

Herbicide trials on *Tradescantia fluminensis*

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Abstract

Tradescantia fluminensis or wandering Jew is a problem weed in Northland that invades damp shady areas of the forest and stream banks. When established it covers the forest floor and prevents regeneration of any other vegetation. Trials of various herbicides and herbicide mixtures were conducted from November 1995 to June 1996 on *Tradescantia* growing in the Hikurangi Covenant of the Northern Dairy Company. Combinations of **Roundup®**, **Escort®**, **Grazon®** and **Amitrole®** were applied to ten plots, each receiving two resprays. Plots 11 and 12 had only one spraying of Escort applied in March 1996. They were monitored fortnightly by estimating for each plot the average of estimated ground cover as a percentage of leaves that had died off, and a percentage of stems that had died. Of all the herbicides trialled Grazon had a superior kill-rate and was the most cost-efficient. Using this information, a spray programme using Grazon was subsequently carried out over a 3.4 ha forest block that was infested heavily with *Tradescantia*.

1. Introduction

Tradescantia fluminensis is a monocotyledon in the family Commelinaceae and comes from South America. It is a major problem on and off the conservation estate in Northland, as it is widespread under forest canopy, along stream banks, gullies and other damp areas. The plant has succulent stems that root at each node and can build up deep layers of rooted stems. In this manner it covers the forest floor and suppresses ferns, seedlings and other ground cover until the forest comprises only mature trees with an understorey of *Tradescantia*. Broken stems are dispersed by flooding, stock movement or humans. *Tradescantia* occurs mostly in habitats close to human occupation. Because of the scale of the infestation now present on land administered by the Department of Conservation, it would be futile to attempt to eradicate it by hand. This leaves herbicides as the only practicable alternative at present. The aim of this study, therefore, was to find the most cost-effective chemical control method for *Tradescantia* by testing different herbicides at different strengths. The herbicides chosen for the trial were those that have been recommended for killing *Tradescantia* by regional landcare officers or were used on Stephens Island *Tradescantia* control trials (Brown and Rees 1995).

Trials began in early November 1995 and were conducted on the Hikurangi Covenant of the Northern Dairy Company (Photos 1 and 2). This site was chosen because of its good sward of *Tradescantia* and ease of access. The covenant is on the eastern edge of the Hikurangi Swamp and the soil is Whareora clay lying over alluvium. The canopy is mainly totara (*Podocarpus totara*) and kahikatea (*Dacrycarpus dacrydioides*) with some rewarewa (*Knightia excelsa*). There are single specimens of pukatea (*Laurelia novae-zelandiae*), titoki (*Alectryon excelsus*), and pokaka (*Elaeocarpus hookerianus*). The average height of the canopy is 25 metres. Apart from a

single specimen of *Coprosma areolata*, there is no understorey other than *Tradescantia*.

2. Methods

Initially, ten plots were set up on 8 November 1995 and sprayed (on the same day) with different treatments of herbicides. On 23 March 1996, the two Escort trials were set up (Plots 11 and 12). Table 1 describes the various herbicide treatments trialled whilst Appendix 1 gives the costs of these herbicides and treatments used.

Plots were marked by placing out stakes at intervals. Each measured herbicide mixture was sprayed by back-pack sprayer in a square or rectangle, using the stake as the centre, until all the herbicide in the backpack was used up. Apart from Plot 1, all plots surrounded at least one mature tree. This was partly to see if application of chemicals affected the mature forest canopy. After there had been obvious die-off of *Tradescantia*, corner stakes were put in to monitor regrowth from the unsprayed edges.

The effects of the spraying were measured by estimating for each plot the percentage of the plants that had died off. As the *Tradescantia* that had not died off could not be seen on Plots 7 and 8 (Grazon) on 22 March 1996 due to layers of dead material, a measurement of regrowth was made.

All the measurements were made fortnightly, and the *Tradescantia* was re-sprayed when there had been a significant amount of regrowth. This treatment was continued until 100% of the *Tradescantia* in the plots had been killed. Some plots, however, did not exhibit 100% die-back even after three spray treatments, and the experiment was concluded at this stage.

3. Results and discussions

Table 2 outlines the results of the trial for each plot and spray mix.

ROUNDUP

Of the two plots sprayed with different strengths of Roundup (Plot 1 and 2, 1% and 3% respectively), the higher strength used on Plot 2 (3%) (Photo 4) was more effective. The first spray slightly damaged growing tips and caused slight stem wilt. The second spray browned off the tops and thinned out the *Tradescantia* in Plot 1 (1%) (Photo 3), while Plot 2 had 70% die-off. The die-off on 12 June 1996, three months after the third spray, was 75% on Plot 1 and 99.9% on Plot 2. However, there was still an occasional green leaf on Plot 2.

