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## **Spring or fall applied granular picloram and dicamba for leafy spurge control in North Dakota<sup>1</sup>**

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Granular and liquid formulations of picloram and dicamba were compared for leafy spurge control in two experiments established in 1980 on June 25 and September 3 near Valley City. Eight experiments to compare picloram 2% and 10%G formulations were established on September 14, 1982 and June 10, 1983 near Sheldon, September 9, 1982, June 21, 1983, and June 13 and September 11, 1984 near Dickinson, and June 14 and September 18, 1984 in the Sheyenne National Grasslands. Blank pellets were included in the experiments conducted at Sheldon so the number of pellets applied per plot was similar to improve uniformity of distribution of the picloram 10%G formulation. All experiments were in a randomized complete block design with four replications and 10 by 30 feet plots. The granules were applied uniformly by hand, while the liquid formulations were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. Evaluations were based on percent stand reduction compared to the control. A significant interaction on between site and treatments occurred, so experimental sites will be discussed individually.

Leafy spurge control with picloram and dicamba was better from fall than spring applied treatments at Valley City, especially when evaluated 24 to 60 months, after treatment (Table 1). The control averaged across all treatments after 24, 48, and 60 months was 54, 22, and 13% for spring applications and 78, 62, and 26% for fall applications, respectively. Fall applied dicamba at 8 lb/A and picloram at 2 lb/A as liquids provided similar control after 5 years, but control with granular picloram was better than with granular dicamba. Dicamba and picloram applied in the spring of 1980, generally did not give satisfactory leafy spurge control by 1982 and 1983, respectively. The exception was picloram at 2 lb/A which provided satisfactory control until 1984. Only fall applied picloram 2%G at 1.5 and 2 lb/A provided satisfactory leafy spurge control after 48 months at 83 and 86%, respectively, but no treatment provided satisfactory control 60 months after application.

Picloram 2%G and 10%G at equal rates generally provided similar leafy spurge control at both Sheldon and Dickinson (Table 2). Fall applications of picloram 2%G and 10%G at all application rates, except 2.0 lb/A, provided better leafy spurge control after 9 months than spring applications after 3 months. This difference could be due to insufficient moisture to completely disperse the granules following the June application, be-

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cause the treatments generally were similar 12 and 24 months after application. Leafy spurge control in 1985 at Sheldon was similar to control in 1984. However, the treatments at Dickinson did not provide satisfactory leafy spurge control in 1985, so specific evaluations were not taken. The soil at Sheldon is very sandy compared to the mostly clay soil at Dickinson which may have allowed deeper picloram movement in the soil profile and thus better long-term leafy spurge root control at Sheldon than Dickinson.

Leafy spurge control with picloram at 1 and 2 lb/A was similar for the 2%G and 10%G when blanks were added, but was much worse with 10%G than 2%G pellets without blanks (Table 2). The picloram 2%G and 10%G pellets were similar in size and 80% fewer pellets per acre are applied with picloram 10%G than with 2%G. Thus, uniform distribution with hand-held application equipment was difficult which probably accounted for the decreased control. Visible grass injury was negligible with either picloram formulation. In general, leafy spurge control with picloram at 2 lb/A declined more rapidly when the liquid (2S) formulation was used compared to 2%G or 10%G.

Similar experiments were begun in 1984 using a new formulation of picloram 10% with smaller pellets which resulted in more pellets per square foot than the previous 10%G formulation at similar rates. Picloram 2%G and 10%G gave similar leafy spurge control at all application rates except 0.5 lb/A (Table 3). Blanks were not mixed with the new 10%G formulation but a uniform distribution still was obtained. Control was much lower at Dickinson than at Sheyenne which again probably was due to deeper picloram movement in the sandy soil at Sheyenne than in the clay soil at Dickinson. Unlike previous experiments, spring application of picloram granules provided better leafy spurge control than fall application when evaluated 12 months after treatment. Fall precipitation was below normal and the soil was very dry until late October in 1984. The dry soil conditions after application apparently caused poor long-term control despite adequate moisture in 1985.

Granular and liquid formulations of dicamba and picloram generally provided similar control at comparable rates. Picloram 2%G and 10%G provided similar leafy spurge control either when blanks were included with the 10%G pellets or when the number of 10%G pellets per square foot was increased by use of a smaller pellet. Generally spring and fall treatment provided similar long-term control except when application was made during very dry conditions. Picloram granules provided better long-term control in sandy compared to clay soils.

