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Controlling spurge with Tordon

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Considerable herbicide evaluation for the control of leafy spurge has been conducted since the introduction of the phenoxy herbicides in the early 1940s. However, the effort put forth by the states of Montana, Wyoming, North and South Dakota, and Nebraska since the first leafy spurge symposium held in Bismarck, N.D. in 1979 has reached unexpected proportions.

Joint research proposals submitted to the Old West Regional Commission was funded to support additional research in the five state commission area. The Old West Regional Commission grant was followed in 1982 by USDA research grant through specific cooperative agreements with the Agricultural Experiment Stations of North Dakota, Montana and Wyoming to continue the research. Practically every potential herbicide and/or combinations have been evaluated for their potential use to control leafy spurge and its spread.

As of the preparation of this paper there are four herbicides that are suggested, in most states, for use on leafy spurge. The herbicides Roundup (N-(phosphonomethyl)glycine), 2,4-D (2,4-dichlorophenoxyacetic acid), Banvel (3,5-dichloro-o-anisic acid) and Tordon (4-amino-3,5,6-Trichloropicolinic acid) along with the combination of Tordon/2,4-D and Banvel/2,4-D are suggested at various rates to fit specific sites and/or locations.

Tordon as either the liquid formulation (2 lb a.e./gal picloram) or the pelleted formulation (2% pellet) has consistently resulted in the highest percentage leafy spurge shoot control without resulting forage (grass) damage.

Seven years of research comparing the effectiveness of picloram rates, ranging from 0.5 to 2.0 lb a.e./A in a repetitive treatment series, has provided data whereby suggestions as to rates and/or repetitive treatment series can be formulated to fit almost any type of leafy spurge infestation and economic consideration.

Picloram applied at the maximum label rate of 2 lb a.e./A, either as the liquid or pelleted formulation, should be expected to maintain 90% control for 4 years before retreatment may be necessary. An application rate of 1.0 lb a.e./A has maintained 84% or better control for 3 years. The 0.5 lb a.e./A application will have to be retreated for 2 to 3 years to obtain control in the 90% or greater range. (Tables 1 & 2).

From the research with picloram and/or the combination of picloram/2,4-D, Dow Chemical U.S.A. research, sales and consulting group have developed guidelines for the Northern Range and Pasture leafy spurge control program.

The guidelines are presented in Tables 3 through 6. The maximum rate of picloram application, 21b a.e./A of either the 2-lb/gal liquid or the 2% pellet is suggested for spring treatment with the pellets being suggested for fall treatment. The high rate is for scattered infestations, isolated patches and inaccessible areas. This rate is expected to maintain 85-90% shoot control for 3-4 years. A retreatment of 1 qt. of Tordon 22K or 25 lb/A of Tordon 2K should be applied when shoot control drops below 75%. Control from the original treatment may vary due to soil type, moisture, etc. (Table 3).

The 1.0 lb a.e./A rate is for scattered infestations, isolated patches which are accessible to easy retreatment. The 1.0 lb a.e./A will maintain 85-90% shoot control for 1 to 2 years. A retreatment of 0.5 lb a.e./A is to be applied when shoot control drops below 75%. (Table 4).

Large uniform infestations, accessible to easy retreatment, where leafy spurge is growing on rocky, shallow, low organic matter soils can be treated with the low rate of 0.5 lb a.e./A of Tordon. It is necessary to retreat with the 0.5 lb a.e./A rate for 2 to 3 successive years to obtain 85-90% shoot control. (Table 5).

The major treatment suggested and used in North Dakota is the combination of 0.25 lb/A picloram plus 0.5-lb/A 2,4-D. This combination has resulted in 73% reduction in leafy spurge stand after 3 successive years treatment. Data are not available from 4 years retreatment.

Although there are considerable data available as to the effectiveness of the various herbicides and/or combinations toward leafy spurge shoot control, the data are quite limited on their effectiveness in reducing the root biomass. Rumors and lack of supportive data indicate little or no root reduction from herbicide treatments. Leafy spurge root assays have been one of the University of Wyoming's major emphasis. Several methods to relate shoot control to root control have been researched starting with the resistance to pull through core sampling and hand separation to the most recent greenhouse vegetative root biomass transplants. The methods used have been extremely time consuming and laborious with correlation of shoot/root reduction difficult to measure. However, data presented in Tables 7, 8 and 9 indicate that the reduction in root biomass corresponds quite closely to the shoot reduction.

There is no doubt a concern with the cost of herbicide treatments, especially with the Tordon herbicides. One factor that has not had a figure for economic analysis attached to it, is the intrinsic value of reducing the population and continued spread of leafy spurge. Minimizing the spread can produce long-term economic benefits not yet measured. Selecting a treatment that is the most effective and will reduce or eliminate the spread may be the most economical treatment for a "total control" aspect.

Table 1. Percent shoot control original treatments.

Original Tr.	Rate lb a.e./A	79	80	81	82
Picloram Liquid	0.5	76	43	29	29
Picloram Liquid	1.0	97	94	84	78
Picloram Liquid	2.0	99	94	90	90

Table 2. Percent shoot control retreatments*.

Original	Retreatment					
	Rate lb a.e./A					
	Tordon 22K 0.5			Tordon 22K 1.0		
	<u>80</u>	<u>82</u>	<u>84</u>	<u>80</u>	<u>82</u>	<u>84</u>
Picloram Liquid 0.5	94	98	92	99	100	97
Picloram Liquid 1.0	96	99	94	99	100	98
Picloram Liquid 2.0	99	100	97	99	100	100

*1979, 80, 81

Table 3.

