WEED CONTROL IN SEEDLING SULLA

M.J. WATSON* and A.N. GILCHRIST

Soil Conservation Centre, Aokautere, Ministry of Works & Development, Palmerston North

SUMMARY

In pot and field trials sulla (*Hedysarum coronarium*) tolerated normal rates of dinitramine, ethalfluralin, pendimethalin, and trifluralin applied pre-sowing and soil-incorporated. In the field trial it also tolerated pre-emergence applications of dinoseb acetate, the only herbicide that controlled weeds sufficiently on its own to give acceptable yields. The only post-emergence herbicide tolerated was chloroxuron in the pot trial. The unplanned presence of terbacil in two blocks of the field trial resulted in excellent weed control, and high yields of sulla where the other herbicide was tolerated, but tolerance to terbacil was not repeated in the pot trial. Sulla did not tolerate EPTC, linuron, 2, 4-DB, MCPB, or ioxynil.

INTRODUCTION

Sulla (*Hedysarum coronarium*) is a short lived, perennial legume with considerable potential in New Zealand for both soil conservation and forage production. It is grown extensively for hay silage, and greenfeed in Southern Europe and North Africa (Kernick 1978).

The Plant Material Group at the Soil Conservation Centre, Aokautere, has been evaluating sulla for the revegetation of hill country and mechanically disturbed sites. It has been successfully established in Northland, Poverty Bay, Hawkes Bay, Rangitikei, Manawatu, Marlborough, Canterbury and Otago (Watson 1982).

Despite sulla's robust seedling, weeds are often a problem in crops sown for forage and seed production. This paper describes the screening of a range of herbicides for weed control in sulla.

METHOD

In a field trial at Aokautere on Manawatu fine sandy loam, herbicides were applied, at 210 kPa in 225 litres of water/ha, using a back-pack pressure sprayer. Plots measured 5 x 1.5 m. All herbicides were applied at two rates, normal and twice normal. Five pre-plant-incorporated (PPI) herbicides were applied (Table 1), and incorporated by rotary-hoeing to a depth of 7.5 cm on 21 October 1981. The area was sown with inoculated dehulled sulla seed at 10 kg/ha on 27 October 1981. The following day three pre-emergence (pre-em) herbicides were applied. Five post-emergence (post-em) herbicides were applied on 4 December 1981 when the crop was at the 8-10 cm, four simple leaves/first compound leaf stage. At this time it was discovered that half of the trial area had been mistakenly sprayed with terbacil at 0.7 kg ai/ha 8 weeks before sowing.

Crop damage and weed control were assessed visually using a 0-10 scale on 25 January 1982. Dry matter yields of crop and weeds were determined in late February by taking two 0.25 m² quadrats and dissecting out the herbage.

To supplement the field study, a pot trial was conducted using sterilised Manawatu fine sandy loam. Herbicides were applied at 138 kPa, in 410 litres of water/ha, using a mobile overhead spray unit in a laboratory enclosure. Six PPI, two pre-em, and five post-em herbicides were applied at two rates. After spraying PPI treatments, the soil

*Present address: 3 Weston Street, New Plymouth
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was thoroughly shaken in a plastic bag before being re-potted. Fifteen inoculated, dehulled sulla seeds were sown in each pot. Post-em treatments were thinned to eight plants per pot and sprayed at the 8-10 cm, four simple leaf/first compound leaf stage. PPI and pre-em treatments were visually assessed at 4 and 6 weeks after sowing. Post-em treatments were assessed 2 and 4 weeks after spray application.

TABLE 1: Mean DM yields of sulla and weeds and mean ratings for crop injury and weed control in field trial.

