BRIDAL CREEPER CONTROL WITH HERBICIDES

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Summary Bridal creeper (*Asparagus asparagoides* (L.) W. Wight), native to southern Africa, is a garden escape which is invading bushland in southern Australia. Two trials on bridal creeper growing in bushland in southern Victoria commenced in October 1994. The bridal creeper had finished flowering and was covering the ground and climbing on trees and shrubs to a height of 2.5–3 m. The spray volume was 1000 L ha^{-1} in Trial 1, and 700 L ha^{-1} in Trial 2. One year after application in Trial 1, glyphosate at 180 g 100 L^{-1}, chlorsulfuron at 1.9 g 100 L^{-1}, metsulfuron methyl at 1.5 g 100 L^{-1}, thifensulfuron methyl/metsulfuron methyl at 15/1.5 g 100 L^{-1} and a tank-mix of glyphosate plus metsulfuron methyl at 90 g plus 1.5 g 100 L^{-1} gave 91–94% control. Higher rates of glyphosate (360 g 100 L^{-1}), metsulfuron methyl (6 g 100 L^{-1}) or glyphosate plus metsulfuron methyl (180 g plus 3 g 100 L^{-1}) did not improve on these results. In Trial 2, glyphosate at 180 g 100 L^{-1}, metsulfuron methyl at 1.5 g 100 L^{-1}, thifensulfuron methyl/metsulfuron methyl at 15/1.5 g 100 L^{-1} and glyphosate plus metsulfuron methyl at 90 g plus 1.5 g 100 L^{-1} gave 88–93% control one year after application. Tribenuron methyl at 15 g 100 L^{-1} gave only 64 % control. No significant increase in control was obtained by applying higher rates of glyphosate (360 g 100 L^{-1}) or metsulfuron methyl (3 g 100 L^{-1}), or by applying metsulfuron methyl at 1.5 g 100 L^{-1} in a higher spray volume of 1000 L ha^{-1}.

INTRODUCTION

Bridal creeper (*Asparagus asparagoides* (L.) W. Wight) is native to southern Africa. Introduced to Australia as an ornamental plant, it is now invading bushland and roadsides in the four southern mainland states. In Victoria, it is a weed in areas in and around Melbourne and Geelong, in coastal Gippsland, the Horsham region, the north-east and along the Murray River.

The plant has a perennial root system of branching, intertwined rhizomes thickly covered with small tubers, which form a dense mat in the surface soil. Thin, sinuous stems which can reach a length of 3 m, arise from the rhizomes in autumn, and grow up and over other vegetation. Flowers are produced in early spring, followed by fruit and the foliage usually senesces by early summer. The root system constitutes at least 87% of the total biomass of the plant (Raymond 1995), so the plant has a high capacity to recover from defoliation. To be effective, a herbicide must be capable of translocating to and affecting the root system.

Previous trial work (McQuinn 1994, Pritchard 1991, 1995) has shown that metsulfuron methyl and some related sulfonylureas and glyphosate are the most effective herbicides against bridal creeper and that they can give relatively good control of the weed. The trials reported here continue the evaluation of these herbicides, and include tank mixes of glyphosate and metsulfuron methyl.

MATERIALS AND METHODS

Two trials on bridal creeper, shaded by trees in bushland, were commenced in October 1994. The bridal creeper, which had finished flowering, was covering the ground and climbing on trees and shrubs to a height of 2.5 to 3 m. In both trials, treatments were arranged in randomized blocks with four replications. Applications were made with an Azo LP gas-pressurized sprayer through a Spraying Systems 43LA hand-gun and a flat fan nozzle (SS 8003 in Trial 1 and SS 8002 and SS 8003 in Trial 2). With the pressure regulator set at 415 kPa there was a constant spray output of 23.6 mL sec^{-1} (8003 nozzle) or 14.5 mL sec^{-1} (8002 nozzle).

The sandy soil in Trial 1 and the loam in Trial 2 were moist at application. In neither trial was there any rainfall in the 24 hours after application.

Trial 1 in Warrandyte State Park on the eastern outskirts of Melbourne, was sprayed on 10 October 1994 in mostly sunny conditions, a temperature of 23°C and RH of 45%. Plot size was 3 × 2 m and the spray volume was 1000 L ha^{-1}. An initial assessment of regrowth was made on 23 March 1995 (22 weeks after application) by counting total shoot numbers in each plot A visual estimate of control was made on 22 September 1995, 50 weeks after application.