<u>LEAFY SPURGE</u>	
MT, ND, SD, WY	
Scattered Infestations	
Isolated Patches	
Inaccessible Areas	
<u>Suggested Use Rate/acre:</u>	
<u>Spring:</u>	
Tordon*22K or Tordon*2K	
2 lb a.e./A	2 lb/A
1 gal/A	100 lb/A Product
<u>Fall:</u>	
Tordon 2K	
2 lb a.e./A	
100 lb/A Product	
Will maintain 85-90%** shoot control for 3-4 yrs.	
**Varies due to soil type, moisture, etc.	
*Retreat any time shoot control drops below 75%	
<u>Retreatment Schedule</u>	
Tordon 22K 1qt/A or Tordon 2K (25 lb/A Product)	

Table 4.

<u>LEAFY SPURGE</u>
MT, ND, SD, WY
Scattered Infestations
Isolated Patches
Accessible to Easy Retreatment
<u>Suggested Use Rate/acre:</u>
<u>Spring:</u>
Tordon*22K or Tordon*2K
1 lb a.e./A 1 lb a.e./A
2 qt./A 50 lb/A Product
<u>Fall:</u>
Tordon 2K
1 lb a.e./A
50 lb/A Product
Will maintain 85-90%** shoot control for 1-2 yrs.
**Varies due to soil type, moisture, etc.
*Retreat anytime shoot control drops below 75%
<u>Retreatment Schedule</u>
Tordon 22K 1qt/A or Tordon 2K (25 lb/A Product)

Table 5.

<u>LEAFY SPURGE</u>
MT, ND, SD, WY
Large Uniform Infestations
Accessible to Easy Retreatment
Suggested for rocky, shallow, low organic matter soils
<u>Suggested Use Rate/acre:</u>
<u>Spring:</u>
Tordon*22K or Tordon*2K
0.5 lb a.e./A 0.5 lb a.e./A
1 qt./A 25 lb/A Product
<u>Fall:</u>
Tordon 2K
0.5 lb a.e./A
25 lb/A Product
*One application will give 70%** or less shoot control one year following application
**Varies due to soil type, moisture, etc.
<u>Retreatment Schedule</u>
Retreat with 0.5 lb a.e./A Tordon 22K or Tordon 2K for 2-3 successive years.
Will give 85-90% shoot control. Retreat when shoot control drops below 75%.

Table 6.

LEAFY SPURGE	
ND	
Large Uniform Infestations	
Accessible to Easy Retreatment	
Suggested Use Rate/acre:	
Tordon 22K	0.25 lb a.e./A
	1 pt./A
2,4-D Amine	0.5 lb a.e./A
	1 qt./A
Retreat every year. Three years of successive treatments have given 73% shoot control in North Dakota.	

Table 7. Resistance to pull and percent live roots in top 6 to 8 in. of soil

Treatment ¹	Rate Lb. a.e./A	Resistance ²	% Live Roots
		To Pull	6 to 8 in.
Picloram Liquid	0.5	3.1	58.3
Picloram Liquid	1.0	0.58	0.0
Picloram Liquid	2.0	0.67	0.0
Picloram G	0.5	2.1	33.3
Picloram G	1.0	1.6	16.7
Picloram G	2.0	0.58	0.0
Dicamba	4.0	1.9	25.0
Dicamba	8.0	1.0	8.0
CHECK	—	5.0	100.0

1 Treatments Applied May 25, 1983.

2 Evaluation June 21, 1979.

0 = (No Resistance)

5 = (Unable To Pull)

Table 8. Leafy spurge root counts original and one retreatment.

Original ¹ Lb. a.e./A		Retreatment Lb. a.e./A	Root Segments/Cu. Ft. ²				% Control Shoot Root	
			Soil Depth (In.)					
			0-8	8-16	16-24	24-32		
Picloram L	2.0	Check	1.7	13.8	39.5	146.1	96	92
Picloram L	2.0	0.5	24.0	13.8	27.5	51.6	99	95
Picloram L	2.0	1.0	3.4	58.4	77.4	142.6	99	87
Picloram L	1.0	Check	5.2	24.0	10.4	37.8	94	96
Picloram L	1.0	0.5	1.7	10.4	10.4	20.6	96	98
Picloram L	1.0	1.0	0.0	1.7	3.4	5.2	99	99+
Picloram G	2.0	Check	3.4	3.4	3.4	8.6	95	99+
Picloram G	2.0	0.5	0.0	24.1	24.0	22.4	98	97
Picloram G	2.0	1.0	0.0	6.9	60.2	77.4	100	93
Picloram G	1.0	Check	44.7	154.6	159.8	142.6	51	76
Picloram G	1.0	0.5	0.0	20.6	17.2	25.8	99	97
Picloram G	1.0	1.0	13.8	25.8	60.2	84.2	99	91
Check		Check	770.1	374.7	498.4	464.0		
% Root segments-Variou								
Soil Depths			36%	18%	24%	22%		

Table 9. Vegetative root biomass transplants.

Treatments ¹ Original/Retreatment Lb. a.e./A	% Shoot ² Control (Field)	No. Shoots Per Container
Picloram L 2.0/0.5	100	0
Picloram L 2.0/1.0	100	0
Picloram L 1.0/0.5	98	0
Picloram L 1.0/1.0	100	0
Picloram 0.5/0.5	98	0
Picloram 0.5/1.0	100	0
Check /0.5	97	0
Check /1.0	100	0
Check	0	22

¹Original Treatments 1978
Retreatments 1979, 80, 81

²Sampled 1983