HERBICIDES FOR SOIL CONSERVATION TREE NURSERIES

A. N. GILCHRIST

*Aokautere Science Centre, Water and Soil Division,
MWD, Palmerston North*

Summary

Nine residual and nine contact herbicides were screened for use over cuttings of poplars, willows, and shrubs in their first growing season. Results indicate tolerable survival and no significant growth reduction with simazine at rates up to 3 kg/ha. Tolerance to other herbicides depends on the species and rate of application. Choice of contact herbicide is much more limited than with residual chemicals, and shielding of the cuttings is recommended to avoid foliar damage.

INTRODUCTION

Lack of knowledge of what poplars, willows, and other plant materials for erosion control will tolerate limits the use of herbicides in New Zealand soil conservation nurseries at present. Much hand and/or mechanical weeding could be reduced, with resultant cost savings.

The object of the two trials reported here was to screen a range of herbicides for possible use in these hardwood tree and shrub nurseries.

METHOD

The trials were planted adjacent to each other on Manawatu fine sandy loam with 4% organic matter at the National Plant Materials Centre nursery at Aokautere on 16-23 August 1977. The area had previously been used for vegetable production.

Six test species were used: two poplars, two willows, and two shrub species. They were: BO2 silver poplar (*Populus alba* 'BO2') (a white poplar), Flevo hybrid black poplar (*P. x euramericana* 'Flevo 923'), NZ 1002 hybrid Pekin willow (*Salix matsudanas*, *x alba* 'NZ 1002') (a tree willow), purple osier (*S. purpurea*) (a shrub willow), saltbush (*Atriplex halimus*), and coralberry (*Symphoricarpos orbiculatus*).

Each species was planted in cultivated ground in two adjacent rows/replicate. The species were not randomised. Unrooted 25-cm cuttings were spaced approximately 25 cm apart within the row; the rows were 1 m apart.

In Trial 1, nine residual herbicides were tested at three rates as listed in Table 1. A cultivated treatment provided a control. These 28 treatments were randomised within each of two blocks or replicates. The herbicides, except dichlobenil, were applied with an Oxford Precision Sprayer on 30 August 1977. Dichlobenil granules were applied from a shaker by hand on the same date.

In Trial 2 nine contact herbicides, listed in Table 2, were tested at three rates. A cultivated plot provided a 28th treatment. The design was again two randomised blocks. The herbicides were applied with the Oxford Precision Sprayer on 6 October 1977 after seedling weeds had emerged and most cuttings were in leaf. Because tolerances were being investigated the test plants were not shielded.

Scrub Weeds

In both trials herbicide plots were 1.5m wide and crossed the rows of test plants, each covering six cuttings/row. A central plot in each block was unweeded for comparison.

Weed control was assessed on 25 October 1977 and the length of the longest stem measured in late January-early February 1978. Only four plants/row or eight/plot of each species were recorded; the plants adjacent to the plot boundary were not measured.

RESULTS AND DISCUSSION

Although all rates of alachlor, atrazine, dichlobenil, terbutometon/terbutylazine, terbacil, and amitrol/ammonium thiocyanate (amitrole-T), high and medium rates of propazine, simazine and atrazine + oil, and high rates of paraquat and prometryn gave good overall weed control, some adversely affected the test plants. Different results might have been obtained in Trial 2 had the plants been shielded.

TABLE 1: Mean survival and length of longest stem of test plants 5 months after spraying with residual herbicide.

Herbicide	Rate (kg/ha)	BO2 poplar (%)	Flevo poplar (%)	NZ 1002 willow (%)	Purple osier (%)	Coralberry (%)	(cm)
alachlor	1.2	81	81	98	100	100	32
alachlor	2.4	88	94	98	100	100	36
alachlor	4.8	75	81	98	100	100	44
atrazine	0.6	94	94	100	100	88	39
atrazine	1.2	75	94	100	88	81	38
atrazine	5.0	6	56	44	6	56	29
chlorthal dimethyl	(6.0)	69	62	93	100	64	25
	(12.0)	44	75	65	100	88	29
	(24.0)	50	50	62	100	88	33
dichlobenil	3.0	50	94	82	94	131	62
dichlobenil	6.0	0	56	88	88	110	36
dichlobenil	12.0	0	25	56	70	120	15
diphenamid	4.5	88	88	100	85	107	30
diphenamid	9.2	88	81	100	101	113	40
diphenamid	13.7	88	69	88	72	100	40
propazine	0.6	69	88	97	100	86	25
propazine	1.5	69	81	87	100	102	41
propazine	3.0	69	50	94	88	94	29
simazine	0.6	100	88	95	94	139	47
simazine	1.8	81	69	90	100	131	44
simazine	3.0	69	88	83	100	94	34
terbacil	0.6	75	94	90	100	104	37
terbacil	1.2	75	81	47	100	86	45
terbacil	2.5	38	81	42	62	42	39
terbutometon +	(1.0)	100	69	109	94	120	33
terbutylazine	(6.0)	50	81	85	100	110	42
terbutylazine	(12.0)	12	69	37	12	52	34
cultivated		81	88	104	94	129	56
unweeded		69	46±26	65±14	100	55±12	28±6
LSD (P = 0.05)		31.1	—	29.9	100	49.5	15.2
F ratio		2.87**	1.73	5.11**	3.35**	2.40*	

