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Leafy spurge research update, 1984

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Three research projects were reported, as a portion of the research conducted on leafy spurge at Montana State University. It is important to understand the reproductive abilities of leafy spurge including the mechanisms that control regrowth from underground structures, the effect of root crown injury on regrowth, and seed dispersal by birds.

The first study examined the effect of glyphosate [N-(phosphoremethyl)-glycine] on the regulation of bud dormancy in leafy spurge. The objectives of this study were to measure the field responses of leafy spurge to glyphosate applied at several stages of plant growth, and to monitor the movement of ¹⁴C-glyphosate in the root system of mature plants grown under field conditions. This information can be used to determine if a relationship between the pattern of glyphosate movement in leafy spurge and lateral bud release from dormancy exists.

Glyphosate was applied to leafy spurge in the field at sublethal and lethal rates. A proliferation of growth ("witches' broom") was observed on stems of leafy spurge plants that were treated with glyphosate the previous spring. Fall applications of glyphosate stimulated witches' broom growth and an increase in the number of stems/m² as a result of bud growth on the crown region of the root system.

An average of 74% of the total ¹⁴C-glyphosate applied to an upper leaf was absorbed. There was increased absorption in plants that were senescing. There was a decrease in the amount of labelled glyphosate translocated out of the treated leaf as applications were made later in the season. The highest concentration of labelled glyphosate other than the treated leaf was in the root crown buds of plants that were senescing at the time of application (Table 1). Increased concentration of ¹⁴C-glyphosate in the root crown buds of senescing plants may be directly related to the number of buds released from dormancy the following summer.

When leafy spurge is pulled, it generally breaks off below the thickened crown causing considerable damage and removing a large percentage of the buds from which regrowth normally occurs. Hand pulling experiments indicated that by pulling the leafy spurge plants in the bloom stage the regrowth vigor was significantly reduced for 2 years.

In June of 1983 an experiment was initiated to compare the effect of machine pulling of leafy spurge with mowing, an application of 0.56 kg ai/ha of picloram (4-amino-3,5,6-trichloropicolinic acid), an application of 2.24 kg ai/ha of 2,4-D amine (2,4-dichlorophenoxy acetic acid), and application of 2,4-D amine (1.12 kg ai/ha) to regrowth after pulling and mowing. Measurements taken on August 11, 1983 indicated that 2,4-D

applied alone in June provides better control than the other treatments (Table 2). None of the machine pulling, mowing, herbicides, or regrowth treatments significantly decrease the density of leafy spurge 1 year after application.

The best application of the pulling concept to leafy spurge control may be inoculation of the soil with pathogens. Injury to the root system can increase potential infection of plants by pathogens.

The third research project¹ was initiated to determine if mourning doves were disseminating leafy spurge seed. The gizzard and crop were collected from seven mourning doves during hunting season in an area infested with leafy spurge. No intact seeds were found in the gizzards and only one intact seed was found in the crop of one bird. The single seed was viable.

In another experiment 150 grams of 81% viable seeds were fed to 10 doves in captivity. The fecal matter was collected and all intact seeds (including all species) were separated out. One intact seed was found which was viable.

Currently germination tests are being conducted on leafy spurge seeds found in mourning dove nests. Nine of the 13 nests collected contained leafy spurge seeds and 54 to 9 seeds were found in each nest.

Table 1. The concentration of ¹⁴C-glyphosate (expressed as DPM's per gram of oven dried tissue) in root crown buds of leafy spurge 120 hours after application at three stages of growth.^a

Herbicide treatment date	Growth stage of leafy spurge at application	DPM's per gram of oven dried tissue
		120 hours after application ^b
6-2-83	Pre-bloom	18,800 a
7-25-83	Full bloom	22,660 a
9-5-83	Senescent	79,750 b

^a Data are averages from four replications.

^b Means within a column followed by the same letter are not significantly different at the 5% level using the LSD test.

¹ This project is in cooperation with David Blockstein at the James Ford Bell Museum of Natural History, University of Minnesota.

Table 2. The effect of machine pulling, mowing, herbicide treatments, and combination treatments on leafy spurge dry weight biomass, dry weight biomass of perennial grasses, and cattle use the same season as application.

Treatment	Application		Data Collected on 8-11-83		
	Rate	Date	Dry Weight Biomass		
			Leafy spurge	Perennial Grass	Cow Feces Per Plot
Bourquin Puller	---	6-29-83	656 abc	731 ab	1.7 ab
Mow	---	6-29-83	1140 bcd	333 a	2.7 ab
Bourquin Puller + 2,4-D Amine	---	6-29-83			
	1.12	7-21-83	183 a	828 ab	3.7 b
Mow	---	6-29-83			
	1.12	7-21-83	333 ab	366 a	4.3 b
2,4-D Amine	2.24	6-29-83	161 a	1140 b	5.0 b
Picloram	0.56	6-29-83	1624 d	871 a	0.7 a
Control	---	---	1527 cd	1226 b	2.0 ab

^a Means within a column followed by the same letter are not significantly different at the 0.05 level using the LSD test.