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Single and repetitive picloram treatments on leafy spurge (*Euphorbia esula* L.) and resulting changes in shoot density, canopy cover, forage production and utilization by cattle

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Research was conducted during 1985, 1986, 1987 and 1988 in central Montana, on a cool season, native grass pasture, to evaluate the response of leafy spurge shoot density, canopy cover, forage production and utilization by cattle to single and repetitive treatments of picloram (4-amino-3,5,6 trichloropicolinic acid).

Single picloram treatments of 0.28, 0.56, 0.84 and 1.12 kg a.e./ha reduced leafy spurge shoot density from 43% to 97% one year following treatment. Leafy spurge shoot control at these treatment levels dropped to 17% to 75% in the second year. Picloram treatments of 1.68 and 2.24 kg/ha maintained leafy spurge control above 90% for 2 years.

Leafy spurge canopy cover was reduced for 2 years from 32% to 15% or less following single applications of 1.68 and 2.24 kg/ha picloram. The 1.12 kg/ha treatment rate was intermediate in effect while the 0.28, 0.56 and 0.84 kg/ha treatments did not reduce leafy spurge canopy cover below pretreatment levels.

Forage production and utilization of forage by cattle increased significantly compared to the untreated control with all picloram treatments at or above 0.84 kg/ha. A 259% increase in forage production resulted from single picloram treatments of 2.24 kg/ha. Forage utilization increased from 0% in the untreated control to an average of 43% in the treated plots.

A 0.56 kg/ha retreatment of 0.28 and 0.56 kg/ha treated plots significantly decreased leafy spurge shoot density and canopy cover and increased forage production and utilization compared to the single treatment alone. Retreatment of the 1.68 kg/ha rate with 0.56 kg/ha picloram was similar to the single treatment in its effect on leafy spurge shoot density, canopy cover, forage production and utilization of forage by cattle.

Single picloram treatments of 1.12, 1.68 and 2.24 kg/ha compared to split treatments with the same total application rate resulted in similar leafy spurge shoot density, canopy cover, forage production and utilization.

Leafy spurge canopy cover exerted the greatest influence on grazing behavior and forage utilization by cattle. Leafy spurge canopy cover of 10% or less and shoot control of 90% or more were necessary to achieve 50% forage utilization by cattle.

Table 1. Picloram treatments applied from 1985-1987 at Grassrange, Montana

	Treatment Rate		
	(kg a.e./ha)		
	1985	1986	1987
0.28		----	----
0.28		0.56	----
0.28		0.56	0.56
0.56		----	----
0.56		0.56	----
0.56		0.56	0.56
0.84		----	----
0.84		0.56	----
0.84		0.56	0.56
1.12		----	----
1.12		0.56	----
1.12		0.56	0.56
1.68		----	----
1.68		0.56	----
2.24		----	----
Untreated		----	----

Table 3. Leafy spurge shoot density and control in response to single picloram treatments.

Treatment Rate ^a	Density ^b				Control ^b		
	(shoots/ m ²)				(%)		
(kg/ha)	1985 ^c	1986	1987	1988	1986	1987	1988
0.28	260	145	312	357	43	12	0
0.56	338	82	282	390	74	17	5
0.84	363	62	205	299	83	45	22
1.12	441	16	108	197	97	75	61
1.68	436	5	37	102	98	91	83
2.24	404	4	16	31	99	96	92
Untreated	282	276	471	396	7	0	0
LSD (0.05)	NS	92	215	134	12	6	10
CV (%)	27	40	55	32	13	21	20

^aTreatments applied May 16, 1985.

^bData collected in May of each year.

^cPretreatment leafy spurge shoot counts.

Table 4. Leafy spurge canopy cover in response to single picloram treatments.

Treatment ^a (kg/ha)	Canopy Cover			
	(%)			
	1985 ^b	1986	1987	1988
0.28	27	28	52	49
0.56	28	19	41	46
0.84	28	9	39	43
1.12	36	2	12	26
1.68	29	1	5	14
2.24	34	1	2	6
Untreated	21	34	49	47
LSD (0.05)	NS	9	13	9
CV (%)	29	38	40	16

^aTreatments applied May 16, 1985.^bPretreatment leafy spurge canopy cover**Table 5. Leafy spurge shoot density, control and canopy cover in 1987 and 1988 with single and repetitive picloram treatments.**

Treatment Rate ^a			Density		Control		Canopy	
(ka/ha)			(shoots/m ²)		(%)		(%)	
1985	1986	1987	1987	1988	1987	1988	1987	1988
0.28	--	--	312	357	12	0	52	49
0.28	0.56	--	61	201	79	47	14	33
0.28	0.56	0.56	--	104	--	76	--	15
0.56	--	--	282	390	17	5	41	46
0.56	0.56	--	30	163	94	60	10	29
0.56	0.56	0.56	--	61	--	84	--	12
0.84	--	--	205	299	45	22	39	43
0.84	0.56	--	37	121	90	72	6	23
0.84	0.56	0.56	--	32	--	92	--	8
1.12	--	--	108	197	75	61	12	26
1.12	0.56	--	12	33	97	86	5	12
1.12	0.56	0.56	--	35	--	94	--	8
1.68	--	--	37	102	91	83	5	14
1.68	0.56	--	4	36	98	90	4	9
2.24	--	--	16	31	96	92	2	6
Untreated			471	395	0	0	49	47
LSD(0.05)			164	93	7	11	11	8
CV(%)			70	34	13	12	48	19

^aTreatments applied May 16,17,14 in 1985, 1986, and 1987 respectively.

Table 7. Production and utilization of forage in response to single picloram treatments in 1985.

Treatment ^a	Production ^b		Utilization	
	(kg/ha)		(%)	
	1986	1987	1986	1987
0.28	813	1002	8	5
0.56	1087	1086	55	0
0.84	1474	1565	50	28
1.12	1612	1756	53	44
1.68	1773	1658	57	48
2.24	1495	1780	50	52
Untreated	660	496	3	0
LSD (0.1)	603	604	27	14
CV (%)	39	37	55	47

^aTreatments applied May 16, 1985.

^b Production data collected August, 1986 and 1987.

Table 11. Leafy spurge shoot density, control and forage utilization in 1987 following single picloram treatments.

Treatment ^a	Density (shoots/m ²)	Control	Utilization
		(%)	(%)
0.28	274	15	5
0.56	265	17	0
0.84	183	46	28
1.12	119	76	44
1.68	24	92	48
2.24	11	97	52
Untreated	404	--	0
LSD (0.05)	234	13	18
CV (%)	86	18	47

^a Treatments applied May 16, 1985.

Table 13. Leafy spurge canopy cover, forage production and utilization in 1987 following single picloram treatments.

Treatment ^a	Canopy Cover	Production	Utilization
(kg/ha)	(%)	(kg/ha)	(%)
0.28	50	1002	5
0.56	38	1086	0
0.84	30	1565	28
1.12	9	1756	44
1.68	6	1658	48
2.24	1	1780	52
Untreated	43	496	0
LSD (0.05)	16	732	18
CV (%)	44	37	47

^aTreatments applied May 16, 1987.