* (a)

** = P < 0.01

* = P < 0.05

Scrub Weeds

Rayless chamomile (*Matricaria matricarioides*) became dominant on the unweeded plots, on some of the less successful treatments such as the low rates of alachlor, chlorthal, diphenamid, simazine, desmetryn, nitrofen, and mineral oil, and grew on many of the plots in Trial 2 after the single herbicide application. Wireweed (*Polygonum aviculare*) dominated the less successful treatments on the four plots at one end of each block.

Mean survival and stem length measurements for each trial are presented in Tables 1 and 2. Because of poor strike from cuttings the saltbush data have been omitted. The unweeded plots were not randomised and were therefore omitted from the analysis of variance. They are listed in Table 1 with their standard deviations, however, for comparison with other treatments.

TABLE 2: Mean survival and length of longest stem of test plants 15-17 weeks after spraying with contact herbicide.

Herbicide	Rate (kg/ha un- less other- wise stated)	BO2 poplar (%)	BO2 poplar (cm)	Flevo poplar (%)	Flevo poplar (cm)	NZ 1002 willow (%)	NZ 1002 willow (cm)	Purple osier (%)	Purple osier (cm)	Coralberry (%)	Coralberry (cm)
amitrole-T	0.4	44	31	75	52	94	61	100	64	81	28
amitrole-T	3.0	12	20	40	45	62	68	100	56	0	0
amitrole-T	9.0	6	25	25	32	56	78	56	51	0	6
atrazine + 20 litres/ha	0.6	19	28	69	58	100	71	100	57	88	37
orchard oil	1.2	12	21	88	54	81	70	94	86	56	43
2,4-D†	2.4	0	0	75	53	69	36	44	47	56	37
2,4-D†	0.7	56	25	62	50	81	59	94	47	81	26
2,4-D†	1.4	6	10	50	64	31	64	81	51	88	27
2,4-D†	2.8	0	0	31	38	25	34	19	61	31	30
desmetryn	0.2	62	34	75	40	100	47	100	58	94	31
desmetryn	0.5	25	10	75	33	94	59	100	59	100	32
desmetryn	1.0	6	8	81	44	94	45	100	45	94	27
nitrofen	3.0	81	23	62	42	100	59	100	47	88	29
nitrofen	6.0	56	22	50	29	69	36	100	52	100	30
nitrofen	12.0	50	39	69	55	94	34	100	60	88	29
herbicide†	(30 l/ha)	56	16	88	53	100	49	100	49	100	27
herbicide†	(60 l/ha)	69	35	81	62	100	67	100	50	88	27
mineral oils	(90 l/ha)	62	20	56	45	94	59	100	54	94	30
paraquat	0.1	69	34	88	57	94	76	94	55	94	32
paraquat	0.2	69	22	69	48	100	62	100	42	100	30
paraquat	1.0	62	32	38	58	94	72	88	72	88	39
prometryn	0.25	25	28	62	51	94	64	94	57	94	33
prometryn	0.8	38	19	69	40	100	45	88	50	94	31
prometryn	2.0	25	21	75	40	81	55	94	49	94	32
terbutryn	0.25	75	30	73	55	100	57	100	77	88	28
terbutryn	0.6	19	16	88	42	100	65	94	53	100	26
terbutryn	1.2	12	38	81	52	88	60	94	53	100	31
cultivated		69	80	81	76	94	103	100	147	100	56
unweeded		56	35±16	81	48±19	100	50±18	100	51±13	100	32±9
LSD (P = 0.05)			26.2		—		—		36.0		9.6
F ratio			2.79**		0.81		1.74		2.53**		8.83**

* = P < 0.05 ** = P < 0.01

† methyl amine of 2,4-D

Scrub Weeds

Poplars

Generally BO2 did not strike well from cuttings. Five of the residual herbicides allowed mean heights above 47 cm at at least one rate. Simazine at 0.7 - 2.3 kg/ha is provisionally recommended for this clone. Second choice is propazine at 1-2 kg/ha. Terbumeton/terbuthylazine cannot yet be recommended at rates above 3.0 kg/ha for white poplars. Although terbacil at 2.5 kg/ha produced an adequate mean height of survivors, mortality was unacceptably high. Atrazine is tolerated by BO2 at rates up to about 1.5 kg/ha.

