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Leafy spurge control in North Dakota - 1986

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Annual picloram plus 2,4-D treatments, aerial application of picloram plus 2,4-D and evaluation of sulfometuron have been the emphasis of the leafy spurge control research program in 1986.

An experiment to determine the number of annual applications of picloram needed to provide 90 to 100% control of leafy spurge and to investigate possible synergism between picloram and 2,4-D was established at two locations in North Dakota. The experiment began on 25 August 1981 at Dickinson and on 11 June 1982 at Valley City. Dickinson, located in western North Dakota, generally receives much less precipitation than Valley City in eastern North Dakota. All treatments were applied annually except 2,4-D alone which was applied biannually (both spring and fall). Picloram treatments were applied in late August 1981 and in June of 1982 through 1984. Thus, the Dickinson site has received five picloram and picloram plus 2,4-D treatments and nine 2,4-D treatments, while the Valley City site has received four and eight treatments, respectively. The plots were 10 by 30 feet and each treatment was replicated four times in a randomized complete block design.

Picloram at 0.25, 0.375 and 0.5 lb/A provided 48, 75 and 90% leafy spurge control, respectively, in August 1985 when averaged across the Dickinson and Valley City locations (Table 1). Control gradually increased for the picloram at 0.375 and 0.5 lb/A treatment, but not the 0.25 lb/A treatment when compared to the August 1982 and 1983 evaluations. 2,4-D alone provided approximately 50% control of leafy spurge after biannual applications for five years.

Leafy spurge control tended to increase when 2,4-D was applied with picloram at 0.25 or 0.375 lb/A (Table 1). Leafy spurge control in June 1986 increased an average of 21, 12 and 19% with picloram at 0.25, 0.375 or 0.5 lb/A plus 2,4-D at 1.0 to 2.0 lb/A, respectively, when compared to the same picloram rate applied alone. The greatest enhancement with 2,4-D plus picloram seems to be with 2,4-D at 1.5 lb/A or less. After five treatments, picloram at 0.375 or 0.5 lb/A with 2,4-D is within 10% of the target of 90 to 100% leafy spurge control.

Table 1. Leafy spurge control from annual picloram or picloram plus 2,4-D treatments and biannual 2,4-D treatments at two locations in North Dakota since 1981.

		Site and 1986 evaluation		Mean			
				August			June
Herbicide	Rate	Dickinson	Valley City	1982	1983	1985	1986
	(lb/A)	(% control)					
Picloram	0.25	56	43	39	48	48	50
Picloram	0.375	62	82	65	62	75	72
Picloram	0.5	70	68	65	71	90	69
2,4-D bian	1.0	40	28	22	30	52	34
2,4-D bian	1.5	36	50	22	24	48	43
2,4-D bian	2.0	33	65	19	30	54	49
Pic+2,4-D	0.25+1.0	77	69	52	66	85	73
Pic+2,4-D	0.25+1.5	67	62	58	66	86	65
Pic+2,4-D	0.25+2.0	67	84	57	62	83	76
Pic+2,4-D	0.375+1.0	82	81	69	72	91	82
Pic+2,4-D	0.375+1.5	87	84	68	74	95	86
Pic+2,4-D	0.375+2.0	79	91	68	59	93	85
Pic+2,4-D	0.5+1.0	84	91	71	75	94	88
Pic+2,4-D	0.5+1.5	80	97	64	73	97	89
Pic+2,4-D	0.5+2.0	83	91	76	75	96	87
LSD (0.05)		19	23	18	14	16	17

An experiment to evaluate forage utilization by cattle in various densities of leafy spurge was begun in 1984 and continued in 1985 near Leonard, ND. The 300 A pasture carried 80 cow-calf pairs from May until mid-October. Caged plots were established on 23 April in four leafy spurge densities, 80% or above (high), 40-80% (moderate) 20-40% (low) and no infestation (zero). Four caged and uncaged 0.25 m^2 paired plots were established per density with four replications. Production was harvested on 12 July or 4 October and separated into cool or warm-season grasses, leafy spurge and forbs.

Forage availability was similar in all densities of leafy spurge in July, but was lower in all densities except the zero density by October (Table 2). Leafy spurge decreased warm-season grass production much more than cool and the decrease was greater with increasing leafy spurge density. Total disappearance was 22% in July in areas with zero leafy spurge infestation but was only 6% when averaged over all other densities. Visual observation indicated that most of the disappearance in the higher densities of leafy spurge was due to trampling. Thus, most of the grazing from April until mid-July was in uninfested portions of the pasture.

Total disappearance and utilization increased in all densities of leafy spurge in October compared to July. Cattle utilized an average of 54% of the total forage produced in the zero and low density leafy spurge infestations, but only 27 and 19% in the moderate and high density infestations, respectively.

Table 2. Forage utilization by cattle in four leafy spurge densities.

