kills from the May spraying were not commercially acceptable.

DISCUSSION

Plots (5 x 4 m) of tussock sedge were sprayed on March 13 and May 8, 1990 with 0.9, 1.4, 1.8 kg a.i./ha Roundup CT^(R) (Table 2) in 200, 500 and 1000 L/ha of water with 0.2% adjuvant Turbo^(R). The March treatments were over-sprayed with 0.7 kg a.i./ha Roundup CT^(R) in 200 L/ha of water with 0.2% Turbo^(R) on May 8, 1990. An unsprayed control was also included. There was an abundance of soil moisture for tussock sedge growth at each time of spraying (247 mm rain in summer and 339 mm in autumn). The herbicide mixtures were applied from a hand-held pneumatic sprayer. Results were recorded on December 6, 1991 by counting living and dead tussocks.

RESULTS

Spot spraying

Roundup CT^(R) applied to vigorously growing plants in November effectively killed tussock sedge, but when applied to drought-affected plants in January and April it proved, respectively, ineffective and moderately effective (Table 1). From these results it is difficult to ascertain whether plant vigour or stage of growth at spraying influenced Roundup CT^(R) efficacy. Perhaps the most useful conclusion from the results would be to avoid spraying tussock sedge in very dry summers.

Table 2: Effect of overall spraying of Roundup on percentage kill of tussock sedge, recorded on December 6, 1991; each treatment averaged for three rates of water carrier.

Treatment		Parameter measured:	
Roundup ^(R) kg a.i./ha or (L/ha) applied on:		Kill (%)	No. tussocks/ha after spraying
3.03.90	08.05.90		
0.9 (2) +	0.7 (1.5)	99.6a	20
1.4 (3) +	0.7 (1.5)	100.0a	0
1.8 (4) +	0.7 (1.5)	100.0a	0
Nil	0.9 (2)	67.7c	1615
Nil	1.4 (3)	91.7b	415
Nil	1.8 (4)	94.0b	300
Nil	Nil	3.0	4850

Means followed by the same letter are not significantly different at $P < 0.05$.

Roundup^(R) proved effective in killing tussock sedge when applied by spot-spraying or overall spraying. Best results were achieved by spraying in November or by split applications in March and May. Spraying in a very dry January or April or a wet May gave inferior results. Victorian research showed that spraying tussock sedge with Roundup^(R) in November was more successful than spraying in October or April (Shovelton *et al.*, 1985).

In New Zealand, spraying *Carex coriacea* with Roundup^(R) was most successful in January-February when seedheads were ripening or ripe (Meeklah and Mitchell, 1979). No mention of rainfall on Roundup^(R) effectiveness was made in the Victorian or New Zealand studies. If the New Zealand research was carried out under moist conditions, as was most likely the case, it suggests that spraying tussock sedge in a wet summer could be effective.

Although Roundup CT^(R) killed mature tussock sedge, only temporary control was achieved because many seedlings established in the areas denuded by the herbicide. To overcome seedling regeneration, two possible procedures could be useful in tussock sedge control, assuming Roundup CT^(R) is effective in killing tussock sedge in wet summers:

1. Apply Roundup^(R) when most pasture species are dormant so that little bare ground is created, *ie.* spray from late spring through summer up till the seasonal break. Split applications within this period could improve the effectiveness of Roundup^(R). By spelling after the seasonal break, until spring, pasture competition should control sedge seedlings that establish in response to the seasonal break;
2. If spraying after the seasonal break, improved pasture species should be sown and spelled for at least 8 months (Campbell, 1985) to control sedge seedlings. If phalaris (*Phalaris aquatica*) and cocksfoot (*Dactylis glomerata*) are already present they should be grazed heavily to reduce green leaf to less than 5% of total ground cover before applying Roundup^(R) (Campbell and Ridings, 1988). Subterranean clover should be sown after spraying and the pasture spelled till late spring.

Further research needs to be undertaken to investigate the effects of Roundup^(R) on tussock sedge in wet summers.

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