SIMAZINE NO SUBSTITUTE FOR CULTIVATION IN HYBRID POPLAR PLANTATIONS

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Successful establishment of hybrid poplar plantations from dormant cuttings requires adequate site preparation and subsequent grass and weed control, at least during the first growing season. Schreiner (5, 6), Ford et al. (3), Cunningham (2), and others have conclusively demonstrated these requirements.

For site preparation, plowing and harrowing are best. For weed control, cultivation as needed during the first year continues to be best. Many failures with poplars can be attributed to lack of weed control or to inadequate control. But these operations are costly and time consuming. The need for them has probably discouraged many landowners from setting out hybrid poplar plantations.

A substitute for cultivation has been sought by the Handcock Research Center of the West Virginia Pulp and Paper Company, Hancock, Md., and the Seeding and Planting Project of the Northeastern Forest Experiment Station, Burlington, Vt. In the spring of 1962, a study was started to learn if simazine, a chemical for pre-emergence weed control, would safely and effectively control grass and weeds in hybrid poplar plantations.

This chemical is a soil sterilant in heavy dosages. Aldhous (1), Gathy (4), Wiltse (7), Zentsch (8), and others report that it is very effective in controlling grass and weeds in forest tree nurseries. All agree that it can be used safely with most coniferous species, but they differ about its use with hardwoods. Most agree that deep-rooted species resist its toxic effects more than other species.

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Among the more resistant species, Gathy (4) includes hybrid poplars. Because ground is prepared in much the same manner for nurseries as for hybrid poplar plantations, we hoped that nursery methods for using simazine could be applied successfully.

Locations and Methods

Test plots were established at two locations. These were the Hopkins Memorial Experimental Forest at Williamstown, Mass., and on West Virginia Pulp and Paper Company land near Albany, N.Y. Soil of the Hopkins Forest site is a rather heavy, imperfectly drained Amenia silt loam; that of the New York site is a well-drained Elmwood fine sandy loam.

Plowing and harrowing early in the spring of 1962 prepared the ground for planting. Two identical blocks, each containing sixtreatment plots, were then laid out at each location. Each treatment plot was planted with 20 graded, dormant hybrid poplar cuttings (two cuttings from each of 10 clones).

Six treatments were applied. These were simazine at 1, 2, 4, and 6 pounds per acre, a cultivated control, and a noncultivated control. Treatments were assigned at random to the six plots in each block. Definite quantities of simazine were mixed in 6 quarts of water (Williamstownplots)or 12 quarts (Albany plots) and applied evenly with a sprinkling can immediately after cuttings were planted. Plots treated with simazine and noncultivated control plots received no further treatment. Cultivated control plots were cultivated as often as necessary for weed eradication during the first summer.

Results

Poplar Growth.--After 2 years trees on cultivated control plots at both locations had grown twice as much in height, or nearly twice as much, as trees grown under the best of the other treatments (fig. 1). The difference was statistically significant. At Williamstown, where trees on cultivated plots averaged 9.93 feet in height, the next highest trees were on plots treated with 4 pounds of simazine per acre, and averaged 4.82 feet in height. At Albany, where the trees on cultivated plots averaged 8.92 feet, the next highest trees were on plots treated with 2 pounds of simazine per acre, and averaged 4.85 feet (table 1). At both locations trees on the untreated control plots grew the least in height (fig. 2).

At neither location during the first year did trees on the untreated plots differ significantly in height growth from trees on simazine-treated plots. But at the close of the second year differences were significant. At no time did trees on plots under the four simazine treatments at either location differ significantly in height growth.

When all treatments were combined, average tree height at the end of the first year was about one-half foot greater at Williamstown than at Albany. But at the end of the second year it was practically identical at the two locations (4.64 feet at Williamstown, 4.70 at Albany).

Poplar Survival. --Survival differed significantly between the two locations. For the first year it was 87 percent overall at Albany and 70 percent at Williamstown. For the second year it was 82 and 67 percent, respectively (table 2). The differences between locations were greater under the heavier applications of simazine than under the 1-pound application and control treatments (fig. 3).

