

THE EVALUATION OF HERBICIDES AND APPLICATION TECHNIQUES
FOR THE CONTROL OF ST JOHN'S WORT (*HYPERICUM PERFORATUM*
VAR. *ANGUSTIFOLIUM*) IN GRAZING AREAS
OF NEW SOUTH WALES

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Summary. Three replicated herbicide trials were conducted on steep grazing country heavily infested with St John's wort in NSW from 1989 to 1991. The trials evaluated a range of herbicide products and rates using the high volume spray application technique. A proprietary formulation of triclopyr (butoxyethyl ester) and picloram (hexoxy propylamine salt) @ 150 g a.i. + 50 g a.i./100 L water was applied as a high volume spray (3,000 L/ha) produced the highest control of St John's wort, after 36 months at Cassilis, 21 months at Rouchel and 14 months at Bundella.

INTRODUCTION

St John's wort, *Hypericum perforatum* var. *angustifolium*, brought into Australia in 1875 as a garden plant, is now a widespread weed of pastures. It causes photosensitisation in sheep, cattle, horses and goats, resulting in loss of condition, lower productivity and, in extreme cases, death. It also spoils fleece quality by adding vegetable fault to wool, and excludes useful plants from pastures (2).

St John's wort is spreading at an alarming rate in grazing hill country in the slopes and tablelands areas of NSW and over 250,000 ha in NSW are estimated to be infested with St John's wort.

METHODS

Trial 1 was located at Cassilis, Upper Hunter Valley, with Trial 2 located at Upper Rouchel, Hunter Valley, and Trial 3 was located at Bundella, Liverpool Range, NSW. A randomised complete block design with three replicates was used.

Trial 1 had a dense stand of St John's wort, growing on steep, basalt hill country. The wort was 50-60 cm tall of an average density of 50% groundcover. Plants actively growing at mid flowering stage, with 40% of plants displaying yellow, open flowers and 60% brown pod stage. Plot size was 3x5 m and herbicides were applied on the 19 December 1989 using a Silvan ATV Flojet Spray Unit fitted with a variable spray nozzle handgun operating at a pressure of 450 kpa and generally applying 2,000 or 3,000 L/ha depending on herbicide used.

Trial 2 had an even dense stand of St John's wort, 75-90 cm high with 65% brown pods when sprayed at the late flowering stage on 23 January 1991. Plot size was 2x5 m and treatments were applied with a Solo knapsack sprayer fitted with a variable spray nozzle. Spray volumes of 3,000 L/ha and 1,500 L/ha were compared.

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Trial 3 also had an even stand of wort which was sprayed at two growth stages, pre-flowering under good growth conditions and flowering under moisture stress. Plot size was 5x10 m and treatments were applied with a power operated sprayer using a handgun fitted with a D6 tip and operating at a pressure of 500 kPa. The fine droplets produced were applied in successive vertical sweeping motions up and down each plant, wetting both leaves and stems.

Formulations tested included Grazon DS# (300 g a.i./L triclopyr as butoxyethyl ester and 100 g a.i./L picloram as hexoxy propylamine salt), Garlon 600# (600 g a.i./L triclopyr as butoxyethyl ester) and Tordon 50-D# (200 g a.i./L 2,4-D and 50 g a.i./L picloram, both present as the tri-isopropylamine salt), Roundup[^] (360 g a.i./L glyphosate as the isopropylamine salt) and Brushoff* (600 g a.i./kg metsulfuron methyl). Agral 600 surfactant at 0.1% v/v was added, where label recommendations required, with Ulvapon~ @ 0.1% v/v added to some treatments. Plots were visually rated for percent control the following seasons.

RESULTS AND DISCUSSION

In all trials, picloram+triclopyr provided effective control of St John's wort when applied under good growing conditions, between October and January and the results are shown in Tables 1 to 4.

Table 1. Percent control of St Johns wort using high volume application technique at Cassilis 12, 24 and 36 MAA (months after application)

Treatment	Rate (g/100 L)	Spray volume (L water/ha)	Percent control		
			12 MAA	24 MAA	36 MAA
picloram+triclopyr	25 + 75	3,000	99	94	86
picloram+triclopyr	50 + 100	3,000	100	99	94
triclopyr	102	3,000	76	68	40
picloram+2,4-D	25 + 100	3,000	76	79	58
glyphosate	180	2,000	84	68	61
glyphosate	360	2,000	88	72	75
metsulfuron methyl	6	2,000	90	83	75

Table 2. Percent control of St John's wort using high volume application technique @ 3,000 L water/ha, with and without the addition of Ulvapon Spray oil @ 0.1% v/v at Rouchel 12 and 21 MAA (months after application).