ROUNDUP/ESCORT

The Roundup/Escort mixtures had much the same result as straight Roundup, though in the first two spraying schedules the mixture resulted in a slightly better die-off. After three months the 3% Roundup/Escort mix caused much the same die-off as straight Roundup, but of the 1% mixes the Roundup/Escort mix was significantly better. The addition of Pulse made no difference to die-back in the 3% plots (Plots 5 and 6, 3% Roundup/Escort/Pulse and 3% Roundup/Escort respectively) (Photos 7 and 8). In the 1% plots (Plots 3 and 4, 1% Roundup/Escort and 1% Roundup/Escort/Pulse respectively) (Photos 5 and 6), the Pulse mixture was slightly better but only initially. After seven months the results were approximately the same.

GRAZON

Grazon appeared to be the most effective herbicide in controlling *Tradescantia*. The *Tradescantia* plants had all collapsed and their leaves were browning two weeks after the first spray. By the fourth week these plots (Plots 7 and 8, 0.7% Grazon and 1.4% Grazon respectively) (Photos 9 and 10) were covered with dead leaves with some green growth emerging in the area sprayed with the 0.7% mix. The first respray on 20 December 1995 was not effective because the mass of dead leaves covering the plots did not allow good penetration of the herbicide. These were the only plots where this problem occurred. By 22 February 1996 regeneration of the protected stems was vigorous and a second respray was carried out. All the *Tradescantia* in Plot 8 died within two weeks and by the end of the fourth week the same had occurred in Plot 7.

AMITROLE

Amitrole (Plots 9 and 10, 2% Amitrole and 3% Amitrole respectively) (Photos 11 and 12) worked more slowly than the other herbicides except for Plot I (1% Roundup). By 12 June 1996 the Amitrole plots still had the poorest die-off rates, despite two resprays.

ESCORT

Because the Escort plots were first sprayed later than the other plots (21 March 1996), the Escort trial has not been completed. However, early indications suggest that Escort is less effective than both Roundup and Grazon. Escort at 2 g in 5 litres (Plot 11, Photo 13) had no effect, but the addition of Pulse (Plot 12, Photo 14) caused the plants to collapse with some tip browning.

None of the mature trees showed any sign of being affected by the spraying over the eight month period that the study was conducted.

Appendix 1 describes the costs of the herbicides and different herbicide treatments and mixes. Based on the trial results, it was concluded that spraying with Grazon once would kill most of the *Tradescantia* and for a 100% kill would require one mop-up spray. Because the other mixes require two follow up sprays, this makes Grazon the most cost-effective treatment at \$810.50 per day, labour inclusive (two people spraying 1400 litres from one vehicle) plus follow-up at \$283.50 per day. In comparison, the cheapest herbicide to spray on a daily basis was 1% Roundup at \$421.44 per day, but because this mix did not achieve a high kill, and had not eliminated all the *Tradescantia* even after three sprays, it was not considered to be a viable option.

This study was followed up with a trial programme using Grazon on a 3.4 ha block containing *Tradescantia* which gave over 90% die-off on the first spray. Appendix 2 describes this programme.

4. Conclusion

From this trial Grazon was found to be the most cost-effective herbicide. The cost efficiency comes about because of the reduced number of follow-up sprays needed on an area. The 3% Roundup and the Roundup/Escort mixes achieved virtually 100% kills, but required at least three treatments, making them less cost-effective. The other herbicide mixes, although cheaper, did not give a good kill rate and cannot be considered as viable options.

5. Acknowledgements

I wish to thank Lisa Forester, Mike Heads and Ray Pierce for helping in the write up of this study and to the Whangarei Field Centre staff, especially John Evans and Neil Smith, for spraying in the Matarau Scenic Reserve.

6. References

- Brown, D. and Rees, D. 1995. Control of *Tradescantia* on Stephens Island. Ecological Management (3), Department of Conservation.
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APPENDIX 1 : Costs of Sprays and Spray Mixes

Dollars per litre:	\$
Roundup	12.96
Grazon	47.55
Escort	87.60/100 gm
Pulse	30.40
Amitrole	10.88

Costs per 100 litres of mix:	\$
Roundup at 3%	38.88
Roundup at 1%	23.96
Escort at 40 gm/100 litres	35.04
Grazon at 0.857%	40.75
Amitrole at 2%	21.75
Amitrole at 3%	32.64

For a day's work in the field, with two people using a vehicle with a powered pump, and a 350 litre tank doing four loads, the costs would be around \$240.00. The costs for using each herbicide for one day would be:

			Costs/Day
Roundup at 3%	labour & equipment	240.00	
	herbicide	544.32	
		784.32	
	x 3		2352.96
Roundup at 3% and Escort	labour & equipment	240.00	
	herbicide	1034.88	
		1274.88	
	x 3		3824.68
Roundup at 1%	labour & equipment	240.00	
	herbicide	181.44	
		421.44	
	x 3		1264.32
Grazon	labour & equipment	240.00	
	herbicide	570.50	
		810.50	
+ one man day with knapsack for mop-ups		283.50	1094.00
Amitrole at 2%	labour & equipment	240.00	
	herbicide	304.50	
		544.50	
	x 3		1633.50
Amitrole at 3%	labour & equipment	240.00	
	herbicide	456.96	
		696.96	
	x 3		2090.88

APPENDIX 2: Matarau Island Scenic Reserve *Tradescantia* spray programme

This 3.444 ha reserve has recently been purchased by DoC. It was once an island in the Wairau River, but it has been modified by the Hikurangi Swamp Drainage Scheme. Now all that remains is a cut-off ox-bow lake isolated from the river by a stopbank. The reserve is inside the ox-bow and is fenced along the open edge. After the reserve was fenced from cattle, *Tradescantia* grew to cover most of the centre of the reserve. It was subsequently decided to use the results of the spray trials to develop a *Tradescantia* eradication programme on Matarau Island.

