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Roller and wick application of picloram for leafy spurge control

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Experiments were established to evaluate roller and wick application of picloram, as an economical alternative for leafy spurge control in pastureland. Leafy spurge control and the picloram soil residue after treatment were compared for conventional broadcast, roller and wick applications. Also, variable picloram concentrations and an additive with picloram were evaluated. The wick applicator is similar to the rope-wick applicator but uses a poly-foam backed canvas instead of the rope and delivers more volume of solution per acre for improved coverage in dense leafy spurge stands.

All experiments were a randomized complete block design with four replications, except the second experiment had five replications. The broadcast treatments were applied at 35 psi, and at 8.5 gpa for the first two experiments and 8 gpa for the last two experiments. The picloram concentrations with the roller and wick applicators varied from 1:1 to 1:15 picloram (Tordon 22K):water (v:v). The 1:7 concentration was comparable to picloram at 2 lb/A broadcast at 8 gpa (1 gal Tordon 22K:7 gal water). The roller and wick applicators were adjusted to treat the top half of the tallest leafy spurge. Evaluations were based on reduction of plant density as compared to the control.

The first experiment was established on September 22, 1978 near Valley City, ND with broadcast treatments of picloram compared to roller applications with and without a foam additive. The second experiment was established on October 3, 1979 near Walcott, ND with a similar objective as the first experiment except an additive with picloram was not used. The leafy spurge was 20 to 25 inches tall with senescent lower leaves but new fall growth on the stem tips for both experiments.

Picloram applied broadcast at 2 lb/A or with the roller applicator using the foam additive at either 1 or 3 mph gave similar results throughout the three years of observations (Table 1). Control was in the upper 90% range for these treatments in the May 1979 evaluations and then began a steady decline as the remaining plants reestablished in the plot area. In June 1981, 33 months after the treatments were applied, control ranged from 61 to 72%. The treatment applied at 3 mph without a foam additive consistently had the lowest control throughout the evaluation period. These data suggest that leafy spurge control by picloram may be due primarily to absorption and translocation within the plant soon after application and not the long soil residual of picloram.

For the second experiment, picloram broadcast at 2 lb/A provided 100% control in the year following treatment, and control had decreased slightly to 96% by the end of the second year (Table 2). The roller applied treatments and picloram at 1 lb/A broadcast provided similar leafy spurge control for one year, but the roller applied treatments were better 2 years after application. Leafy spurge control for the roller applied treatments was lower than comparable observations for the previous experiment. These treatments were applied when the leafy spurge had lost most of its leaves, the temperature was in the low 40ºs F and a killing frost occurred within 6 days. These treatment conditions suggest that picloram absorption and translocation was reduced by low weed vigor and cold conditions resulting in reduced control.

Table 1. Leafy spurge control with picloram using the roller applicator near Valley City, ND for treatments applied September 22, 1978. (Lym and Messersmith).

Type of application	Additive	Rate[a] (lb/A)	Control May 31, 1979	Aug. 29, 1979	May 30, 1980	Aug. 27, 1980	June 23, 1981
			(%)				
Broadcast	None	1	88	82	74	65	36'
Broadcast	None	2	98	91	88	72	61
Roller - 1 mph	None	2	91	87	82	66	53
Roller - 3 mph	None	2	94	69	52	36	20
Roller - 1 mph	Foam	2	97	94	94	77	72
Roller - 3 mph	Foam	2	97	88	83	73	62
Control	----	----	0	0	0	0	0
LSD (0-05)			9	10	17	23	30

[a] Solution concentration on the roller was the same as 2 lb/A at 8.5 gpa broadcast.

Table 2. Leafy spurge control with picloram using the roller applicator near Walcott, ND for treatments applied October 3, 1979. (Lym and Messersmith).

Type of Application	Rate[a] (lb/A)	Control May 8, 1980	June 24, 1980	May 22, 1981	Aug. 19, 1981
		(%)			
Broadcast	1	99	79	59	19
Broadcast	2	100	100	98	96
Roller - 1 mph	2	99	80	61	43
Roller - 2 mph	2	94	77	70	53
LSD (0.05)		6	13	19	32

[a]Solution concentration on the roller was the same as 2 lb/A at 8.5 gpa broadcast.

The third experiment evaluated the most efficient picloram, concentration for use with the roller and wick applicators. Solution concentrations ranged from 1:1 to 1:15 picloram (Tordon 22K):water (v:v). An experiment was established in the spring on June 16, 1980 near Sheldon, ND and in the fall near Valley City, ND on September 2, 1980. The lowest solution concentration that gave adequate leafy spurge control was considered

the most efficient because it used less picloram per acre than a more concentrated solution. A 1:3 solution concentration seemed to be the most efficient for both applicators (Table 3). In general the fall treatment had better leafy spurge control than spring applications, but the experiments were not at the same site and there has been nearly two full growing seasons after the spring treatments.