Herbicide	Rate (kg ai/ha)	SULLA				WEEDS ³	
		Without terbacil Injury ¹	Yield ²	With terbacil Injury	Yield ²	Without terbacil Injury ¹	Yield ²
Pre-plant incorporated							
dinitramine	0.6	2.0	1.38	2.0	4.20	4.5	3.39
dinitramine	1.2	0.5	1.52	1.5	5.84	7.5	3.68
EPTC	4.3	3.0	0.43	6.0	1.75	3.0	7.27
EPTC	8.6	6.5	0.64	6.5	1.04	3.0	8.32
ethalfluralin	0.5	2.0	0.77	0	4.89	5.5	3.61
ethalfluralin	1.0	3.0	0.78	1.0	4.88	5.5	1.51
pendimethalin	1.0	1.0	1.17	0.5	5.95	6.0	3.22
pendimethalin	2.0	1.0	1.73	2.0	4.23	5.0	2.96
trifluralin	0.8	1.0	1.83	2.0	5.15	6.5	3.60
trifluralin	1.6	2.5	1.41	0.5	5.02	6.0	1.55
Pre-emergence							
dinoseb acetate	4.0	0	2.78	1.0	4.53	7.0	4.00
dinoseb acetate	8.0	0	3.78	2.0	3.55	8.0	1.81
linuron	1.2	9.0	0	10.0	0	3.0	6.35
linuron	2.4	9.5	0	10.0	0	8.0	3.38
pendimethalin	1.5	2.5	0.53	5.5	2.33	3.0	3.91
pendimethalin	3.0	5.5	0.62	6.5	1.05	7.5	3.09
Post-emergence							
chloroxuron	1.5	6.0	0.16	4.0	1.79	1.5	7.06
chloroxuron	3.0	3.0	0.16	7.0	0.29	2.5	5.54
2,4-DB	1.2	8.5	0.02	7.5	0.58	3.0	5.90
2,4-DB	2.4	9.5	0.03	9.0	0	3.0	6.93
dinoseb acetate	2.0	1.5	0.52	3.5	2.71	3.0	7.34
dinoseb acetate	4.0	4.0	0.28	6.0	1.28	2.5	5.92
ioxynil	0.75	9.5	0	10.0	0	2.0	6.62
ioxynil	1.5	9.5	0	10.0	0	4.0	6.49
MCPB	1.2	8.5	0.06	3.5	2.31	1.5	5.77
MCPB	2.4	9.5	0.01	8.5	0.35	2.5	4.86
handweeded		0	3.43	1.5	5.12	10	0
untreated		0	0.24	1.0	4.32	0	7.09
LSD _{.05}		2.7	1.09	3.2	2.05	2.6	2.19

¹ Visual assessment 25 January 1982 on 0-10 scale (nil - complete effect)

² Dry matter yield late February 1982 in t/ha

³ Insufficient weeds present on plots treated with terbacil

RESULTS AND DISCUSSION

Field trial

Because the unplanned terbacil treatment had a very highly significant effect on sulla DM yields, the experiment was treated as two separate trials, each of two randomised blocks. Data from these trials are summarised in Table 1.

The virtually weed-free area with terbacil provided an unexpected opportunity to test the tolerance of sulla to the other herbicides, assuming no synergistic or antagonistic effects existed between them and terbacil. The other area provided a test of the effectiveness of the herbicides in the presence of both weeds and crop.

The weeds present in the unweeded control plots were mainly willow weed (*Polygonum persicaria*), wireweed (*P. aviculare*), and spurrey (*Spergula arvensis*). The only weeds not completely controlled by terbacil were rayless chamomile (*Matricaria matricarioides*) and a few plants of redroot (*Amaranthus powellii*).

TABLE 2: Mean ratings for sulla damage (0-10 scale) in pot trial four weeks (post-em) and six weeks (PPI and pre-em) after herbicide application.

Herbicide	Rate (kg ai/ha)	Injury
Pre-plant incorporated		
dinitramine	0.6	0
dinitramine	1.2	0
EPTC	4.3	1.0
EPTC	8.6	2.8
ethalfluralin	0.5	0
ethalfluralin	1.0	0
pendimethalin	1.0	0
pendimethalin	2.0	0.2
trifluralin	0.8	0
trifluralin	1.6	0.2
terbacil	0.35	6.0
terbacil	0.70	8.8
Pre-emergence		
dinoseb acetate	4.0	1.4
dinoseb acetate	8.0	4.0
pendimethalin	1.5	5.6
pendimethalin	3.0	6.8
Post-emergence		
chloroxuron	1.5	0.2
chloroxuron	3.0	1.6
dinoseb acetate	2.0	5.4
dinoseb acetate	4.0	8.4
dinoseb amine	1.2	5.6
dinoseb amine	2.4	7.6
metribuzin	0.35	8.4
metribuzin	0.70	9.8
terbacil	0.4	4.0
terbacil	0.8	7.2
Controls (3, corresponding to PPI, pre-em and post-em treatment dates of sowing)		0

Best weed control was given by the PPI herbicides, ethalfluralin at 1.0 kg ai/ha and trifluralin at 1.6 kg ai/ha and by dinoseb acetate applied pre-em at 8.0 kg ai/ha. Dinitramine at 1.2 kg ai/ha, the lower rates of trifluralin and pre-em pendimethalin appeared visually to also control weeds satisfactorily and they did significantly lower weed DM yield.