Spraying (by hand using knapsack sprayers) began on 14 February 1996. This was too slow, so on the next day a four wheel drive with a power pump and 350 litre tank was used. A mix of 4 litres of Grazon to 350 litres of water was applied (1.14%). Another day was spent with the mixture changed to 3 litres of Grazon to 350 litres of water (0.86%). At the end of these three days half the reserve was covered. One month later the plants were flattened with the leaves dead and stems beginning to shrivel. Two months later the die-off rate was over 95%. The remaining plants had 50% of their tops browned off; it appeared as if they had not received a direct blast from the spray gun.

The effects on the native plants in the understorey was also dramatic, with most of the seedlings being killed, but native plants and ferns that were growing underneath a covering of *Tradescantia* survived.

Spraying half of the reserve (1.722 ha) used 3000 litres of mix. At 0.857% mix rate at an application cost of 57.9 cents per litre, the cost of this operation so far is \$1736.80. It will cost another \$283.50 to mop-up spray this half of the reserve bringing costs to a total of \$2020.30. This works out to \$1173.25 per hectare. The remaining half of the reserve will be sprayed in the 1996/97 summer.

Table 1: Herbicide mixes

Plot no.	Herbicide	Quantity	% to water	Volume in litres
1	Roundup	30 ml	1	3
2	Roundup	90 ml	3	3
3	Roundup	50 ml	1	5
	Escort	2g		
4	Roundup	50 ml	1	5
	Escort	2g		
	Pulse	210 ml	0.2	
5	Roundup	150 ml	3	5
	Escort	2g		
	Pulse	10 ml	0.2	
6	Roundup	150 ml	3	5
	Escort	2g		
7	Grazon	35 ml	0.7	5
8	Grazon	70 ml	1.4	5
9	Amitrole	60 ml	2	3
10	Amitrole	90 ml	3	3
11	Escort	2 g		5
12	Escort Pulse	2 g 10 ml	0.2	5

Table 2: Spray and monitoring programme of *Tradescantia fluminensis* trials

Plot No.	8-11-95	6-12-95	20-12-95	22-2-96	6-3-96	4-4-96	12-6-96
1 1 % Roundup	First spray	Die-back in top leaves	Respray	Tops browned & thinning of patch	Respray	60% die-off	75% die-off
2 3% Roundup	First spray	Leaves dying back. Yellowing of stems	Respray	70% die-off	Respray	95% die-off	99.9% die-off Occasional leaf emerging
3 1% Roundup + 2g Escort/5l	First spray	Browning of tops. Yellowing of stems	Respray	30% die-off	Respray	70% die-off	95% die-off
4 1% Roundup + 2g Escort+Pulse/5l	First spray	Die-off in tops. Stems yellowing & wilting	Respray	40% die-off	Respray	85% die-off	95% die-off
5 3% Roundup + 2g Escort+Pulse/5l	First spray	Stems browning off. Wilting	Respray	75% die-off	Respray	90% die-off	99% die-off
6 3% Roundup + 2g Escort/5l	First spray	Tops browning, yellowing & wilting	Respray	75% die-off	Respray	90% die-off	99.9% die-off
7 0.7% Grazon	First spray	New growth emerging from under dead plants	Respray	10% regeneration	Respray	1 stem with green leaves 100% die-off	100% die-off
8 1.4% Grazon	First spray	No green growth showing	Respray	5% regeneration	Respray	100% die-off	100% die-off
9 2% Amitrole	First spray	Wilting. Yellowing of leaves.	Respray	30% die-off	Respray	50% die-off	65% die-off
10 3% Amitrole	First spray	Slight top browning. Wilting	Respray	40% die-off	Respray	60% die-off	85% die-off
11 2 g Escort/5l					21-3-96 First spray	No noticeable effects	No noticeable effects
12 2 g Escort+Pulse/5l					First spray	Slight wilting, less than 5% leaf browning	General slumping of plants



Photos 1 and 2: Views of the Hikurangi Covenant of the Northern Dairy Company before spraying trials began, 8-11-95





Photo 3: Plot 1 12-6-96. Sprayed with 1% Roundup on 8-11-95. A lot of stems still green, with some leaves. Cleaver (*Galium aparine*) seedlings beginning to form a carpet at edges of plot.



Photo 4: Plot 2 12-6-96. 3% Sprayed with Roundup on 8-11-95. There is an occasional green leaf.