Trial 2 in the Point Nepean National Park on the Mornington Peninsula south of Melbourne, was sprayed on 18 October 1994. The weather at application was mostly overcast, 14–15°C and 80 to 90% RH. Plot size was 3 × 3 m and the spray volume was 700 L ha^{-1}, except for one treatment which was applied at 1000 L^{-1}. An initial assessment of regrowth was made by counting shoot numbers in 2 × 1 m^2 quadrats per plot on 1 June 1995 (32 weeks after application). A visual estimate of control

was made on 21 September 1995, 48 weeks after application.

The herbicides used were chlorsulfuron as Glean™ (750 g a.i. kg^{-1}); glyphosate as Glyphosate 360™ (Trial 1) and Roundup™ (Trial 2) (both 360 g a.i. L^{-1}); metsulfuron methyl as Brush-off™ (600 g a.i. kg^{-1}); thifensulfuron methyl/metsulfuron methyl as Harmony M™ (682/68.2 g a.i. kg^{-1}); and tribenuron methyl as Express™ (750 g a.i. kg^{-1}). Non-ionic surfactants included in the sprays were BS1000™ (alcohol alkoxylate) or Pulse™ (modified polydimethylsiloxane).

RESULTS

Trial 1 In March 1995, 22 weeks after application, the untreated plots had a mean of 29.7 bridal creeper shoots m^{-2} (Table 1), with the stems up to 2 m high. On treated plots the regrowth stems were much fewer, thinner and were mostly less than 0.5 m high. Shoot densities on treated plots ranged from 2.8 m^{-2} with metsulfuron methyl at 3 g 100 L^{-1} to 1.1 m^{-2} with thifensulfuron methyl/metsulfuron methyl at 15/1.5 g 100 L^{-1}. These densities are reductions in shoot numbers relative to the untreated plots of 91–96%. There were no significant differences (P=0.05) between herbicide treatments.

On 22 September 1995, 50 weeks after application, all treatments were still giving high levels of control, with visually estimated control ranging from 90 to 95% (Table 1). As at the earlier assessment, there were no significant differences between treatments.

In September 1995, most treated plots had greater than 80% bare ground. Species which were present in the plots included panic veldt grass (*Ehrharta erecta*), spear thistle (*Cirsium vulgare*), chickweed (*Stellaria media*), and kangaroo apple (*Solanum* sp.). Glyphosate, applied alone or mixed with metsulfuron methyl, killed the foliage of grasses and *Juncus* sp. contacted by the spray. This effect was still obvious one year after application. Damage to non-target species was not apparent with the other treatments.

Trial 2 At assessment on 1 June 1995, 32 weeks after application, the untreated plots had a mean of 71 shoots m^{-2} (Table 2) and these stems were up to 2 m long. Shoot densities with the better treatments were 7.3 to 16 m^{-2} (representing reductions in shoot density of 90–77%). However shoots on treated plots were often less than 5 cm high, so that shoot numbers gave an over-estimate of the amount of biomass on treated plots relative to that on the untreated plots.

On 21 September 1995, 48 weeks after application, control with metsulfuron methyl, thifensulfuron methyl/metsulfuron methyl, glyphosate, and glyphosate plus

Table 1. Bridal creeper shoot density on 23 March 1995 and visual estimate of control on 22 September 1995, 22 and 50 weeks respectively after herbicide application on 10 October 1994.

Herbicide	Concentration (g 100 L^{-1})	Rate (g ha^{-1})	Shoots m^{-2} 22 WAA[A]	Control (%) 50 WAA
Metsulfuron methyl[C]	1.5	15	1.2 a[B]	93 a
Metsulfuron methyl[D]	1.5	15	1.2 a	95 a
Metsulfuron methyl[D]	3	30	2.8 a	90 a
Metsulfuron methyl[D]	6	60	1.5 a	90 a
Thifensulfuron methyl/metsulfuron methyl[D]	15/1.5	150/15	1.1 a	92 a
Glyphosate[C]	180	1800	1.6 a	92 a
Glyphosate[C]	360	3600	2.3 a	90 a
Glyphosate + metsulfuron methyl[C]	90 + 1.5	900 + 15	2.6 a	94 a
Glyphosate + metsulfuron methyl[C]	180 + 1.5	1800 + 15	2.7 a	90 a
Glyphosate + metsulfuron methyl[C]	90 + 3	900 + 30	1.7 a	94 a
Glyphosate + metsulfuron methyl[C]	180 + 3	1800 + 30	1.6 a	91 a
Chlorsulfuron[D]	1.88	18.8	2.3 a	91 a
Chlorsulfuron[D]	3.75	37.5	1.6 a	92 a
Untreated	–	–	29.7 b	0 b

[A] Weeks after application.