Leafy spurge density	Leafy spurge	Yield							Disappearance		
		Leafy spurge	Caged			Uncaged			Total	Utilization[a]	Mean[b]
			Cool	Warm	Total	Cool	Warm	Total			
(% cover)	(stems/ft^2)	(lb/A)							(%)		
July harvest											
0 (zero)	0	0	749	186	949	670	73	750	22		
20-40 (low)	10	172	385	181	565	364	160	529	6		
40-80 (moderate)	34	341	530	161	713	520	154	678	5		
80-100 (high)	55	951	697	193	895	604	216	824	7		
LSD (0.05)	7	239	228	129	283	228	129	283			
October harvest											
0 (zero)	--	0	1128	327	1456	360	65	425	69	57	44
20-40 (low)	--	127	593	265	858	293	76	319	63	51	43
40-80 (moderate)	--	18A	745	154	931	418	88	509	39	27	24
80-100 (high)	--	550	918	142	1063	584	65	650	31	19	10
LSD (0.05)		112	290	122	324	290	122	324	24		

[a]Estimate of utilization by cattle based on: Total disappearance - natural disappearance (12%).
[b]Average of 1985 and 1984 studies.

Helicopter application of herbicides for leafy spurge control has steadily increased in North Dakota. An experiment was begun near Minot, ND on 18 June 1985 to evaluate the most cost effective application rate, volume and 2,4-D formulation for aerial application. The plots were 15 by 50 feet and replicated four times in a randomized complete block design. Plots were individually covered with plastic tarps which were removed immediately prior to and replaced immediately after treatment. This allowed the plot area to remain relatively small, the experiment to be replicated and the helicopter to apply the treatments at a normal height and flight speed. Treatments were applied using single and double microfoil nozzles (manufactured by Union Carbide).

Leafy spurge control tended to be better when 2,4-D SULV was applied with picloram compared to 2,4-D amine and oil amine formulations (Table 3). Picloram plus 2,4-D SULV at 0.5 + 1.0 applied at 5.0 gpa using the 2 nozzle boom provided 79% leafy spurge control 12 months after application. Similar treatments using 2,4-D oil or water amine provided only 38 and 31% leafy spurge control, respectively. Leafy spurge control was similar with similar treatments applied at 5 and 10 gpa but declined 25% or more when applied at 2.5 gpa. Control averaged 42 and 41% for all treatments applied at 5 and 10 gpa, respectively, but only 14% when applied at 2.5 gpa.

The herbicide sulfometuron (tradename Oust) has provided leafy spurge control in initial unreplicated experiments. An experiment to evaluate sulfometuron for leafy spurge control spring or fall applied was begun near Hunter, ND on 27 June and 4 September 1986. Sulfometuron alone at 0.5 to 2.0 oz/A has given inconsistent leafy spurge control (Table 4). Plants generally stopped growth but remained green. However, when applied with an auxin herbicide, leafy spurge control with sulfometuron averaged 87 and 98% as a spring or fall applied treatment, respectively. Initially control is similar regardless which phenoxy herbicide is applied with sulfometuron. An extensive program to evaluate

these treatments for leafy spurge control and effect on forage production at various times and rates was begun in 1986.

Table 3. Leafy spurge control with picloram and various formulations of 2,4-D tank-mixed and applied using a helicopter with various water volumes.

Herbicide	Rate	Volume	Boom type [a]	Control	
				Sept. 85	June 86
	(lb/A)	(gpa)		%	
Picloram + 2,4-D amine	0.25 + 1.0	5.0	2 nozzle	97	4
Picloram + 2,4-D SULV[b]	0.25 + 1.0	5.0	2 nozzle	99	26
Picloram + 2,4-D SULV[b]	0.25 + 1.0	2.5	1 nozzle	91	1
Picloram + 2,4-D SULV[b]	0.5 + 1.0	5.0	2 nozzle	100	79
Picloram + 2,4-D oil amine	0.5 + 1.0	5.0	2 nozzle	99	38
Picloram + 2,4-D amine	0.5 + 1.0	5.0	2 nozzle	100	31
Picloram + 2,4-D amine	0.5 + 1.0	5.0	1 nozzle	100	59
Picloram + 2,4-D amine	0.5 + 1.0	2.5	1 nozzle	97	26
Picloram + 2,4-D amine	0.5 + 1.0	10.0	2 nozzle	99	42
Picloram + 2,4-D amine	0.25 + 1.0	5.0	Ground	96	11
LSD (0.05)				8	39

[a] Micro-foil boom with one or two rows of parallel nozzles - Manufactured by Union Carbide.
[b] Ultra low volume formulation of 2,4-D mixed amines - Manufactured by P.B.I. Gordon.

Table 4. Leafy spurge control with sulfometuron.

Treatment	Rate	Control/applied		
		Spring		Fall
		Aug. 85	June 86	June 86
	(oz/A)	(%)		
Sulfometuron	0.5			16
Sulfometuron	1	0	6	95
Sulfometuron	1.5	0	63	
Sulfometuron	2.0	0	36	
Sulfometuron + 2,4-D	1 + 16	95	76	99
Sulfometuron + dicamba	1 + 32	96	85	97
Sulfometuron + picloram	1 + 8	70	96	99
LSD (0.05)		25	22	26
Sulfometuron + 2,4-D	0.5 + 16	--	--	95
Sulfometuron + dicamba	0.5 + 32	--	--	97
Sulfometuron + picloram	0.5 + 8	--	--	99
LSD (0.05)				26