Leafy Spurge Control with Tebuthiuron – 1984

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A study that tests the effects of tebuthiuron (Graslan) on leafy spurge (Euphorbia esula) was started in 1983 at the Dickinson Experiment Station. Leafy spurge is a major problem weed in uncultivated rangelands in North Dakota. It greatly reduces herbage production and beef production which causes substantial economic losses. The leafy spurge plant is extremely difficult to control and has numerous mechanisms to survive control attempts.

Tebuthiuron is a herbicide that is primarily intended for use on shrubs in rangeland. The chemical is absorbed by the roots and translocated to the leaves. Photosynthesis is restricted. The leaves senesce prematurely and fall off and a new set of leaves develop. This process continues until the plant depletes its stored carbohydrates. The process may take one to four years before the plant dies completely depending on the species and the environmental conditions. In theory, this appears to be a desirable method to control leafy spurge.

One set of test plots for this study was established in 1983 on 0.1 acres located on the NE¼, NE¼, SW¼ sec. 22, T. 141 N., R. 104 W. on the property of Dale Maus, five miles north of Camels Hump Butte. The 10 x 53 foot plots were arranged in a randomized block design with two replications. The size of the leafy spurge patch was not sufficient for additional treatments or replications. The soil was vebar fine sandy loam. The range site was sandy. The site has a slight slope of about 3% with an east aspect and the south half of the plots has a slight slope of about 5% with a north aspect. The vegetation on the site was predominantly leafy spurge with an understory of Kentucky bluegrass (Poa pratensis) and a few scattered plants of smooth bromegrass (Bromus inermis).

A second set of plots was established in 1984 on 0.12 acres located on NE¼, SE¼, NE¼ sec. 4, T. 140 N., R. 103 W. on the property of Cecil Adams, northeast of Camels Hump Butte in the Knutson Creek drainage. The 30 x 22 foot plots were arranged in a randomized block design with two replications. The soil was Havrelon silt loam. The range site was overflow. The vegetation on the site was predominantly leafy spurge with a few scattered plants of silver sage (Artemisia cana) and western wild rose (Rosa woodsii) and a very sparse understory of Kentucky bluegrass.

The herbicide, tebuthiuron, was furnished by the Elanco Products Company. The chemical was incorporated into solid clay pellets with 20% active ingredients. Three rates of the 20% concentration were used in this trial each year. The three rates were: 1, 2 and 3 pounds of active ingredient per acre. A control of no chemical treatment was included in each replication. No additional herbicide was added to the 1983 applied treatment plots in 1984. The herbicide was broadcast applied with a whirly-bird hand spreader on 12 July 1983 and 4 June 1984. The recommended optimum period to apply herbicides to leafy spurge is from mid-June until seed dispersal during hot, dry weather in July (Lym and Messersmith, 1983).

The data that were collected on the 1983 applied and the 1984 applied treatment plots in 1984 were: above ground herbage production, leafy spurge stem densities and mean weight per leafy spurge stem. The sample dates in 1984 were 5 June, 19 June, 6 July, 8 August, 6 September, 8 October, and 8 November. The above ground herbage production was sampled by clipping the vegetation to ground level in two ¼ m^2 quadrats for each plot. The herbage was separated into four categories, leafy spurge, grass, forbs, and shrubs. The samples were oven dried at 80°C. The average herbage production for each category and the total production for each plot were determined. The leafy spurge stem densities were conducted by counting all of the current years leafy spurge stems that were rooted within two ¼ m^2 quadrats per plot. These data were converted to stems per foot square. The mean dry weight per leafy spurge stem data was collected by counting the number of stems clipped during collection of the above ground herbage samples per ¼ m^2 and calculating the mean weight per stem from the leafy spurge herbage production data.

A new set of plots will be established for each of the next two years. No retreatment will be applied to the four sets of plots. The herbage production data, the leafy spurge stem density data and the mean dry weight per leafy spurge stem data will be collected from these plots for a total of six years in order to follow the effects of tebuthiuron on leafy spurge.

Tebuthiuron does have an effect on leafy spurge. The herbicide causes a reduction in herbage weight, stem density and mean weight per stem of leafy spurge.

The first set of plots were treated with 1, 2, and 3 lbs ai per acre in 1983. The reduction in herbage weight of leafy spurge at 422 days after treatment was 78%, 93% and 95% for the 1, 2, and 3 lbs ai/acre rates respectively. The control treatment had a reduction of 68% in herbage weight of leafy spurge during the same time period. The density of leafy spurge stems was reduced by 66%, 94%, and 99.6% for the 1, 2, and 3 lbs ai/acre rates respectively while the control stem densities were reduced by 40% in 422 days. The mean weight per stem was reduced by 66%, 74%, and 67% for the 1, 2, and 3 lbs ai/acre rates respectively in 422 days while the control weight per stem was reduced by 57%. The grass component was also effected by the Tebuthiuron at these rates. Very little grass growth occurred on these plots after treatment. The reduction in herbage weight of grass at 422 days after treatment was 52%, 66%, and 78% for the 1, 2, and 3 lbs ai/acre rates respectively. The control had no change in grass herbage production at 422 days after treatment.

The second set of plots were treated with 1, 2, and 3 lbs ai per acre in 1984. The reduction in herbage weight of leafy spurge at 93 days after treatment was 37%, 52%, and 69% for the 1, 2, and 3 lbs ai/acre rates respectively. The control treatment had a reduction of 5% in herbage weight of leafy spurge during the same time period. The density of leafy spurge stems was reduced by 47%, 43%, and 62% for the 1, 2, and 3 lbs ai/acre rates respectively while the control stem densities were reduced by 32% in 93 days. The mean weight per stem was reduced by 14% and 28% for the 2 and 3 lbs ai/acre rates respectively in 93 days. The mean weight per stem was increased by 5% and 24% for the 1 lb ai/acre rate and the control respectively in 93 days. There was very little grass on this set of plots. The small amount of grass that was present at the start of the trial was semidormant at 93 days after treatment. Some regrowth did occur.

At 125 days after treatment the grass herbage production was 103 lbs, 29 lbs, 18 lbs, and 0 lbs per acre for the control, 1, 2, and 3 lbs ai/acre rates respectively.

The data from these two sets of plots do show encouraging trends on the detrimental effects of tebuthiuron on leafy spurge.

Literature Cited

Lym, Rodney G. and Calvin G. Messersmith. 1983. "Control of Leafy Spurge with Herbicides". North Dakota Farm Research Bimonthly Bulletin Vol. 40(5):16-19.