There were no significant differences among treatments on Flevo. With seven herbicides producing heights as good as, or better than cultivation the choice is wide. Terbacil at 1 kg/ha gives good weed control and height growth on fine sandy loams. The rate can be increased on clay loams or soils high in organic matter. Simazine is tolerated by this clone at rates up to 3 kg/ha at least. Dichlobenil would not be tolerated at 10 kg/ha and care would have to be taken to avoid overlap or uneven application if this material were to be used at 5 kg/ha.

No contact herbicides can be recommended for use among white poplars without shielding as all produced significantly poorer growth than cultivation from BO2.

Trial 2 showed no significant differences among treatments on Flevo. Only those that were better than the unweeded control could be considered for operational use. 2,4-D gave unacceptable mortality. Care would have to be taken not to exceed 70 litres/ha if oil is used. Paraquat can be used at 60-70 g/ha but plants should be shielded when higher rates are used. Atrazine + oil at 1 kg/ha or amitrole-T at 380-500 g/ha could be used. Where chamomiles (*Matricaria* spp) are a problem, terbutryn at 0.4-0.5 kg/ha is suitable. If chamomiles and other resistant weeds such as chickweed (*Stellaria media*), twin cress (*Coronopus didymus*) and wireweed that were on the trial area are absent, nitrofen at 7.2 kg/ha is suitable.

Willows

Those residual herbicides allowing mean heights of 85 cm or above in NZ 1002 and 94 cm or more in purple osier can be considered for operational use. Atrazine allowed the best growth in purple osier and can be provisionally recommended at 0.6 - 1.2 kg/ha for both willows. Simazine would be second choice for purple osier and could be used also for NZ 1002 at 1-1.5 kg/ha. Dichlobenil could be used at 5 kg/ha for both.

No significant differences between treatments of Trial 2 occurred in mean height of NZ 1002. Although the next best to cultivation was amitrole-T at 9 kg/ha, mortality was high. Paraquat was less damaging and could be used at 40-70 g/ha but plants should be shielded at higher rates. Atrazine + oil cannot yet be recommended at rates above 0.9 kg atrazine/ha and care would have to be taken to avoid overlap or other unevenness in application.

All contact herbicide treatments on purple osier were significantly poorer than cultivation. None can be recommended for osiers at this stage.

Coralberry

Those residual herbicide treatments with means of 41 cm or above in longest stem length were not significantly different from the best treatment, cultivation. Simazine or terbacil, both at 1 kg/ha, can tentatively be recommended for this shrub.

All contact herbicide treatments were significantly poorer than cultivation. None can therefore be recommended.

Scrub Weeds

CONCLUSIONS

Results from saltbush were inconclusive because of poor strike from cuttings.

BO2 also struck poorly from cuttings and was more sensitive to herbicide treatments than the hybrid black poplar, 'Flevo'. Simazine and propazine are likely to be tolerated by both poplars at double normal rates. Terbumeton/terbuthylazine and terbacil can also be used for Flevo. Paraquat, atrazine + oil, terbutryn, and amitrole-T were tolerated by Flevo poplar at low but generally effective rates. Mineral oil and nitrofen were also tolerated but gave only fair to poor weed control. BO2 tolerated no effective contact herbicides.

Both willows tolerated at least one rate of each residual herbicide tried but did not generally tolerate contact herbicides. Atrazine, terbumeton/terbuthylazine, simazine, alachlor, dichlobenil, and diphenamid are the most useful. Chlorthal-dimethyl controls too narrow a spectrum of weeds to be effective on its own.

There are differences in tolerance between poplars and willows, and between their sections or subgenera. Thus atrazine is more successful among willows than poplars while propazine is better among poplars than willows. Terbacil is very suitable for some black poplars (section *Aigeiros*) but not for white poplars (section *Leuce*) nor for willows.

Weeds among coralberry can be controlled with terbacil or simazine. The contact herbicides tested were unsatisfactory.

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