

PRE-EMERGENT HERBICIDE TRIAL IN WHITE SPRUCE AT

PINE RIDGE FOREST NURSERY

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ABSTRACT: Four pre-emergent herbicides, Pronamide, Chlorthal Dimethyl, Bifenox, and Napropamide were tested in the white spruce seedbed at Pine Ridge Forest Nursery, Alberta, Canada. Results showed that these herbicides, except Pronamide, could significantly reduce the amount of weeds and thus increase the plant growth of white spruce under local growing conditions.

INTRODUCTION

Though weeds have been considered the major pest problem in forest nurseries, published information on the selection and use of effective herbicides is very limited. Perhaps this is due to the difference in local growing conditions and tree species, which causes individual tree nurseries to set up their own herbicide testing programs.

The objective of this herbicide trial was to investigate the effectiveness of certain pre-emergent herbicides applied after the spring seeding of white spruce at Pine Ridge Forest Nursery.

The management plan at Pine Ridge emphasizes tight control of chemicals used for crop maintenance. Therefore, the main purpose of these herbicide experiments was to gather information on how, when, and what herbicide can be effectively used when conventional methods such as mechanical and hand weeding would prove very costly.

MATERIALS AND METHODS

The existing jack pine stand at Pine Ridge was cleared in 1977 to form the production fields. The soil consists of loamy sand to a depth of 180 feet (55 m). This sandy soil has very low organic matter which amounts to 0.5 to 1.0 percent.

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The field that was assigned for this herbicide trial was sown with fall rye in 1977, oats and peas in 1979, and faba beans in 1980 to improve the organic content. In the spring of 1981 the seedbed was prepared for this test. On May 11, 1981, stratified seed of white spruce was sown at 500 seeds/yard<sup>2</sup> (400/m<sup>2</sup>) and the seedbed was hydromulched. On the same day (May 11, 1981), the testing herbicides were applied on top of the mulch according to the procedure of this experiment.

The treatments consisted of four pre-emergent herbicides plus control. The herbicides and their application rates were:

Treatment #1 : Pronamide (as KERB 50W, application rate : 0.2 g a.i./m<sup>2</sup>)

Treatment #2 : Chlorthal Dimethyl (as Dacthal 75W 0.6 g a.i./m<sup>2</sup>)

Treatment #3 : Bifenox (as Modown 4F, 0.24 g a.i./m<sup>2</sup>)

Treatment #4 : Napropamide (as Devrinol 50W, 0.5 g a.i./m<sup>2</sup>)

Treatment #5 : Control

Four replicates per treatment were used. Each plot size was 13.1 ft long by 4.1 ft wide (4 m by 1.25 m), or 6.25 yd<sup>2</sup> (5 m<sup>2</sup>) in area. Herbicides were mixed with 60 tsp (300 ml) of water and were applied by using a wagon-mounted CO<sub>2</sub> plot sprayer.

All treatments were located on one seedbed. The experimental design allowed four blocks of plots and each block contained one replicate of each treatment. Location of treatment (plot) within each block was chosen at random, including the control plots. A buffer zone 3.3 ft (1 m) long was allowed between plots (fig. 1).

The effect of respective herbicide treatment was assessed by the following methods:

- a. Weed count among treatments.
- b. Density count of spruce seedlings after complete germination and also after one winter.

- c. Visual assessment of spruce seedlings to check if physical damage occurred.
- d. Measurement of growth parameters such as stem height, root area index, and plant dry weight after one growing season.

Analyses of variance were performed on all data except visual assessment. Duncan's multiple range test was run to test the differences among treatments for significance.