Table 3. Leafy spurge control with variable picloram concentrations using the roller and wick applicators with treatments applied on June 16, 1980 at Sheldon and September 2, 1980 at Valley City. (Lym and Messersmith).

		Location/Evaluation date			
		Sheldon		Valley City	
Applicator	Picloram concentration[a]	May 26, 1981	June 17, 1981	Aug. 20, 1981	Sept. 2, 1981
		% control			
Roller	1:1	90	58	96	93
Roller	1:3	93	48	97	81
Roller	1:7	75	15	91	50
Roller	1:11	70	9	67	15
Roller	1:15	69	12	35	3
Wick	1:1	88	38	96	92
Wick	1:3	80	18	93	78
Wick	1:7	41	2	79	28
Wick	1:11	49	8	68	5
Wick	1:15	62	5	15	0
LSD (0-05)		14	21	17	22

[a]Picloram (Tordon 22K):water (v:v).

A fourth experiment to evaluate the usefulness of additives with picloram when using the roller and wick applicators was established on June 12 and 16, 1980 near Sheldon. A surfactant and a petroleum based oil at 5% (v:v) were added to various picloram concentrations. Neithcr additive at any picloram concentration improved leafy spurge control over the same rate without an additive, and there was a trend for the additives to decrease control (Table 4).

Leafy spurge control for the third and fourth experiments that were established in 1980 generally was less than for the first and second experiments established in 1978 and 1979. Leafy spurge control in other experiments at the same locations as the 1980 experiments generally had lower weed control than other sites with comparable treatments, which suggests that location differences may have affected control. Also, 1980 was a dry year so many of the leafy spurge stems were shorter than normal. Perhaps the procedure of adjusting the roller and wick applicator height to treat the upper half of the tallest leafy spurge stems resulted in insufficient contact with the short weed stems to provide control comparable to the results of previous years.

Table 4. Leafy spurge control with picloram plus additives using roller and wick applicators with treatments applied on June 12 and 16, 1980. (Lym and Messersmith).

Method	Picloram concentration[a]	Additive			
		None	Surfel[b]	Oil[c]	Mean
		% control			
Roller	1:7	74	67	56	66
	1:11	48	45	37	43
	1:15	46	53	51	43
Mean		56	55	48	
LSD (0.05) =conc=16;add=16;concxadd=27					
Wick	1:3	76	77	81	78
	1:7	38	44	68	50
	1:11	45	50	57	51
Mean		53	57	67	
LSD (0.05) =conc=17;add=17;concxadd=29					

[a]Picloram (Tordon 22K):water (v:v).
[b]5% surfactant (v:v).
[c]5% oil(v:v) (83% paraffin base petroleum oil + 15% emulsifier).

A soil bioassay was conducted to determine the picloram residue from broadcast, roller, and wick applications. Plots from two adjacent experiments were sampled to obtain the full range of treatments shown in Table 5. Six soil samples to an 8-inch depth were taken from each plot in October which was 19 weeks after treatment. Sunflower height, and fresh and dry weight in a greenhouse bioassay were used to determine the picloram residual. The experimental design was completely random with three replications.

Table 5. Estimates of the picloram residue in soil 19 weeks after application for treatments applied near Sheldon, ND in 1980 by a sunflower bioassay. (Lym and Messersmith).

Application method	Rate (lb/A)/ solution conc.(v:v)	Picloram residue (ppm)
Broadcast	1	0.03
Broadcast	2	0.17
Roller	1:1	0.07
Roller	1:3	0.06
Roller	1:7	0.03
Roller	1:7 + 5% crop oil	0
Roller	1:11	0
Roller	1:15	0.05
Wick	1:1	0.19
Wick	1:3	0.04
Wick	1:3 + 5% crop oil	0.06
Wick	1.7	0
Wick	1:11	0
Wick	1:15	0.01
Control	----	0
LSD (0.05) = 0.04		

Picloram at 2 lb/A broadcast had a residual of 0.17 ppm and the wick application at 1:1 (v:v) was very similar with 0.19 ppm picloram residual (Table 5). Picloram at 1 lb/A broadcast had a residual of 0.03 ppm, and the residual was similar for 4 of 6 roller-applied treatments and 2 of 6 wick-applied treatments. Picloram from the roller and wick applied treatments could be reaching the soil through several methods including washing from treated plants, release through decomposition of treated stems and roots, and exudation from the roots of treated plants directly into the soil.