[B] Within columns, means followed by the same letter are not significantly different (P=0.05) according to Duncan's Multiple Range Test. Shoot density values (22 week assessment) transformed to Öx for analysis and per cent control data (48 week assessment) arcsin transformed for analysis.

[C] Pulse surfactant included in the spray at 0.5% v/v.

[D] BS1000 surfactant included in the spray at 0.25% v/v.

metsulfuron methyl ranged from 88 to 95% (Table 2). The tribenuron methyl treatments, which gave 63 and 64% control, were significantly poorer ($P<0.05$) than all the other treatments.

The plots treated with glyphosate were obvious because of the dead non-target vegetation, principally mat rush (*Lomandra* sp.) and grass tussocks, and the relatively bare ground. The other treatments had little or no effect on non-target species. The weed species growing in the plots in September 1995 were panic veldt grass (*Ehrharta erecta*), milk thistle (*Sonchus oleraceus*) and petty spurge (*Euphorbia peplus*).

DISCUSSION

The lowest effective dose of metsulfuron methyl may not yet be determined. In both trials the lowest concentration of metsulfuron methyl (1.5 g 100 L^{-1}) was as effective as higher concentrations (6 g 100 L^{-1} in Trial 1 and 3 g 100 L^{-1} in Trial 2). In Trial 2, 1.5 g 100 L^{-1} in a spray volume of 1000 L ha^{-1} (i.e. 15 g ha^{-1}) did not give better control than application in 700 L ha^{-1} (i.e. 10.5 g ha^{-1}). In pot trials, spray concentrations of less than 1 g 100 L^{-1} have killed plants, but the root systems of potted plants are much smaller than those in field infestations. A current field trial is evaluating metsulfuron methyl rates as low as 0.6 g 100 L^{-1} (6 g ha^{-1}). Initial results indicate slightly less control at this rate than with higher rates, although 1.2 g 100 L^{-1} (9 g ha^{-1}) appears to be excellent.

In Trial 1, metsulfuron methyl gave equivalent control whether applied with the surfactant BS1000 or with Pulse. McQuinn (1994) also found that these surfactants were equally effective when used with metsulfuron methyl for bridal creeper control. This contrasts with the results in a pot trial (Pritchard 1995), where control was slightly better when Pulse was used.

In both the current trials, a commercial formulation of thifensulfuron methyl/metsulfuron methyl at 15/1.5 g 100 L^{-1} gave no improvement in control over that given by metsulfuron methyl alone at 1.5 g 100 L^{-1}, and in Trial 2 the mixture at 30/3 g 100 L^{-1} was no better than metsulfuron methyl alone at 3 g 100 L^{-1}. In an earlier trial at Point Nepean (Pritchard 1995), thifensulfuron methyl/metsulfuron methyl at the lower rate of 6.8/0.68 g 100 L^{-1} tended to give less control than metsulfuron methyl at 1.5 g 100 L^{-1}. Thifensulfuron methyl has a much shorter soil residual life than metsulfuron methyl, so there would be value in using the combined formulation if it enabled lower rates of metsulfuron methyl to be used, but this does not seem to be the case.

Control with glyphosate was as effective at 180 g as at 360 g 100 L^{-1} in both trials. In pot trials (Pritchard 1991, 1995), glyphosate at 180 g gave less control than at 360 g 100 L^{-1}. Although this has not been the experience in field trials, it seems unlikely that concentrations lower than 180 g 100 L^{-1} would be as effective. Pulse was applied with glyphosate in the current trials because

Table 2. Bridal creeper shoot density on 1 June 1995 and estimated control on 21 September 1995, 32 and 48 weeks respectively after application on 18 October 1994.

