

USE OF A SPRINKLER SPRAYER FOR FOREST WEED CONTROL

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Summary. Initial experiments to develop the sprinkler sprayer for forest weed control are described. The sprinkler sprayer shows considerable potential as an application technique and can be used to apply either knockdown or residual herbicides. It can be adapted for either hand held or tractor mounted application. The sprayer is capable of low volume application and has the advantage of producing a relatively drift free spray pattern.

INTRODUCTION

The concept of a sprinkler sprayer was developed by staff of the Alan Fletcher Research Station, Queensland Lands Department. The device depends on use of a simple irrigator for a nozzle. Under hydraulic pressure the irrigator rotates and produces a coarse spray pattern up to about five metres diameter. The spray is projected outward at a low angle from the nozzle and falls to ground. In its initial form the nozzle was attached to a 3 metre long fishing rod. A knapsack forced spray mixture up through the rod and out of the nozzle. This device is currently undergoing a series of trials for forest weed control operations. Interim results are briefly presented.

SPRINKLER SPRAYERS FOR LANTANA CONTROL

Lantana (*Lantana camara*) is a scrambling bush which is a major weed problem in hoop pine (*Araucaria cunninghamii*) plantations. In recent years the department has developed a splatter gun technique to control lantana. This technique, which employs a gun to fire shots of glyphosate, became difficult to use when massed stands of lantana are encountered. The sprinkler sprayer concept was considered worthy of trial. Every two months since October 1982 a complete randomised block of four replications has been set down to examine application of glyphosate by both sprinkler sprayer and splatter gun. Treatments applied were:

- | | | |
|---|---|---|
| 1 | - | Splatter gun application of 2% ai glyphosate |
| 2 | - | " " " " 3% " |
| 3 | - | Sprinkler sprayer application of 1.8% ai glyphosate |
| 4 | - | " " " " 3.6% " |
| 5 | - | " " " " 7.2% " |
| 6 | - | " " " " 10.8% " |

The splatter gun technique involved use of a Phillips 5 ml Tree Injector to fire 2 ml shots of glyphosate mixture onto the lantana foliage. One shot was fired per 30 cm of height or width of bush.

The sprinkler sprayer used a unit comprising a compression sprayer, pressure control valve, fishing rod wand and sprinkler nozzle. Using a "Water bird" nozzle at 0.5 bars produced an output of 400 ml per minute which created a very coarse spray about 3.5 metres in diameter. The wand was passed over the target bush to deposit widely spaced droplets on the foliage. In moderate densities of lantana, application rates were in the order of 25-30 litres of mixture per hectare.

Bushes were periodically assessed for 12 months. Because the trial is still current only raw data is presented. Results are summarised below.

Table 1 lists the percentage of stems classed as dead at the time of assessment.

Table 1. Average Percent Outright Kill

Month Treatment Applied	Age (months)	Treatment					
		1	2	3	4	5	6
October 1982	12	29	29	-	42	47	56
December 1982	12	49	89	-	96	96	100
April 1983	12	73	93	-	93	93	89
July 1983	9	93	100	-	100	100	100
September 1983	8	51	82	-	33	84	93
November 1983	7	-	-	67	100	100	-
January 1984	5	-	-	71	100	93	-

Table 2 lists the average percent injury in terms of a scale 0% healthy to 100% dead.

Table 2. Average Percent Injury

Month of Treatment	Age (months)	Treatment					
		1	2	3	4	5	6
October 1982	12	38	38	-	54	64	72
December 1982	12	67	93	-	99	97	100
April 1983	12	80	97	-	98	96	96
July 1983	9	96	100	-	100	100	100
September 1983	8	81	93	-	70	95	98
November 1983	7	-	-	81	100	100	-
January 1984	5	-	-	90	100	99	-

The raw data suggest a seasonal effect with best results between December and July. Splatter gun is consistently effective at the 3% glyphosate rate. Sprinkler sprayer is consistently effective at rates above 3.6% ai glyphosate.

The data has also been briefly examined for the effect of bush size.

Table 3 sets out average kill by bush height for three periods of application.

