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Leafy spurge control with various herbicide combinations applied alone or with spray additives[1]

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The relatively high cost of herbicides limits their use on pasture and rangeland for leafy spurge control, especially when applied at rates that are in excess of $5 to $10/A. Previous research at North Dakota State University has shown that picloram plus 2,4-D at 0.25 + 1 lb/A applied annually is more cost-effective than high rates of herbicides applied once. Picloram or 2,4-D applied alone at relative low rates did not provide satisfactory leafy spurge control. The purpose of this research was to evaluate various herbicide combinations applied alone or with spray additives for leafy spurge control.

Three experiments were established in a dense leafy spurge infestation growing along railroad tracks in West Fargo. The first two were established on June 9, 1987, when leafy spurge was in the true flower growth stage, and the third on September 1, during fall regrowth. A fourth experiment was established on June 16, 1987, near Valley City with leafy spurge in the seed-set growth stage. A retreatment of picloram at 8 oz/A was applied in June 1988 as a split-block treatment to the back one-third of each plot at Valley City. All herbicides were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. All plots were 10 by 30 feet in a randomized complete block design. Evaluations were based on visible percent stand reduction as compared to the control.

Picloram plus 2,4-D or picloram applied with methylated sunflower oil, with NH_4SO_4 (liquid or granular formulations), or at pH 4.7 buffered with citric acid did not provide satisfactory leafy spurge control (Table 1). Though not evaluated in this experiment, leafy spurge control from similar herbicide treatments applied without additives in adjacent experiments provided better initial and long-term control. Visual observations indicated that inclusion of additives caused rapid desiccation of the upper leaves. The plants recovered quickly and regrowth from the lower portion of the stems resumed. Leafy spurge control with fosamine applied alone or with sulfometuron also was lower than expected and may be due to application during low relative humidity (30%). Fosamine provides fair to good leafy spurge control if applied when relative humidity is high.

Sulfometuron applied with picloram, fluroxypyr, or various formulations of 2,4-D generally provided leafy spurge control similar to the same herbicides applied alone

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(Table 2). Subsequent research has shown sulfometuron increases leafy spurge control when applied with these herbicides in the fall but not in the spring, when this experiment was established. Leafy spurge control with sulfometuron plus fluroxypyr or picloram decreased as the fluroxypyr rate increased, but increased with increasing rates of picloram.

Table 1. Leafy spurge control with various herbicides and additives spring or fall applied at West Fargo, ND (Lym and Messersmith).

		1987Application/Evaluation Date		
		June 9		September 1
Treatment	Rate	Aug 87	May 88	May 88
	— (oz/A) —	——— (%) ———		
Picloram + 2,4-D + MSW[a]	4 + 16 + 16	27	6	22
Picloram + 2,4-D + MSW[a]	8 + 16 + 16	15	8	23
Picloram + MSW[a]	4 + 16	33	0	–
Picloram + MSW[a]	8 + 16	25	6	34
Picloram + sulfometuron + MSW[a]	8 + 1 + 16	47	18	–
Fosamine	64	0	14	–
Fosamine	96	13	40	–
Fosamine + sulfometuron	64 + 1	6	13	–
Fosamine + sulfometuron	16 + 1	6	0	–
Dicamba + MSW[a]	32 + 16	24	13	36
Picloram + 2,4-D + NH_4SO_4[b]	4 + 16 + 0.13	–	–	15
Picloram + 2,4-D + NH_4SO_4[b]	8 + 16 + 0.13	–	–	21
Picloram + 2,4-D + NH_4SO_4[c]	4 + 16 + 40	–	–	4
Picloram + 2,4-D + NH_4SO_4[c]	8 + 16 + 40	–	–	23
Picloram + 2,4-D + citric acid[d]	4 + 16	–	–	11
Picloram + 2,4-D + citric acid[d]	8 + 16	–	–	10
LSD (0.05)		20	15	NS

[a]MSW = Methylated sunflower oil plus sponto 4K-3158 emulsifier.
[b]8-0-0-9 liquid fertilizer equivalent to N and S at 0.2 lb/A respectively.
[c]Equivalent to 2.5 lb. N/A.
[d]Spray solution buffered to pH 4.7.

