Stock age, planting method and weed control in red oak afforestation

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L'âge du matériel, la méthode de plantation et le contrôle des mauvaises herbes dans le reboisement du chêne rouge. Le contrôle des mauvaises herbes augmenta de 300 à 400% la croissance des semis 2+0 et 2+2 de chêne rouge plantés dans un champ sablonneux de l'Ontario méridional. En effet, une première application de Simazine (6 livres / acre) pulvérisée peu de temps après la plantation et suivie d'une seconde (3 livres / acre) appliquée au printemps de la seconde saison de croissance, contrôlant 90% des mauvaises herbes durant les deux premières années et 60% la troisième année sans nuire aux arbres eux-mêmes.

L'utilisation d'un paillage en polyéthylène noir ne parvint pas à contrôler la croissance des mauvaises herbes et plus, servit d'abris aux souris qui causèrent des dommages par annélation. Ni l'âge du matériel, ni la méthode de plantation n'influencèrent de façon nette la reprise et la croissance des plants. L'auteur cite quelques recommandations touchant le reboisement du chêne rouge dans le sud de l'Ontario.

Red oak (*Quercus rubra* L.) is one of the most commonly used trees in hardwood afforestation of sandy soils in southern Ontario. Planting success, however, has not always been good. To isolate factors believed to be important to successful establishment, the effects of planting stock age, planting method and weed control on survival and early growth were determined. Limstrom (1963) recommended the planting of seedlings with stem diameters of 7/32 inch, but field foresters have often expressed a preference for larger transplant stock. Erdmann (1967) found that plowing and disking failed to stimulate rapid height growth of oak seedlings, but that mechanical site preparation was a necessary prerequisite to satisfactory weed control when using simazine.¹ For sandy soils, he recommended applying 2 to 2.5 lb/acre of active simazine. Bergmann (1968) stated that 3.5 lb/acre of active simazine controlled weed growth for only 1 year. He recommended a second application in early spring of the second year.

Methods

The planting site near Grand Bend, Ontario, was an abandoned field of deep, moderately well-drained fine sand. The plow layer had a pH of 6.8 and an organic matter content of 2.8%. Weed growth was very dense, consisting mainly of quack grass (*Agropyron repens* (L.) Beauv.) with patches of

milkweed (*Asclepias* spp.) and goldenrod (*Solidago* spp.). The field was plowed and disked in autumn prior to spring planting.

A total of 800 red oak seedlings and 800 transplants were planted at a spacing of 3 x 3 ft in the spring of 1968 (Table 1). Planting treatments consisted of planting 1/ with a spade and 2/ with a motorized auger drilling holes 12 inches deep and 10 inches in diameter. Weed control consisted of:

- 1/ no treatment;
- 2/ mulching with a 3-ft-wide cover of black polyethylene film, .0015 in. thick;
- 3/ broadcast application of 2 and 1 lb/acre of active simazine in April of the first and second growing seasons;
- 4/ broadcast application of 4 and 2 lb/acre of active simazine in April of the first and second growing seasons; and
- 5/ broadcast application of 6 and 3 lb/acre of active simazine in April of the first and second growing seasons.

A factorial design with five replications was used. Thus within each age class there were 5 replications of 10 planting method/weed control treatments with each combination containing 16 trees in a 15 x 15 ft plot.

Weed control was assessed by ocular estimate of the ground cover density and vigor. Tree survival and height growth data were recorded each autumn and the 3-year data were subjected to analyses of variance.

Results and discussion

Survival was 83% or better in all but the auger-planted seedling plots. There, with applications of 6 and 3 lb/acre of active simazine, survival was only 75% (Table 2). The cause of this mortality could not be explained. It occurred in the second winter, and did not appear to be simazine damage.

TABLE 1. Size of planting stock

Age class	Length of stem (in.)	Stem diam. 1 inch above root collar (in.)	Oven-dry weight of stem (g)	Oven-dry weight of roots (g)	Top-to-root ratio
2+0	12	9/32	5	13	1:2.6
2+2	22	13/32	24	50	1:2.1

¹Simazine is now distributed in Canada under the registered trade name of "Princeps", the name by which it has been known in Europe and the United States.

TABLE 2. Three-year survival and height growth of planted red oak by age classes, planting methods and weed control treatments

Weed control treatments	Survival				Height growth			
	2 + 0		2 + 2		2 + 0		2 + 2	
	Spade %	Auger %	Spade %	Auger %	Spade cm	Auger cm	Spade cm	Auger cm
Control.....	93	95	96	96	15	14	14	13
Black polyethylene 3ft. wide.....	93	93	96	96	19	21	25	19
Active simazine 2 + 1 lb/acre.....	93	88	94	94	19	26	31**	28*
Active simazine 4 + 2 lb/acre.....	83	86	90	89	31*	37**	29*	30**
Active simazine 6 + 3 lb/acre.....	86	75**	86	84	64**	49**	45**	43**

*Significantly different from control at the p .05 level.

**Significantly different from control at the p .01 level.

Height growth was closely correlated with effectiveness of weed control (Table 3). The best growth always occurred in plots treated with 6 and 3 lb/acre of active simazine. Neither planting stock age nor planting method influenced height growth (Table 2). Black polyethylene provided a fair control only during the first year, but provided shelter for large populations of mice which caused girdling damage during the winter. Simazine applied at the active rate of 2 lb/acre shortly after planting, and 1 lb/acre in April of the second growing season, provided 70 percent weed control during the first year. However, this treatment did not prevent the regrowth of weeds during the following years. Applications of 4 and 2 lb/acre controlled 80% of weed growth during the first 2 years, but only 30% in the third year. Dosages of 6 and 3 lb/acre provided 90% control during the first 2 years and 60% in the third year. No herbicide damage was observed on any trees. Mouse damage was restricted to trees growing in weed-infested plots; no damage occurred in any of the plots with adequate weed control.

TABLE 3. Effectiveness of weed control by years since application

Weed control treatments	Effectiveness of weed control		
	First year %	Second year %	Third year %
Control, no treatment.....	0	0	0
Black polyethylene 3 ft. wide....	50	30	10
Active simazine 2 + 1 lb/acre....	70	30	10
Active simazine 4 + 2 lb/acre....	80	80	30
Active simazine 6 + 3 lb/acre....	90	90	60

Weed control is necessary for successful red oak afforestation. Although quack grass is recognized as a strong competitor, red oak growth was equally retarded in plots where wild carrot (*Daucus carota* L.) and Canada thistle (*Cirsium arvense* (L.) Scop.) had replaced the quack grass following applications of light and intermediate dosages of simazine. As neither transplant stock nor auger planting improved red oak survival or growth, the extra expense of producing transplants and of auger planting could well be saved.

Red oak afforestation is recommended in southern Ontario if the following conditions can be met:

- a light- to medium-textured, well-drained soil
- complete plowing and tilling of the planting site
- planting of 2+0 seedlings with a ground line diameter of at least 7/32 inch
- application of 6 lb/acre of active simazine applied either at or shortly after planting, followed by a 3 lb/acre application in April of the second year.

Literature cited

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