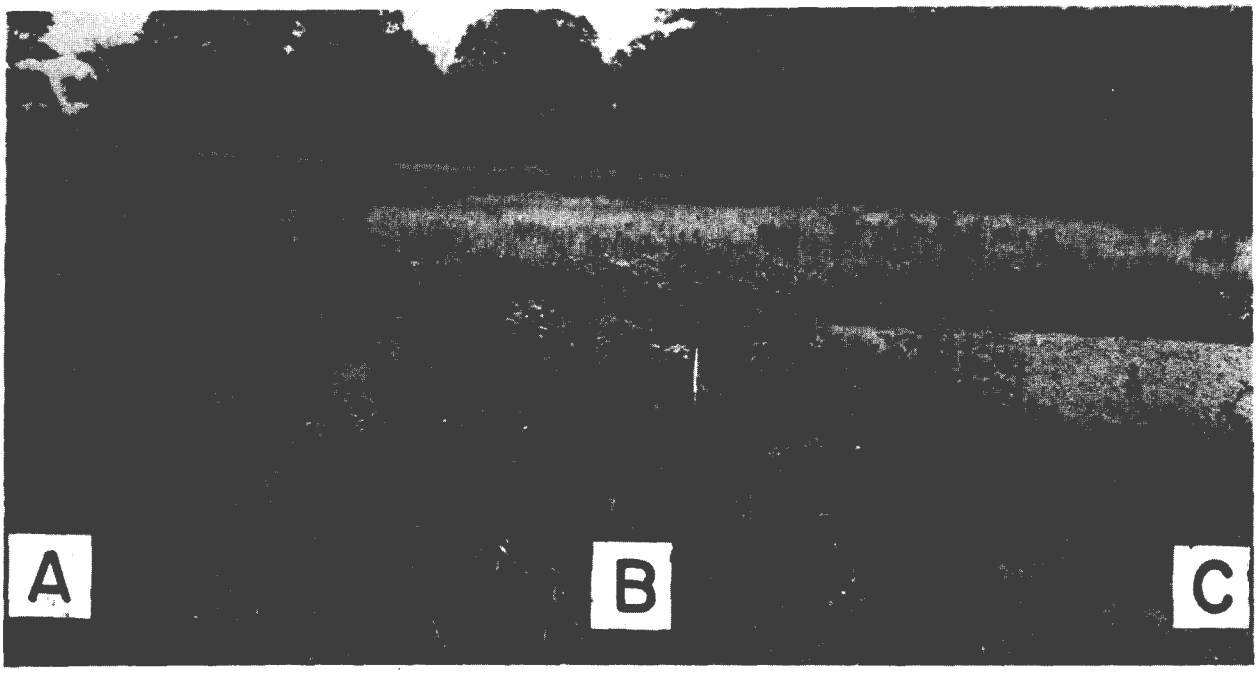

Figure 1.--Simazine-treated hybrid poplars growing near Albany, N.Y., at the end of the first growing season: A, Untreated cultivated controls; B, treated with 1 pound of simazine per acre; C, treated with 6 pounds of simazine per acre.

Table 1.--Average hybrid poplar height by treatment and year

Albany

Weed-control treatment	Block 1		Block 2		Average	
	1962	1963	1962	1963	1962	1963
	Feet	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*
Control: cultivated	3.74	8.13	4.28	9.71	4.01	8.92
Control: not cultivated	.87	1.66	1.37	2.94	1.12	2.30
1 lb. simazine/acre	1.88	3.45	1.54	3.18	1.71	3.31
2 lb. simazine/acre	1.67	4.23	2.36	5.38	2.01	4.85
4 lb. simazine/acre	1.82	4.17	1.97	4.89	1.89	4.53
6 lb. simazine/acre	2.06	4.31	1.43	4.36	1.74	4.33

Williamstown

Weed-control treatment	Block 1		Block 2		Average	
	1962	1963	1962	1963	1962	1963
	Feet	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*
Control: cultivated	4.89	10.05	5.28	9.82	5.08	9.93
Control: not cultivated	1.67	1.92	1.74	2.90	1.70	2.41
1 lb. simazine/acre	2.05	3.97	2.57	3.88	2.31	3.92
2 lb. simazine/acre	1.30	2.77	2.27	3.52	1.78	3.14
4 lb. simazine/acre	2.48	3.73	2.98	5.92	2.73	4.82
6 lb. simazine/acre	1.30	2.80	2.53	4.36	1.91	3.58