In August 1987, sulfometuron at 1 to 2 oz/A applied with picloram at 8 oz/A or 2,4-D at 16 oz/A provided an average of 94% leafy spurge control but only 61% when applied with dicamba at 16 oz/A (Table 3). The average control at Valley City was much higher than with similar treatments applied at West Fargo (Table 2). The increase could be due to application at a later growth stage at Valley City than West Fargo, or different experimental conditions during treatment. It was 90ºF with 50% relative humidity at Valley City during application compared to 77ºF and 30% relative humidity, at West Fargo. The soil pH and organic matter was similar at the two locations.

Table 2. Leafy spurge control with sulfometuron plus various auxin herbicides at West Fargo, ND (Lym and Messersmith).

Treatment	Rate	Evaluation date[a]	
		9 Aug 87	24 May 88
	(oz/A)	(%)	
Picloram + sulfometuron	4 + 1	6	13
Picloram + sulfometuron	8 + 1	9	5
Picloram + sulfometuron	12 + 1	14	17
Picloram + sulfometuron	16 + 1	49	44
Picloram + sulfometuron	4 + 1.5	0	11
Picloram + sulfometuron	8 + 1.5	22	23
Picloram + sulfometuron	12 + 1.5	54	37
Picloram + sulfometuron	16 + 1.5	65	48
Picloram + sulfometuron	4 + 2	7	0
Picloram + sulfometuron	8 + 2	33	3
Picloram + sulfometuron	12 + 2	29	61
Picloram + sulfometuron	16 + 2	60	74
2,4-D alkanolamine + sulfometuron	8 + 1	7	4
2,4-D alkanolamine + sulfometuron	16 + 1	6	0
2,4-D alkanolamine + sulfometuron	32 + 1	9	0
2,4-D alkanolamine + sulfometuron	8 + 1.5	14	0
2,4-D alkanolamine + sulfometuron	16 + 1.5	20	3
2,4-D alkanolamine + sulfometuron	34 + 1.5	16	0
2,4-D alkanolamine + sulfometuron	8 + 2	17	3
2,4-D alkanolamine + sulfometuron	16 + 2	16	0
2,4-D alkanolamine + sulfometuron	32 + 2	14	7
2,4-D mixed amine[a] + sulfometuron	16 + 1	6	0
2,4-D ester[b] + 2,4-DP + dicamba + sulfometuron	2 + 2 + 0.5	13	0
Picloram	8	9	4
Picloram	16	59	35
2,4-D alkanolamine	16	6	5
Fluroxypyr + sulfometuron	4 + 1	78	48
Fluroxypyr + sulfometuron	8 + 1	38	13
Fluroxypyr + sulfometuron	16 + 1	49	5
Fluroxypyr	16	32	13
LSD (0.05)		25	24

[a] Mixed amine salts of 2,4-D (2:1 dimethylamine:diethanolamine)-EH 736.
[b] 2,4-D isooctyl ester:2,4-DP butoxyethanol ester:dicamba (4:4:1)-EH 680.

Dicamba plus sulfometuron at 16 + 2 oz/A and all sulfometuron plus picloram treatments provided good leafy spurge control 12 months after treatment (Table 3). Control declined rapidly, thereafter, and no treatment provided satisfactory control by August 1988 even with a picloram retreatment. In general, no herbicide combination treatment or additive provided longer-term or more cost-effective leafy spurge control than picloram plus 2,4-D.

Table 3. Leafy spurge control with sulfometuron applied with picloram, 2,4-D, or dicamba at Valley City, ND (Lym and Messersmith).

		Evaluation date			
				Aug 88	
Treatment	Rate	Aug 87	June 88	Original	Retreatment[a]
	(oz/A)	(%)			
Picloram + sulfometuron	8 + 1	98	88	19	25
Picloram + sulfometuron	8 + 1.5	99	87	26	39
Picloram + sulfometuron	8 + 2	92	95	15	26
2,4-D alkanolamine + sulfometuron	16 + 1	89	15	8	32
2,4-D alkanolamine + sulfometuron	16 + 1.5	89	26	12	29
2,4-D alkanolamine + sulfometuron	16 + 2	98	56	11	22
Dicamba + sulfometuron	16 + 1	54	34	3	35
Dicamba + sulfometuron	16 + 1.5	45	11	1	40
Dicamba + sulfometuron	16 + 2	84	80	15	36
Untreated		0	0	0	28
LSD (0.05)		28	25	NS	NS

[a] Picloram at 8 oz/A applied on June 2, 1988, to the back one-third of each plot.