With little or no weed competition sulla tolerated all of the PPI treatments except EPTC, and pre-em dinoseb acetate, and produced more than 3 t/ha of DM. Terbacil alone, applied 8 weeks before sowing at 0.7 kg ai/ha, allowed sulla to yield over 4 t DM/ha. EPTC, 2,4-DB, MCPB, ioxynil, linuron, chloroxuron, pre-em use of pendimethalin, and dinoseb acetate applied post-em at the higher rate of 4 kg ai/ha, damaged the crop.

Of the tolerated herbicides only dinoseb acetate applied pre-em controlled the weeds adequately for sulla to yield more than 2.75 t DM/ha.

Table 2 shows the tolerance of sulla in the absence of weeds. All the PPI herbicides, except terbacil, were tolerated. The only other materials which caused little or no injury were dinoseb acetate (pre-em) at 4 kg ai/ha and chloroxuron (post-em) at both rates.

Dinoseb acetate at 8 kg ai/ha, applied pre-em may cause moderate injury under some conditions but the crop usually recovers. Sulla tolerated chloroxuron in the pot trial although the eye assessments in the field trial, averaged over all four blocks, suggested moderate injury. It may perhaps be used with caution in other weed populations or in mixtures where PPI or pre-em weed control has been unsuccessful or omitted.

Terbacil severely injured sulla when soil-incorporated before sowing and when applied at 0.8 kg ai/ha post-em. At 0.4 kg ai/ha post-em, terbacil caused moderate injury. The lack of agreement between the pot and field trial may be explained by possible leaching of a large part of the terbacil out of the seedling root zone in the eight weeks between application and field sowing (137 mm of rain fell in that period and terbacil has a solubility of 710 ppm in water at 25 °C). Sufficient chemical remained near the soil surface however to kill germinating weed seedlings.

CONCLUSIONS

Pre-emergence applications of dinoseb acetate at 4 and 8 kg ai/ha were the only herbicide treatments in the field trial to produce significantly more dry matter than the unweeded control in the absence of terbacil. They were not significantly different from hand weeding. A pre-sowing-incorporated application of terbacil at 0.7 kg ai/ha was at least as good, and the improved weed control enhanced DM production when PPI treatments of pendimethalin at 1.0 and 2.0 kg ai/ha, dinitramine at 0.6 and 1.2 kg ai/ha, trifluralin at 0.8 and 1.6 kg ai/ha or ethalfluralin at 0.5 and 1.0 kg ai/ha were used. Nevertheless, the use of terbacil in sulla crops cannot yet be recommended because of its toxic effects shown in the pot trial.

No post-em herbicides used alone in the field trial significantly reduced weed DM yields, nor did they raise sulla DM yields compared with the unweeded control.

Sulla did not tolerate EPTC, linuron, 2,4-DB, ioxynil, or MCPB.

PPI herbicides trifluralin, pendimethalin, dinitramine and ethalfluralin were tolerated by sulla, generally gave significant weed control, and, with the exception of ethalfluralin without terbacil, gave reasonable DM yields.

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LIST OF CHEMICALS USED

chloroxuron	'Tenoran 50 WP'	ioxynil	'Totril'
2,4-DB	'ICI 2,4-DB'	linuron	'Linuron 50 Weedkiller'
dinitramine	'Cobex Herbicide'	MCPB	'Weedar Butyrac MCPB'
dinoseb (acetate)	'Aretit 50% EC	metribuzin	'Sencor'
(amine)	'Sinox PE'	pendimethalin	'Stomp 330E'
EPTC	'Eradicane'	terbacil	'Sinbar'
ethalfluralin	'Sonalan'	trifluralin	'Treflan'