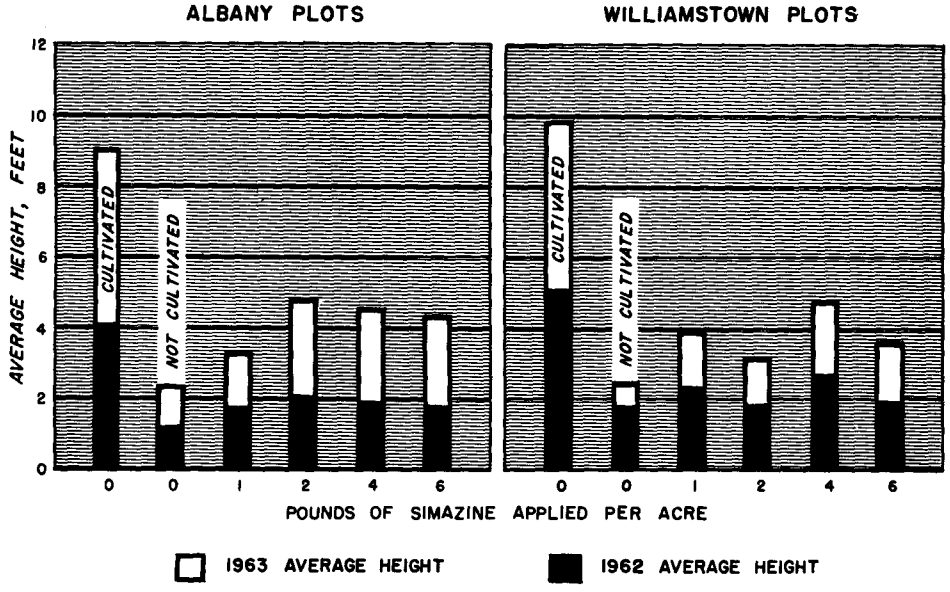

Figure 2.--Average tree height at each location by treatment and year.

Table 2.--Hybrid poplar survival by treatment and year

Albany

Weed-control treatment	Block 1		Block 2		Average	
	1962	1963	1962	1963	1962	1963
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Control: cultivated	95	95	95	95	95	95
Control: not cultivated	90	75	80	80	85	77
1 lb. simazine/acre	95	85	95	90	95	87
2 lb. simazine/acre	90	90	90	90	90	90
4 lb. simazine/acre	90	80	80	75	85	77
6 lb. simazine/acre	95	90	50	35	72	62
Average	92	86	82	77	87	82

Williamstown

Weed-control treatment	Block 1		Block 2		Average	
	1962	1963	1962	1963	1962	1963
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Control: cultivated	85	85	90	90	87	87
Control: not cultivated	85	75	80	75	82	75
1 lb. simazine/acre	80	75	95	95	87	85
2 lb. simazine/acre	60	60	80	80	70	70
4 lb. simazine/acre	35	35	65	60	50	47
6 lb. simazine/acre	20	20	60	60	40	40
Average	60	58	78	77	70	67

At Albany differences in survival between control plots and simazine-treated plots lacked statistical significance. This was also true of differences among the simazine-treated plots. However, survival tended to decrease as the application rate increased (fig. 3).

At Williamstown, differences in survival were greater than at Albany and were significant between cultivated plots and simazine treated plots collectively, and among treated plots. Survival was best on the cultivated plots and on those treated with 1 pound of simazine per acre--87 and 85 percent, respectively. The poorest survival was on the plots treated with 6 pounds of simazine per acre--40 percent. Survival on the uncultivated control plots did not differ significantly from

