

TECHNICAL NOTES

Establishment of Firebreaks on Forest and Rangeland with Herbicides¹

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Highlight

Thirty-one soil sterilant herbicides were investigated for fire-break establishment in the Nebraska sandhills. Diuron gave most effective vegetative control of all compounds tested.

A conventional method to limit fire spread on forest or rangeland is to cultivate a soil barrier around a designated area. In the Bessey National Forest in the Nebraska Sandhills, one method of destroying unwanted vegetation is by disking strips. This expensive operation exposes the sandy soil to severe wind and water erosion. Therefore, herbicides were studied to eliminate or reduce tillage, and to reduce wind erosion by killing unwanted vegetation with minimum soil disturbance.

Procedure

The herbicides and rates of treatment are shown in Table 1. All herbicides were applied on May 31, 1961 except erbon and paraquat plus atrazine which were applied on June 12, 1961. The herbicides were sprayed with a hand boom sprayer on square-rod plots in triplicate using a randomized block design.

Atrazine at 7.5 and 15 lb/acre, dalapon plus atrazine at 3.75 and 7.5 lb/acre, simazine at 3.75, 7.5 and 15 lb/acre, and diuron at 3.75, 7.5 and 15 lb/acre were applied in water at 20 gal/acre. All remaining herbicides were applied in water at 160 gal/acre with the exception of the boratemonuron-TBA mixture (BMM) which was applied in pellet form.

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One series of treatments was applied to soil had been clean cultivated with a disk. The other area contained natural vegetation and received no tillage prior to herbicide application. The predominant grasses in the experimental area were prairie sandreed (*Calamovilfa longifolia* (Hook.) Scribner), sand dropseed (*Sporobolus cryptandrus* (Torr.) A. Gray), little bluestem (*Andropogon scoparius* Michx.) and hairy grama (*Bouteloua hirsuta* Lag.). The primary broadleaved species were lead plant (*Amorpha canescens* Pursh), poison ivy (*Rhus radicans* L.), wild rose (*Rosa arkansana* Porter) and sunflower (*Helianthus petiolaris* Nutt.). Plant kill was determined by visually estimating percentage control in each plot.

Results and Discussion

On plots having undisturbed vegetation, erbon gave effective top kill of native grasses and broadleaved species during the first year after application, but its effectiveness declined the second year (Table 1). Atrazine was ineffective as a foliar herbicide. Dalapon plus atrazine killed vegetation the first year after treatment but failed to control vegetation for two years. Paraquat plus atrazine initially gave excellent top kill of all vegetation. After one year, good control was found only at the 40 lb/acre rate of atrazine combined with paraquat. Obviously, the rapid top kill was caused by paraquat. Amitrole plus simazine was ineffective.

On plots disked before treatment, simazine and atrazine were most effective at the highest rates used (Table 1). Atrazine failed to control vegetation during the second year. Diuron was effective for at least two years at rates of 7.5 lb/acre and higher. The three lower rates of BMM showed excellent control one year after treatment but declined in effectiveness the second year. The 1300 lb/acre rate was more effective the second year after application than the first.

The persistence of soil sterilant herbicides is equally as important as their initial phytotoxicity in maintaining a soil free of vegetation.

Table 1. Percentage vegetation control one and two years after treatment in 1961 with 31 soil sterilant herbicides on Valentine fine sand, Bessey National Forest, Halsey, Nebraska.

Treatment	Lb/acre	Control ¹	
		June 1962	July 1963
<i>Undisked</i>			
Erbon	60.0	90	40
Erbon	80.0	90	45
Erbon	100.0	100	70
Atrazine	7.5	25	5
Atrazine	15.0	40	20
Atrazine	40.0	80	5
Dal + atr ²	3.75+7.5	85	15
Dal + atr	5+20	90	20
Dal + atr	5+40	100	60
Par + atr	1+10	70	20
Par + atr	1+20	65	20
Par + atr	1+40	95	20
Ami + sim	2.5+7.5	5	0
Ami + sim	5+15.0	70	20
Ami + sim	10+30.0	60	20
<i>Disked</i>			
Simazine	3.75	80	65
Simazine	7.5	75	40
Simazine	15.0	85	70
Simazine	40.0	95	100
Atrazine	3.75	75	60
Atrazine	7.5	90	80
Atrazine	15.0	90	50
Atrazine	40.0	100	80
Diuron	3.75	80	55
Diuron	7.5	100	100
Diuron	15.0	90	95
Diuron	40.0	95	100
BMM ³	162.5	95	80
BMM	325.0	100	80
BMM	650.0	100	90
BMM	1300.0	80	100

¹Average percentage of three replications.

²Abbreviations: dal.=dalapon; par.=paraquat; ami.=amitrole; atr.=atrazine and sim.=simazine.

³Disodium tetraborates, 93.1%; monuron, 3%; and TBA, 1%.

Andrews (1961) indicated that in Tennessee soil sterilant herbicides lost their effectiveness within one year after treatment. Furthermore, vegetative control was less on the

coarse textured soils. However, he stated that in more arid regions of the United States, soil sterilant herbicides may give vegetation control for several years. Klingman (1961) estimated the persistence of simazine monuron, diuron, sodium chlorate and boron compounds at soil sterilant rates was 6 to 24 months on a moist loam soil in a temperate climate. Burnside (1963) reported considerable leaching of atrazine, monuron, and simazine in three Nebraska soils as determined by bioassays 4 and 16 months after application.

In the Nebraska Sandhills all effective herbicides applied as foliar sprays lost their effectiveness after one year. However, on disked areas simazine at 40 lb/acre, diuron at 7.5, 15, and 40 lb/acre, and BMM at 1300 lb/acre remained effective for at least two years. These herbicides offer many possibilities for maintaining soil free of vegetation on railroads, roadways, industrial sites, fence lines, firebreaks, and other non-crop areas particularly where tillage equipment cannot be used. Complete control may not be necessary for adequate fire protection, in which case lower herbicide rates could be used. A few remaining plants would probably not support a fire but would help stabilize the soil. Annual or repeated treatment during the growing season with a contact herbicide such as paraquat may be practical especially on areas previously tilled or treated with a soil sterilant herbicide. Combinations of herbicides such as paraquat and diuron may be utilized where quick kill plus long lasting control is desired. Several other herbicides, including some new compounds, warrant investigation.

LITERATURE CITED

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