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A summary of original and three repetitive herbicide treatments for control of leafy spurge (*Euphorbia esula* L.)

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Leafy spurge (*Euphorbia esula* L.) is a competitive and aggressive perennial, which is very difficult and expensive to control. Its deep, tenacious root system with the capacity to sprout from root segments arid underground buds along with the potential of the seed remaining viable for up to eight years is indicative of its persistent nature.

The weed has spread in recent years from small isolated areas to where it is reported to infest 2.5 million acres in the United States and Canada. It is found from the best agriculture land to rocky slopes and hillsides of low productive rangeland sites. Infestations range from solid stands where all other vegetation is virtually eliminated to isolated infestations which serve as a source of seed for spread and subsequent infestation of additional areas.

An extensive repetitive herbicide treatment program for leafy spurge control was initiated in 1978 and the effects of original and retreatments on leafy spurge shoot and root control has been evaluated since the initiation of the study.

Initial herbicide treatments were made on May 25, 1978 in a randomized complete block design. Plots were 11 feet by 132 feet per treatment with two replications. The original treatments consisted of dicamba (3,6-dichloro-o-anisic acid) at 4.0 and 8.0 lb ai/A, picloram (4-amino-3,5,6 trichloropicolinic acid) at 0.5, 1.0 and 2.0 lb ai/A of the picloram K salt and 2% bead formulation, picloram/2,4-D, amine (1.0 lb picolinic acid + 2 lb 2,4-D amine/gal) at 0.5 + 1.0, 1.0 + 2.0 and 2.0 + 4.0 lb ai/A and an untreated check.

The soil at the experimental site was classified as a sandy loam (65.4% sand, 23.2% silt, 11.4% clay with 1.5% organic matter and a 7.7 pH).

Repetitive herbicide treatments have been applied in the years of 1979, 1980, 1981 and 1982. Plot size was 11 feet by 22 feet per repetitive treatment. Repetitive treatments were applied over the initial treatments creating a split block design. Each treatment was random and replicated twice. Retreatments were dicamba at 2.0 lb ai/A, dicamba/2,4-D amine at 1.0 + 2.0 lb ai/A, amine at 2.0 lb ai/A and picloram at 0.5 and 1.0 lb ai/A.

Four square foot quadrats were located at random within each original and retreatment plot. Live, aboveground leafy spurge shoots have been recorded each year over the life of the study. Percent shoot control was determined by using the formula:

$$\text{Percent control} = 1 - \frac{\text{Counts per ft}^2 \text{ in treatment}}{\text{Counts per ft}^2 \text{ in check}} \times 100$$

The percentage leafy spurge shoot control resulting from the original treatments are presented in Figure 1. The original treatment of picloram K salt and 2% beads applied at the rate of 2.0 lb ai/A in 1978 were maintaining 90 and 85% leafy spurge shoot control, respectively, four years following treatment. These percentages have decreased from 99% shoot control as evaluated one year following application. The 1.0 lb ai/A of picloram K salt was maintaining 78% shoot control in 1982, a decline from 97% in 1979. Lower rates of picloram, picloram/2,4-D and the dicamba treatments are maintaining, from 0 to 61% shoot control.

The effectiveness of the various original treatments which received the different repetitive treatments are presented in Tables 2 through 7. The most effective original plus a repetitive treatment was where picloram was a component of each of the treatments. Picloram applied at 0.5 lb ai/A in 1978 and retreated with 0.5 lb ai/A in 1979, 1980, and 1981 gave 98% shoot control when evaluated in 1982. The higher rates resulted in 99 to 100% shoot control (Table 2).

Picloram as an original treatment and retreated for three successive years with dicamba, dicamba/2,4-DA or 2,4-DA were not as effective, especially at the lower application rates of picloram (Table 3).

Outstanding leafy spurge shoot control can be obtained with dicamba if the retreatment is picloram (Table 4). From 98 to 100% shoot control was obtained with the original dicamba treatment which was retreated for three successive years with picloram at 0.5 and 1.0 lb ai/A. The high rates of dicamba required for initial control are more damaging to the associated grass species than rates of picolinic acid that gives equivalent leafy spurge shoot control.

The retreatments of 2,4-D amine, dicamba/2,4-DA or dicamba were not as effective as retreatments as picolinic acid (Tables 3, 5, 7).

Data indicate that a maintenance or repetitive herbicide treatment would not have to be initiated for three years where the 2.0 lb ai/A of picolinic acid was utilized as a treatment. Where dicamba or the lower rates of picolinic acid were utilized retreatments would have to be initiated earlier. With dicamba retreatments would have to be on a year-to-year basis to maintain shoot control.

