

DIURON FOR WEED CONTROL IN NEW WINDBREAK PLANTINGS 1 /

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Herbicides have been used successfully to control weeds in many agricultural crops. Research has indicated that some of these chemicals can be used in tree plantations under certain conditions with good weed control and with no apparent ill effects to the trees. Ferrell ³ / found that CMU was the most effective weed killer tested in South Dakota when applied at the rate of 20 pounds per acre of active ingredient on 1 year old windbreaks. No damage was reported on the 8 tree species under test.

The purpose of this study was to determine the effect of diuron (Karmex DW) applied at various rates on the survival and growth of newly planted trees and on weed control in new plantations.

Materials and Methods

Fifty trees each of 7 species, graded for uniformity in caliper and height were planted in late April 1956, at each of 4 locations: Lincoln, North Platte, Mitchell, and Alliance. The Lincoln soil is a deep silty clay loam and the soils at the 3 western locations are deep, very fine sandy loams and silt loams. Each species was divided into 10 plots, 20 feet long by 1.5 feet wide, of 5 trees each. Five treatments, each in 2 randomized blocks, were assigned to each species. Machine cultivation controlled the weeds outside of the treatment plots. Treatments consisted of:

1. Hoe. A check plot cultivated by hand.
2. None. A check plot which received no cultivation or chemical treatment.
3. 10 - Diuron at 10 pounds per acre of 80 percent commodity.
4. 20 - Diuron at 20 pounds per acre of 80 percent commodity.
5. 40 - Diuron at 40 pounds per acre of 80 percent commodity.

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3 / Ferrell, E. K. Chemical Weed Control in Shelterbelts. Proc. 11th Annual North Central Weed Control Conference 1954: pp 117-119.

The equivalent of 80 gallons per acre of water was used in spraying the 1.5-foot band of diuron on the tree row immediately after planting. At Lincoln a 2-year-old plantation of ponderosa pine was also treated with diuron at the same rates of application as above.

Results and Discussion

Tree Survival and Growth

Within a month after planting chlorosis appeared in varying amounts on Russian olive, Siberian elm, and hackberry. Necrosis of affected leaves followed. By late June Russian olive suffered high mortality at all chemical treatment levels. Siberian elm and hackberry were severely injured by late June or early July at the 20- and 40-pound per acre rates, and most of them failed to recover (table 1). Under the lowest chemical treatment the survival of these 2 species was only slightly lower than the 2 check treatments.

On the 40-pound treatment mottling and yellowing of the midribs on the green ash leaves appeared about one month after planting followed by necrosis of some of those most seriously affected. New leaves appeared, growth continued, and by mid-July few symptoms of injury remained. Very little injury was noted at the 10- and 20-pound rates. Survival of the green ash was exceptionally high except on the "hoe" and "none" treatments at Mitchell which had 20 and 30 percent survival respectively while under the chemical treatments it was 70, 100, and 100 percent at 10, 20, and 40 pounds per acre respectively. These results can probably be explained in part by the exceptionally dry season (table 2).

The tips of the leaflets of honeylocust yellowed about 2 months after treatment on 42 percent of the trees in the 20- and 40-pound plots. No symptoms of injury remained at the end of the growing season and growth was excellent compared to the 2 check plots.

Chlorosis appeared on eastern redcedar in mid-July. On the 40-pound plots symptoms of injury remained at the end of the growing season on 72 percent of the surviving trees but only 18 percent of the redcedar in the 10- and 20-pound treatments were chlorotic.

Injury was difficult to assess on ponderosa pine but by the end of the season probable symptoms of chemical injury were evident on 63 percent of the trees in the plots treated at 40 pounds per acre. At all 4 locations poor vigor and little growth of most of the pines in the "none" treatment indicated severe damage by shading and deficient soil moisture. The light rainfall was probably responsible for the complete failure of the pine at Mitchell. The 2-year-old ponderosa pine planting at Lincoln exhibited no ill effects at the end of the growing season under the 3 chemical treatments.

