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Fall Application of Herbicides for Musk Thistle Control

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Musk thistle (*Carduus nutans* L.) infests nearly 1 million acres in Kansas, despite the efforts of numerous individuals and agencies to control it. Previous research has indicated that musk thistle seedlings and rosettes are most susceptible to herbicides and control declines as the plant matures.

Dicamba, 2,4-D, and picloram are all labeled for musk thistle control in Kansas. Spring application of these herbicides on musk thistle rosettes generally has provided equivalent control. However, adverse growing conditions often exist in the fall, which apparently cause differences in the effectiveness of these herbicides. Fall herbicide application is becoming more popular because the treatment period for rosettes usually extends several weeks longer than in the spring and there is little hazard of injury from spray drift to foliage of nearby desirable plants. The objectives of this research were to compare herbicides currently labeled for musk thistle control in the fall and to determine environmental constraints, if any, to effective control.

Procedure

A series of experiments was conducted on rangeland sites in north central and northeastern Kansas during 1978-84. In 1978, herbicides were applied in Republic, Washington, and Mitchell counties between October 16 and November 1. Similar treatments were applied in Pottawatomie County in 1980 and 1982-84.

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All treatments were replicated two or three times in a randomized block design and applied in water solutions at 20 gallons/acre using 30 psi pressure. Plots varied in size from 7 feet wide by 25 feet long to 21 feet wide by 69 feet long, depending on the site and year. All musk thistles were in the rosette sage at the time of application. Treatment dates and environmental conditions are given in Table 1. Herbicides and rates used are given in Table 2.

Plots were evaluated for percent control by comparing initial density counts to the number of bolted thistles present in June of the following year using 5 to 10, 2.7 ft^2 frames per plot. Adjustments for winter kill were made using stand counts from untreated check plots. All data were subjected to analysis of variance and the Least Significant Difference test was used to separate treatment means.

Results

Three climatic conditions are represented in this study (Table 1). Dry soil conditions characterized the fall of 1978, when less than 0.90 inches of precipitation were received on the average at the three treatment sites the month prior to herbicide application. Environmental conditions favorable for musk thistle growth (good soil moisture and warm temperatures) existed in 1980, 1983, and 1984. The December treatment in 1982 was conducted under cloudy, damp, and cool conditions. The soil and air temperatures were less than 45°F.

Very few differences existed among 2,4-D amine, 2,4-D low-volatile ester, dicamba, picloram, and dicamba + 2,4-D amine for controlling musk thistle in 1980, 1983, and 1984 (Table 2). Dicamba at 0.25 lb. a.e./A was the least effective treatment used in 1980 but still provided 95% control. Control ranged from 92 to 100% using these labeled herbicides under conditions considered favorable for musk thistle growth.

Table 1. Application conditions for musk thistle control in the fall, 1978-84.

County	Date	Temperature (°F) Air	Temperature (°F) So[1]	Wind (m[illegible])	Relative Humidity (%)
Mitchell	Oct. 16	57		2	
Republic	to	to	—	to	—
Washington	Nov. 1, 1978	69		12	
Pottawatomie	Nov. 11, 1980	56	45	5	35
Pottawatomie	Dec. 4, 1982	40	45	calm	85
Pottawatomie	Nov. 18, 1983	55	—	7	60
Pottawatomie	Nov. 14, 1984	68	—	calm	68

[1]Taken at 4-inch depth.

Table 2. Percent control of fall-treated musk thistle in Kansas.

Herbicide	Lbs. a.e./acre	1978[1]	1980	1982	1983	1984
2,4-D amine	1.5	66 c[2]	99 ab	67 bc	—	—
2,4-D amine	2.0	72 c	98 ab	64 c	98 a	100 a
2,4-D l.v.e.[3]	1.5	85 ab	97 bc	87 ab	—	—
2,4-D l.v.e.	2.0	91 a	99 ab	89 ab	99 a	100 a
Dicamba	0.25	—	95 c	51 c	92 a	100 a
Dicamba	0.33	71 c	100 a	71 abc	—	100 a
Dicamba	0.5	—	100 a	53 c	93 a	—
Picloram	0.09	68 c	100 a	90 a	—	—
Picloram	0.12	88 a	100 a	87 ab	99 a	100 a
Dicamba + 2,4-D amine	0.25 + 0.75	63 c	100 a	59 c	98 a	100 a

[1]No differences existed among sites so data were combined.
[2]Means within columns followed by the same letters are not significantly different at the 10% level.
[3]Low-volatile ester.

Data were combined in 1978, since the analysis of variance indicated that no differences existed among the sites. The dry soil conditions reduced control of musk thistle with nearly all herbicides compared to control under more favorable conditions in 1980, 1983, and 1984 (Table 2). Only 2,4-D low-volatile ester at 1.5 to 2.0 lb. a.e./A and picloram at 0.12 lb. a.e./A provided control of greater than 85%. Control with 2,4-D amine, dicamba, or dicamba + 2,4-D amine was reduced by 25-35%.

Results in 1982 with cool air and soil temperatures are similar to those obtained in 1978 when soil moisture was limited (Table 2). Picloram at 0.09 to 0.12 lb. a.e./A and 2,4-D low-volatile ester at 1.5 to 2.0 lb. a.e./A were the most effective herbicides, providing greater than 87% control under these cool conditions. Picloram at 0.09 lb. a.e./A was not affected by cool temperatures, as it was in 1978 with limited moisture.

Summary

Results of this study indicate that foliar applications in the fall of several labeled herbicides at recommended rates are all equally effective in controlling musk thistle, if growing conditions are favorable. Dry or cool conditions reduce the effectiveness of these treatments and 2,4-D low-volatile ester at 1.5 to 2.0 lb. a.e./A or picloram at 0.12 lb. a.e./A are recommended under such adverse conditions. The 2,4-D amine, dicamba, and dicamba + 2,4-D amine treatments should be applied when air temperatures exceed 50°F and good soil moisture is available for plant growth in order to obtain optimum results.

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