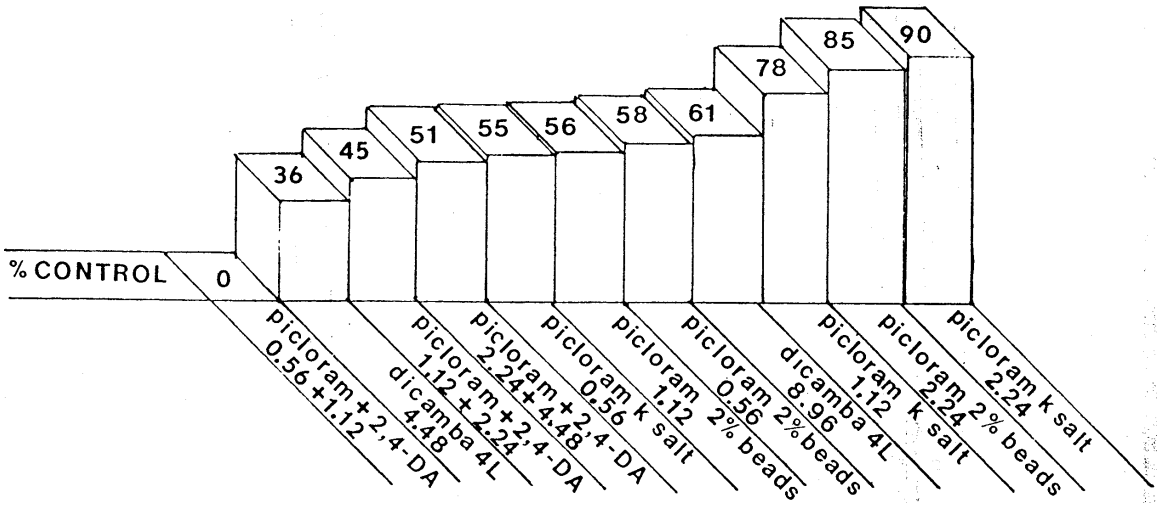

Figure 1. Longevity of leafy spurge shoot control resulting from treatments applied in 1978 and evaluated in 1982.

Table 2. Percentage leafy spurge shoot control resulting from picloram as the original treatment and picloram as a retreatment.

	Retreatment[2]					
	Rate lb ai/A					
	picloram 0.5			picloram 1.0		
Original Treatment[1]	1980	1981	1982	1980	1981	1982
picloram 0.5	94	99	98	99	100	100
picloram 1.0	96	99	99	99	100	100
picloram 2.0	99	100	100	99	100	100

[1]Original treatment: 1978.
[2]Retreatments: 1979, 1980, 1981.

Table 3. Percentage leafy spurge shoot control resulting from picloram as the original treatment and dicamba, dicamba/2,4-DA and 2,4-DA as a retreatment.

	Retreatment								
	Rate lb ai/A								
	dicamba 2.0			dicamba/2,4-DA 1.0 + 2.0			2,4-DA 2.0		
Original Treatment[1]	1980	1981	1982	1980	1981	1982	1980	1981	1982
picloram 0.5	49	79	88	59	77	85	70	80	86
picloram 1.0	96	90	96	99	89	98	76	84	83
picloram 2.0	98	96	97	99	95	98	98	98	94

[1]Original treatment: 1978.
[2]Retreatments: 1979, 1980, 1981.

Table 4. Percentage leafy spurge shoot control resulting from dicamba as the original treatment and picloram as a retreatment.

	Retreatment					
	Rate lb ai/A					
	picloram 0.5			picloram 1.0		
Original Treatment[1]	1980	1981	1982	1980	1981	1982
dicamba 4.0	84	97	98	100	100	100
dicamba 8.0	87	96	98	98	98	100

[1]Original treatment: 1978.
[2]Retreatments: 1979, 1980, 1981.

Table 5. Percentage leafy spurge shoot control resulting from dicamba as the original treatment and dicamba, dicamba/2,4-DA and 2,4-DA as a retreatment.

	Retreatment								
	Rate lb ai/A								
				dicamba/2,4-DA					
Original Treatment[1]	dicamba 2.0			1.0 + 2.0			2,4-DA 2.0		
	1980	1981	1982	1980	1981	1982	1980	1981	1982
dicamba 4.0	67	84	88	56	83	90	53	69	78
dicamba 8.0	87	87	96	78	94	98	74	82	87

[1]Original treatment: 1978.
[2]Retreatments: 1979, 1980, 1981.

Table 6. Percentage leafy spurge shoot control resulting from picloram/2,4-DA as the original treatment and picloram as a retreatment.

	Retreatment[2]					
	Rate lb ai/A					
	Picloram 0.5			Picloram 1.0		
Original Treatment[1]	1980	1981	1982	1980	1981	1982
picloram/2,4-D 0.5 + 1	97	96	98	99	100	100
picloram/2,4-D 1 + 2	96	98	98	100	100	100
picloram/2,4-D 2 + 4	99	99	98	100	100	100

[1]Original treatment: 1978.
[2]Retreatments: 1979, 1980, 1981.

Table 7. Percentage leafy spurge shoot control resulting from picloram/2,4-DA as the original treatment and dicamba, dicamba/2,4-DA and 2,4-DA as a retreatment.

	Retreatment[2]								
	Rate lb ai/A								
	dicamba 2.0			dicamba/2,4-DA 1.0 + 2.0			2,4-DA 2.0		
Original Treatment[1]	1980	1981	1982	1980	1981	1982	1980	1981	1982
picloram/2,4-DA 0.5 + 1.0	49	65	84	40	73	88	58	66	75
picloram/2,4-DA 1.0 + 2.0	68	89	94	39	64	91	63	76	81
picloram/2,4-DA 2.0 + 4.0	99	95	96	78	89	94	81	90	98

[1]Original treatment: 1978.
[2]Retreatments: 1979, 1980, 1981.