Herbicide	Concentration (g 100 L^{-1})	Spray volume (L ha^{-1})	Herbicide (g ha^{-1})	Shoots m^{-2} 32 WAA[A]	Control (%) 48 WAA
Metsulfuron methyl[B]	1.5	1000	15	7.4 b[D]	93 a[D]
Metsulfuron methyl[B]	1.5	700	10.5	9.3 b	93 a
Metsulfuron methyl[B]	3	700	21	7.3 b	92 a
Thifensulfuron methyl/metsulfuron methyl[B]	15 + 1.5	700	105/10.5	11.6 b	93 a
Thifensulfuron methyl/metsulfuron methyl[B]	30 + 3	700	210/21	10.4 b	92 a
Glyphosate[C]	180	700	1260	16.0 b	88 a
Glyphosate[C]	360	700	2520	13.8 b	94 a
Glyphosate + metsulfuron methyl[C]	90 + 1.5	700	630 + 10.5	10.0 b	95 a
Tribenuron methyl[B]	7.5	700	52.5	22.6 b	63 b
Tribenuron methyl[B]	15	700	105	28.5 b	64 b
Untreated	–	–	–	70.8 a	0 c

[A] Weeks after application.
[B] BS1000 surfactant included in the spray at 0.25% v/v.
[C] Pulse surfactant included in the spray at 0.5% v/v.
[D] Within columns means followed by the same letter are not significantly different according to Duncan's Multiple Range Test. Density counts at 32 week assessment log transformed for analysis; control data at 48 week assessment arcsin transformed for analysis.

results from pot trials (Pritchard 1991) indicated that the surfactant enhanced the performance of the herbicide on bridal creeper. Other surfactants have not been evaluated.

In a pot trial (Pritchard 1995) there was some enhancement in control when metsulfuron methyl was tank-mixed with glyphosate. However in Trial 1, where four tank mixes were evaluated, and again in Trial 2 with one tank-mixed treatment, no improvement in control was obtained over that given by metsulfuron methyl or glyphosate applied alone at the same rate.

Chlorsulfuron at 1.88 g and 3.75 g 100 L^{-1} was as effective as metsulfuron methyl and glyphosate in Trial 1 and had also given equivalent control to metsulfuron methyl in an earlier trial (Pritchard 1995). However chlorsulfuron has somewhat longer soil persistence than metsulfuron methyl, and unpublished results of pot trials conducted at KTRI indicate that young eucalypts are more sensitive to soil-applied chlorsulfuron than to metsulfuron methyl. Chlorsulfuron therefore appears to offer no advantage over metsulfuron methyl.

Tribenuron methyl has a very short soil residual life and far less activity through the soil on eucalypts than metsulfuron methyl. However tribenuron methyl at 7.5 and 15 g 100 L^{-1} gave only 63 and 64% control respectively 48 weeks after application in Trial 2. This confirms results in an earlier trial at Point Nepean, where 7.5 g 100 L^{-1} gave only 50% control one year after application and in South Australia, where McQuinn (personal communication 1995) obtained 35% control one year after application of tribenuron methyl at 7.5 g 100 L^{-1} in one trial and the same result from 15 g 100 L^{-1} in another trial. With no response in control to increasing dose, tribenuron methyl appears to have insufficient activity on bridal creeper.

In neither trial was any examination made of the root system in treated plots, because the trial was to continue after re-treatment and digging up the roots may have influenced future results. It is assumed that the amount of foliar regrowth reflects the proportion of the root system which is still alive, although it is possible that the treatments have temporarily inhibited shoot regrowth while killing little of the root system.

Non-target species were obviously damaged by treatments containing glyphosate. The effects were more apparent on ground vegetation than on the foliage of trees and shrubs which were supporting the bridal creeper. The other herbicide treatments caused no observable damage to ground vegetation (which was predominately grasses, *Lomandra* sp. and *Juncus* sp.) and minimal damage to shrub or tree foliage.

In both trials the treatments were re-applied in September or October 1995. In practice, when the level of control one year after an initial spray is 90% or higher and many shoots are small, it may be preferable to leave respraying until two years after the first application. This approach could be expected to take less spraying time (searching for small shoots is time-consuming) and probably use little more herbicide. Since there would be more foliage, a greater uptake of herbicide into the root system would be achieved. McQuinn (1994) has advocated this method to also allow for a second season of seedling emergence before re-spraying. Against this, however, would be the additional recovery of the root system before the re-application was made.

The initial results from the re-spraying indicate that complete kill has still not been achieved. Shoot numbers are often (but not always) less than in the previous year.

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