RESULTS AND DISCUSSION

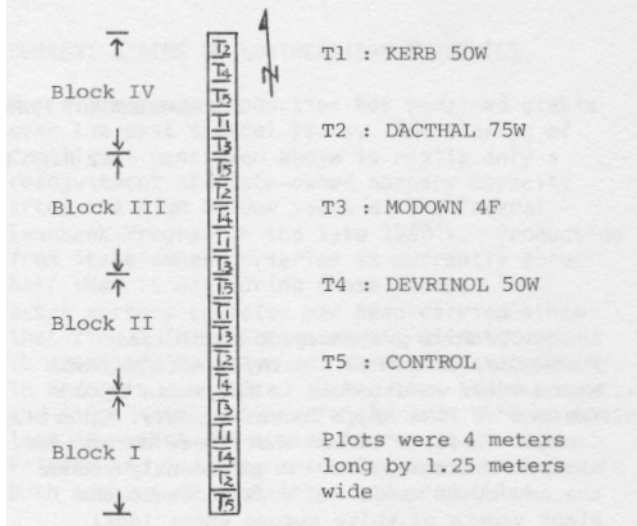
Weed Counts

The weed assessment included all broadleaf species and grasses. Weeds were mainly hawksbeard, lambsquarter, buckwheat and grasses.

Test results in table 1 showed that all tested herbicides significantly reduced the amount of weeds in comparison to the control.

After the weed count on June 2, 1981, all plots were hand-weeded to check the residual effect of the herbicides. The weed count on June 25, 1981, showed similar results of reducing the amount of weeds in comparison to the control, except that the residual effect of KERB was significantly lower than the other three herbicides.

Figure 1.--Plot layout



Seedling Density

Judging by the density count of spruce seedlings in table 1 after complete germination the herbicides did not reduce the germination of spruce seed, since there was no significant difference between respective treatments and the control.

Table 1.--Weed counts and density for white spruce seedbeds treated with four pre-emergent herbicides

Treatments	Weed counts (number per m <sup>2</sup> )				Seedling density (number per m <sup>2</sup> )	
	June 2/81		June 25/81		July/81	Sept./82
	Mean	Range	Mean	Range		
T1 - KERB 50W	<sup>1</sup> 49 b	29-62	35 b	25-49	326	258
T2 - DACTHAL 75W	52 b	19-111	20 a	15-29	325	286
T3 - MODOWN 4F	9 a	7-11	16 a	11-19	368	306
T4 - DEVRINOL 50W	39 b	16-88	14 a	7-22	340	291
T5 - CONTROL	80 c	43-114	57 c	43-76	350	236
					<sup>2</sup> N.S.	N.S.

<sup>1</sup>Numbers in vertical columns not followed by the same letters differ significantly at 5 percent level as judged by Duncan's multiple range test.

<sup>2</sup>N.S.: not significant.

Table 2.--Growth measurements of spruce seedlings in seedbeds treated with four pre-emergent herbicides

Treatment	Stem height (cm)	Root area index (cm <sup>2</sup> )	Plant Dry weight (mg)
T1 - KERB 50W	<sup>1</sup> 3.12 c	0.87 b	46.1 c
T2 - DACTHAL 75W	3.81 a	1.22 a	79.4 a
T3 - MODOWN 4F	3.76 a	1.20 a	79.0 a
T4 - DEVRINOL 50W	3.72 a	1.52 a	83.3 a
T5 - CONTROL	3.40 b	1.42 a	64.6 b

<sup>1</sup>Numbers in vertical columns not followed by the same letters differ significantly at 5 percent level as judged by Duncan's multiple range test.

The density count in September, 1982, showed that after one winter the survival of spruce seedlings from respective treatments was as good as those from the control. This result suggested that the health of spruce seedlings in treated plots was as good as the control before winter.

#### Seedling Growth

After one growing season, sample seedlings from each treatment and the control were dug out for growth measurements. Results from table 2 showed that seedlings from treatment plots of Devrinol, Modown, and Dacthal grew significantly taller and heavier. Perhaps this is due to the significant release from weed competition as shown in table 1.

Seedling samples from KERB-treated plots were significantly smaller than those of other treatments. Perhaps KERB did not maintain effectiveness as long as the other three herbicides as shown in the second weed count (table 1) and weeds came back faster to compete with the spruce seedlings.

#### CONCLUSION

The results of this experiment can only be applied to Pine Ridge due to its unique local growing conditions. Considering the scope of needs to collect practical information on weed control in the local area and to consider all possible environmental and physical conditions of the nursery site, this study was the tip of the iceberg for further studies.