Table 3. Average Kill by Bush Height

Height Class (metres)		0-1	1-2	2-3	3-4	4+
Treatment	Month					
1	October	100	52	8	24	-
	December	84	80	60	78	30
	April	100	100	76	64	-
2	October	100	54	18	6	-
	December	100	100	90	92	40
	April	100	100	94	100	-
4	October	50	50	66	46	-
	December	100	96	100	80	100
	April	100	100	98	100	100
5	October	100	56	70	74	-
	December	100	100	98	92	100
	April	100	98	96	94	100
6	October	60	84	66	84	-
	December	100	100	100	100	100
	April	94	98	94	100	-

The data suggest that at times of the year when glyphosate is less effective kill decreases with increasing bush size. The splatter gun appears more sensitive to bush size effects than the sprinkler sprayer.

The sprinkler sprayer is an easy, clear and fast tool to use. Current cost trials suggest sprinkler sprayers can achieve high kill rates for costs equivalent to or less than other methods.

SPRINKLER SPRAYERS FOR PASTURE CONTROL

The Department has been attempting to establish exotic pine plantations on areas of land previously developed for improved pasture. Unless these grasses are controlled tree survival and growth are very poor. To achieve grass control, a regime of pre plant application of knockdown grass killers and residual herbicides has been developed. To apply these herbicides tractor mounted Micro Max boom sprayers were developed. These units apply herbicides on a 2 metre band at speeds of 5-6 kilometres per hour. In lieu of the Micro Max, sprinkler sprayers have been used for this work. Hand held sprinkler sprayers can effectively apply glyphosate and simazine over a 3.5 metre band. On the tractor mounted units the Micro Max nozzles were directly replaced with sprinkler sprayer nozzles. A current experiment is comparing the sprinkler sprayer and Micro Max application of various herbicides in a complete randomised block of four replications. In the first phase of this trial five herbicides were applied.

1 - glyphosate	1.0 kg ha ⁻¹
2 - "	1.6 kg ha ⁻¹
3 - "	2.2 kg ha ⁻¹
4 - 2,2DPA	14.8 kg ha ⁻¹
5 - 2,2DPA	22.2 kg ha ⁻¹

These were applied in water by both Micro Max and sprinkler sprayer nozzles applying 100 litres of mixture per hectare.

Table 4 sets out percent "kill" at 5 weeks and average weed cover at 15 weeks.

Table 4. Average Percent Kill and Weed Cover

Factor	Treatment									
	1		2		3		4		5	
	MM	Sp.	MM	Sp.	MM	Sp.	MM	Sp.	MM	Sp.
Average Kill at 5 weeks	91	92	98	98	96	96	45	51	50	59
Average % Weed Cover at 15 weeks	10	10	5	10	15	15	15	20	15	5
MM = Micro Max			Sp. = Sprinkler Sprayer							

Results suggest that sprinkler sprayers can achieve high kill rates which are equivalent to Micro Max application.

Subsequently residual herbicides such as simazine and hexazinone have been applied to this trial. Both types of nozzles appeared to apply a satisfactory band of residual herbicide.

Routine Field Experience with Sprinkler Sprayers. In addition to these current trials the hand held sprinkler sprayer has been used by routine field staff over quite large areas for herbicide application. Phenoxy herbicides have been applied to areas carrying dense germination of *Grevillea fosteri*. Kills and cost have been superior to equivalent applications by tractor mister. The sprinkler sprayers were light and easier to use. They had a special advantage in being almost drift free.

Sprinkler sprayers have also been used to apply glyphosate, atrazine and 2,4-D to a range of other weed situations. In all cases the units have been effective and enjoyed a high operator acceptance.

DISCUSSION

This paper has attempted to briefly outline current development of the sprinkler sprayers for forest weed control. Each trial will be subject to proper statistical analysis on completion to arrive at valid conclusions. In the interim, results to date suggest the sprinkler sprayer promises to be an effective means of herbicide application. The sprinkler nozzle can be mounted on hand held or tractor mounted sprayers. The unit is capable of low volume application. A wide range of nozzle types and flow control orifice plates is available to adjust output, droplet pattern and swathe width. At high pressure the nozzle can produce a pattern with a large proportion of fine droplets. It is suggested that the sprinkler sprayer is best used at low pressure (0.5 - 1 bar) to produce a coarse droplet pattern, which produces minimal drift. Application of herbicides such as glyphosate, 2,2DPA, 2,4-D, 2,4,5-T atrazine, simazine and hexazinone as a coarse spray appears to achieve a good result. Operator acceptance of hand held units has been excellent. Pending the result of current trials the sprinkler sprayer appears likely to replace both knapsacks and misters in Queensland forest operations.

CONCLUSION

The sprinkler sprayer is a new tool which promises to be a simple, effective low volume and drift free way to apply herbicides in many situations.