Treatment	Rate (g/100 L)	Without oil		With oil	
		12 MAA	21 MAA	12 MAA	21 MAA
picloram+triclopyr	12.5 + 37.5	67	68	69	73
picloram+triclopyr	25 + 75	81	87	83	93
picloram+triclopyr	50 + 150	100	99	100	100
triclopyr	102	53	53	46	40
picloram+2,4-D	25 + 100	81	82	88	87
picloram+2,4-D	50 + 200	92	97	94	99

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This trial clearly identified picloram+triclopyr as the most effective herbicide treatment on St Johns wort 12, 24 and 36 months after application. Picloram+triclopyr at 50+150 g/100 L was the most reliable treatment, showing better control than currently registered ingredients triclopyr, picloram+2,4-D and glyphosate.

The addition of oil (Ulvapron) at 0.1% v/v to picloram+triclopyr slightly improved the control of St John's wort (not significant), however, the level of control with triclopyr was reduced by the addition of oil, as shown in Table 2.

Spray volume did not significantly affect control of St John's wort with picloram+triclopyr, when applied at equivalent rates/ha and these results are shown in Table 3.

Table 3. Percent control of St John's wort following high volume application of picloram+triclopyr at different application volumes, Rouchel, 12 and 21 MAA (months after application)

Treatment	Rate (g/100 L)	Spray volume (L/ha)			
		3,000		1,500	
		12 MAA	21 MAA	12 MAA	21 MAA
Picloram + triclopyr	0.375 + 1.125	67	68	66	70
Picloram + triclopyr	0.75 + 2.25	87	87	77	80

Even though there was no significant difference between control of St John's wort with picloram+triclopyr at different application volumes, it was much easier to calibrate the application technique to apply 3,000 L/ha compared to 1,500 L/ha. There was less likelihood of application errors applying 3,000 L/ha, as it was essential to obtain complete coverage of the whole plant to obtain acceptable results.

Table 4. The effect of dry conditions on the control of St John's wort with picloram+triclopyr and picloram+2,4-D by high volume application at Bundella

Treatment	Rate (g/100 L)	Time 1	Time 2
		Application: 4.10.91	Application: 3.12.91
		Stage: pre-flower	Stage: flowering
		Soil Moisture: good	Soil Moisture: poor
		Plants active growth	Plants stressed
		% control 14 MAA	% control 12 MAA
picloram+triclopyr	50 + 150	92	82
picloram+triclopyr	35 + 105	-	67
picloram+triclopyr	25 + 75	78	47
picloram+2,4-D	50 + 200	93	80
picloram+2,4-D	25 + 100	80	40

Results in Table 4 show lower control of St John's wort after application of picloram+triclopyr and picloram+2,4-D to flowering plants under poor soil moisture conditions, when plants were

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stressed. Results show that best control of St John's wort was achieved with picloram+triclopyr at 50+150 g/100 L water in a spray volume of 3,000 L/ha, applied when good soil moisture was present and plants were actively growing from pre-flowering to flowering or November to January.

Although not reported in this paper, other application techniques have been evaluated during our research, which included Dupont Gas Gun, aerial application by helicopter and boomspray techniques. All trials confirm that picloram+triclopyr at 1.5+4.5 kg/ha was required to achieve effective control of St John's wort by all application methods.

From these results Ross Watson, District Agronomist Scone (3) obtained a pesticide order issued on 18 March 1992 for the use of picloram+triclopyr (Grazon DS @ 500 mL/100 L water) for the control of St John's wort, with the following critical comments:-

1. Apply during late spring to early summer (Nov-Jan) to coincide with flowering to early seed set. Do not apply during the autumn or winter as inferior levels of control will occur.
2. High Volume: apply through well calibrated hand gun equipment. Adjust hand gun spray equipment to apply the equivalent of 3,000 L/ha (ie. 3 L/10 square m). Check your application rate over a measured area of St John's wort infestation before spraying large areas. Adjust hand spraying speed or nozzle size to change application rate. Always ensure thorough coverage.
3. Handgun equipment should be fitted with a D5 (2 mm) nozzle plated and operated at 400-500 kPa as a broad spray pattern. Apply to thoroughly wet all leaves and stems, avoiding excess runoff. Do not apply to plants showing obvious signs of stress. If applied as directed, one application will provide a high degree of control. Some minor regrowth and seedlings may need retreatment the following summer. Grasses are largely unaffected, pasture legumes are severely damaged or killed by this herbicide. Clover regeneration will be significantly reduced for 12-18 months after application. However, good regeneration from seed should be observed 18-24 months after application (1).

REFERENCES

1. Anon. 1992. NSW Government Gazette No. 87. p. 4778.
2. Watson, R.W. and Campbell, M.H. 1993. St John's wort. NSW Agriculture, Agfact P7.6.1, Agdex 647. (In print.)
3. Watson, R.W. 1992. Agronomy News for the Upper Hunter No. 8. NSW Agriculture.