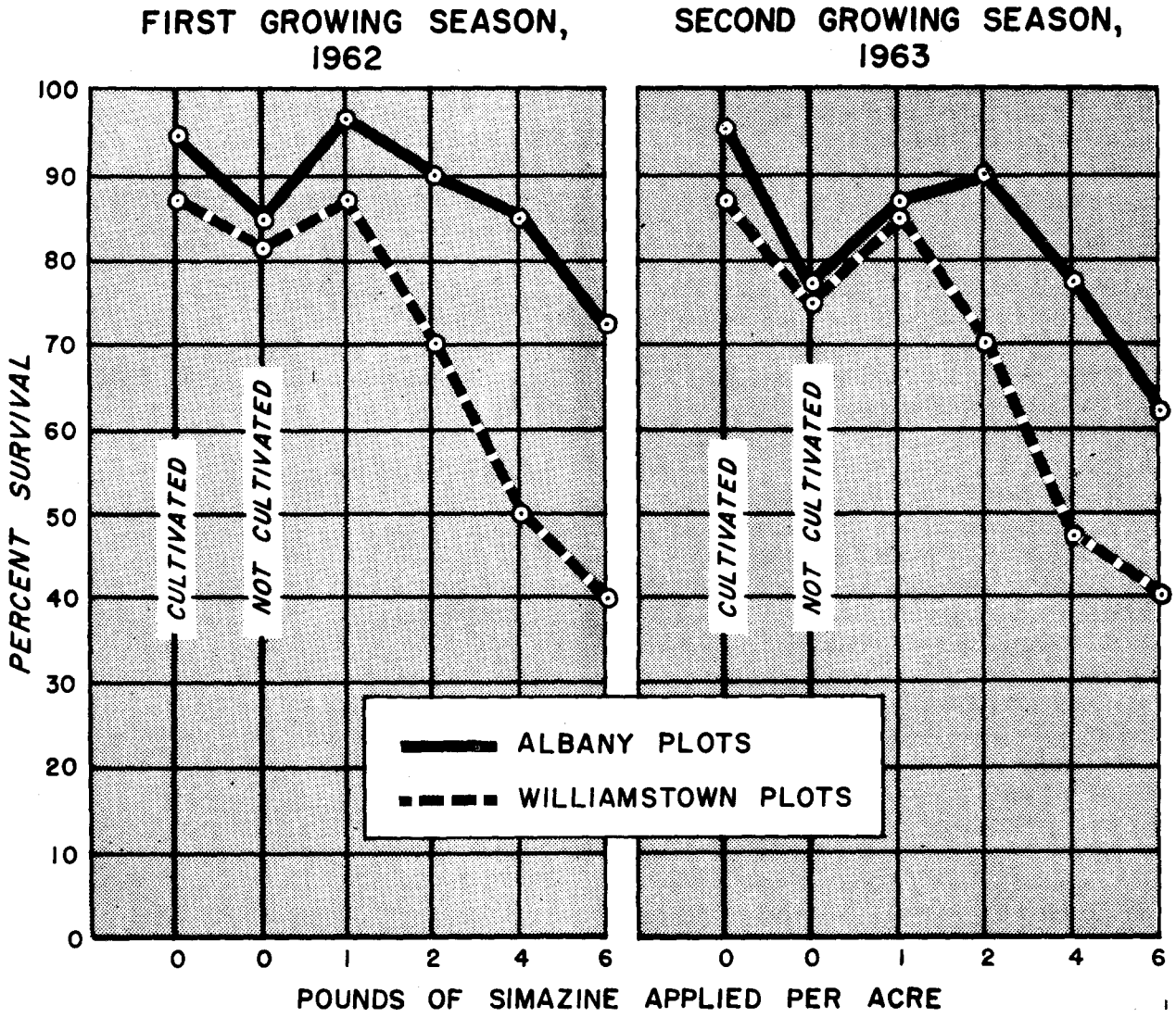

Figure 3.--Percent of survival each year, by treatment and location.

that on all simazine-treated plots collectively (table 2, fig. 3).

The combined results show that simazine at rates of 2 pounds per acre or more reduced survival of hybrid poplars. The effect was more severe at Williamstown than at Albany, possibly because of heavier and less well-drained soils at the, Williamstown site.

Weed and Grass Control.--This study was designed primarily to determine the effect of simazine on survival and growth of hybrid poplars, and no quantitative measurements of effect on grasses and other weeds were made. But much better control of herbaceous vegetation was observed on the lighter soils at Albany than on the heavier, imperfectly drained soils at Williamstown.

In general, simazine suppressed grasses and broadleaf weeds starting from seed. It affected those capable of regenerating from

vegetative parts much less, and they tended to increase and spread on treated plots. Even in heavier applications simazine did no more than slow vegetative regeneration. Quackgrass, orchard grass, bindweed, and goldenrod in particular were observed to be highly resistant to simazine.

Summary

Simazine at rates of 1, 2, 4, and 6 pounds per acre was applied to plots of newly planted hybrid poplar cuttings to determine whether this herbicide could be substituted for cultivation when establishing poplar plantations. Survival and growth on these plots and on cultivated and uncultivated control plots were compared over a 2-year period.

The growth of trees on simazine-treated plots never approached that of trees on cultivated control plots. Trees on the cultivated control plots grew twice as much in height, or nearly twice as much, as trees on the best of simazine-treated plots, and up to three and four times as much as trees on both poorer simazine-treated plots and uncultivated control plots.

More than 1 pound of simazine per acre reduced hybrid poplar survival. The higher the rate above 1 pound, the more survival was reduced.

Grasses and other weeds starting from seed were generally suppressed by simazine. But plants capable of regenerating from vegetative parts were not adequately controlled at any of the rates of application tested.

We conclude that, at least under conditions of this study, simazine is no substitute for cultivation in hybrid poplar plantations.

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