Species	Hoe		No treatment		Diuron per acre					
	Height growth	Survival	Height growth	Survival	10 lbs.		20 lbs.		40 lbs.	
					Ft.	Pct.	Ft.	Pct.	Ft.	Pct.
Eastern Redcedar (<u>Juniperus virginiana</u>)	--	55	--	68	--	60	--	60	--	45
Ponderosa Pine (<u>Pinus ponderosa</u>)	--	62	--	60	--	57	--	40	--	40
Green Ash (<u>Fraxinus pennsylvanica</u>)	1.2	80	0.9	80	1.4	93	1.3	95	1.5	95
Honeylocust (<u>Gleditsia triacanthos</u>)	2.2	100	1.2	95	2.4	100	2.5	100	2.9	93
Hackberry (<u>Celtis occidentalis</u>)	1.1	63	.7	73	1.2	55	1.0	15	1.2	5
Siberian Elm (<u>Ulmus pumila</u>)	1.4	70	1.1	73	1.2	53	1.2	13	2.5	5
Russian Olive (<u>Elaeagnus angustifolia</u>)	1.7	73	.9	43	1.2	40	1.2	15	--	0

Table 1. Average survival and height growth of seven species at the end of first growing season at 4 locations, by type of treatment.

Table 2. Comparison of total precipitation with storms totaling over 0.5 inch at 4 locations, from late April planting date to October 15, 1956

Location	Total pre- cipitation	Storms totaling over 0.5 inch			
	<u>Inches</u>	<u>Number</u>	<u>Inches</u>	<u>First</u>	<u>Last</u>
Mitchell	5.38	4	4.23	April 30	July 4
North Platte	11.19	5	6.61	May 27	August 3
Alliance	9.63	7	7.99	May 14	August 20
Lincoln	15.56	9	13.00	May 29	September 5

The vigor and growth of all surviving trees were greater on plots where weeds were controlled in varying degrees than on the weedy check plots except when chemical injury was severe and persistent. At all 4 locations the growth of green ash and honeylocust in the "hoe" treatments was exceeded by the growth in plots under chemical weed control. Since the hand cultivated check plots allowed some weed growth between the 3 or 4 cultivations during the season probably less soil moisture was available for tree growth than in plots where weeds were chemically controlled.

Variations between locations in the rainfall pattern and total precipitation is indicated in table 2. Storms resulting in less than 0.50 inch precipitation would have little effect on tree growth and survival or downward movement of the chemical below the immediate surface. However, at all 4 locations light showers were adequate to carry, the diuron into the soil far enough to give immediate results in weed control.

Weed Control

A wide variety of weed species were encountered at the 4 locations across the State. Some of the more common are as follows: Kochia (Kochia scoparia), pigweed (Amaranthus sp.), Russian thistle (Salsola pestifer), foxtail (Setaria sp.), annual bromes (Bromus sp.), stinkgrass (Eragrostis ciliansis), crabgrass (Digitaria sanguinalis), witchgrass (Fanicum capillare), smartweed (Polygonum pennsylvanica), sunflower (Helianthus annus) sandbur (Cenchrus pauciflorus), bladder ketmia (Hibiscus trionum), puncture vine (Tribulus terrestris), groundcherry (Physalis heterophylla), buffalo-bur (Solanum rostratum), and barnyard grass (Echinochloa crusgalli).

Diuron at 20 and 40 pounds per acre gave nearly perfect weed control all season. Occasional plants found in these plots near the end of the season included ground cherry, barnyard grass, pigweed, foxtail, smartweed, and crabgrass. A few more individuals of the above species were found in the 10-pound treatments, and they appeared as early in the season as the first week in July. Also appearing in the lightest chemical treatment were witchgrass, Russian thistle, puncture vine, stinkgrass, and volunteer soybeans (Lincoln). Weed cover was always light and never attained much height on any of the chemically treated plots, and some species, notably kochia never appeared.

Summary

The effect of 10, 20, and 40 pounds per acre of diuron on tree survival and growth and on weed control was studied. Russian olive was easily injured while Siberian elm and hackberry, though easily injured, showed some ability to recover at low concentrations. The two conifers, eastern redcedar and ponderosa pine, were moderately resistant to chemical injury. Honeylocust and green ash were highly resistant to permanent injury at all levels of concentration. Weed control was excellent at 20 and 40 pounds per acre and satisfactory at 10 pounds. In spite of a wide variation in rainfall pattern from eastern to western Nebraska during the 1956 growing season the results of all treatments were similar on medium textured and moderately heavy soils.