**Table 1. Spring and fall applied granular picloram and dicamba for leafy spurge control at Valley City, ND.**

Herbicide		Application and evaluation date																		
		Spring treatment (25 June 1980)									Fall treatment (3 Sept 1980)									
		6-81	9-81	6-82	9-82	6-83	9-83	6-84	9-84	6-85	6-81	9-81	6-82	9-82	6-83	9-84	5-84	9-84	6-85	8-85
		----- (% control) -----																		
	Rate (lb/A)	6-81	9-81	6-82	9-82	6-83	9-83	6-84	9-84	6-85	6-81	9-81	6-82	9-82	6-83	9-84	5-84	9-84	6-85	8-85
Picloram 2%G	1.0	97	80	53	25	44	22	10	8	3	95	86	84	55	76	52	51	52	18	10
Picloram 2%G	1.5	98	89	87	22	77	38	29	26	11	99	100	100	96	98	97	87	83	59	48
Picloram 2%G	2.0	99	98	90	53	85	72	56	62	28	100	100	99	100	100	98	93	86	68	63
Dicamba 5%G	4.0	74	55	9	3	4	0	4	0	0	94	74	43	31	31	29	18	20	17	9
Dicamba 5%G	6.0	82	54	25	3	16	5	4	3	1	96	99	89	58	55	55	41	40	22	6
Dicamba 5%G	8.0	91	75	45	19	29	6	5	6	0	99	100	98	83	84	78	66	67	39	20
Picloram	2S	100	99	98	90	94	79	64	71	54	100	100	100	100	98	94	79	78	50	28
Dicamba	4S	94	74	28	12	42	13	7	5	4	99	99	100	97	92	83	69	72	47	33
LSD (0.05)		9	14	21	17	20	11	11	12	20	3	10	22	29	24	24	29	23	26	23

**Table 2. Leafy spurge control using picloram 2%G and 10%G of similar size.**

Picloram formation	Rate (lb/A)	Evaluation date									
		1983		1984		1985		1983		1984	
		June	Aug	June	Aug	June	Aug	June	Aug	June	Aug
		----- (% control) -----									
Applied Fall 1982		Sheldon					Dickinson				
2%G + blanks	0.5	66	26	8	21	11	16	38	5	18	5
2%G + blanks	1.0	86	41	29	33	31	18	69	15	42	13
2%G + blanks	1.5	87	67	48	48	47	24	90	37	71	51
2%G	2.0	99	76	80	66	71	44	96	53	79	64
10%G + blanks	0.5	39	11	3	31	0	0	34	9	19	0
10%G + blanks	1.0	83	60	52	56	39	30	84	21	45	36
10%G + blanks	1.5	81	60	43	58	54	38	88	35	55	47
10%G + blanks	2.0	87	63	77	56	65	45	89	40	75	64
10%G	1.0	53	26	11	13	18	13	---	---	---	---
10%G	2.0	89	61	45	45	52	57	---	---	---	---
Liquid (2S)	2.0	94	67	55	44	30	35	94	42	60	41
LSD (0.05)		16	30	19	23	24	25	18	28	30	33
Applied Spring 1983											
2%G + blanks	0.5	---	28	27	10	21	8	---	38	28	12
2%G + blanks	1.0	---	38	58	13	55	14	---	57	53	43
2%G + blanks	1.5	---	86	95	36	92	50	---	62	83	60
2%G	2.0	---	97	94	69	93	62	---	76	89	65
10%G + blanks	0.5	---	26	11	6	18	4	---	25	20	2
10%G + blanks	1.0	---	54	61	16	52	28	---	32	42	23
10%G + blanks	1.5	---	74	70	26	58	35	---	78	75	56
10%G + blanks	2.0	---	92	92	56	92	56	---	63	76	70
Liquid (2S)	2.0	---	93	79	39	76	57	---	96	94	51
LSD (0.05)			22	14	14	23	15		23	19	29

**Table 3. Leafy spurge control using picloram 2%G, 10%G, and 2S as spring or fall applied treatment.**

Picloram. formulation	Rate (lb/A)	Evaluation date							
		1984		1985		1986		1985	
		Aug	June	Aug	June	Aug	June	Aug	June
		----- (% control) -----							
Applied Spring 1984									
2%G	0.5	83	89	53	56	34	0	0	0
2%G	1.0	96	99	83	79	54	38	48	8
2%G	1.5	96	100	97	95	91	43	62	13
2%G	2.0	98	100	98	98	94	83	88	53
10%G	0.5	64	75	19	4	4	3	0	4
10%G	1.0	95	99	84	86	82	31	43	23
10%G	1.5	97	99	94	93	86	56	45	16
10%G	2.0	97	99	94	94	86	72	56	31
Liquid (2S)	2.0	98	100	99	98	94	98	80	28
LSD (0.05)		8	10	16	17	24	23	24	21
Applied Fall 1984									
2%G	0.5	---	94	57	76	7	---	71	16
2%G	1.0	---	100	91	91	74	---	85	39
2%G	1.5	---	100	96	98	83	---	97	56
2%G	2.0	---	100	97	97	86	---	98	81
10%G	0.5	---	82	42	43	6	---	46	15
10%G	1.0	---	96	81	66	52	---	79	36
10%G	1.5	---	99	91	89	81	---	91	45
10%G	2.0	---	99	91	96	73	---	95	68
Liquid (2S)	2.0	---	100	99	97	88	---	99	47
LSD (0.05)		---	6	16	14	26	---	9	17