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HERBICIDE TRIALS ON EUROPEAN LARCH IN NORTHERN WISCONSIN

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ABSTRACT.—Herbicides of 17 different rates and formulations were oversprayed on newly planted 1-0 European larch seedlings in the spring of 1983 at the recommended rates. Simazine, bifenox, oxyfluorfen, pronamide, and oryzalin provided adequate weed control with no damage to the larch. Height growth at the end of the first growing season was one-and-a-half times greater in the six best treatments as in the unsprayed control.

KEY WORDS: Competition, weeds, pre-emergent, intensive culture, seedlings,

European larch *(Larix decidua)* is a promising species for use in intensively cultured plantations for biomass and energy.[1] Good site preparation, including the application of pre-emergent herbicides, is essential for the establishment of larch plantations. However, larch is extremely sensitive to herbicide damage. Herbicide use is further complicated by larch's long growing season; it is one of the first species to begin growth in the spring and the last to stop in the fall. This eliminates the strategy of overspraying in late summer to release it from competition as is done with red pine.

This paper reports on a study to identify potential herbicides, formulations, and rates for establishing intensively cultured larch plantations.

MATERIALS AND METHODS

European larch seedlings were grown by the Wisconsin Department of Natural Resources at the Hayward Nursery in northern Wisconsin. The 1-0 seedlings were lifted in early May 1983 and moved to cold storage at the Forestry Sciences Laboratory at Rhinelander and stored at 3°C until planting. The planting site was an old field at the Harshaw Forestry Research Farm, 10 miles west of Rhinelander, Wisconsin. The soil is a Padus silt loam with the major weed competitor quackgrass *Agropyron repens.*

Site preparation began in August 1982 with an application of glyphosate (Roundup)[2] at 2.2 kg/ha mixed with 187 L/ha water followed in October with moldboard plowing and disking. The site was redisked in late May 1983 before planting. The seedlings were hand-planted using a planting bar on June 1, 1983 at a 1×1 m spacing. Buds were green and swollen but no needles were showing at the time of planting.

Seventeen herbicide treatments were applied over the trees on June 2 (table 1). Wettable powders and emulsifiable concentrates were applied with a small-plot N_2-powered hand sprayer at 25 psi at a rate of 234 liters per hectare. Granules were spread by hand. In a field situation, the need for immediate incorporation of a particular herbicide, either by mechanical means or by rainfall, must be considered. For this trial, all herbicides were incorporated immediately after application using a hand rake. The study was a randomized block design with three replications per treat-

[1] *Einspahr, Dean W.; Wyckoff, Gary W.; Fiscus, Marianne (Harder). Larch-A fast-growing fiber source for the Lake States and Northeast. J. For. 82(2): 104-106; 1984.*

[2] *Mention of trade names does not constitute endorsement of the products by the USDA Forest Service.*

Table 1.—*Herbicide trade names, formulations, and rates used*

Herbicide	Trade name-formulation[1]	Rate	
		Kg/ha	*(lb/acre)*
Alachlor	Lasso EC	2.2	(2)
Bifenox	Modown EC	3.4	(3)
Dichlobenil	Casoron 4G	4.5	(4)
Diphenamid	Enide 50W	4.5	(4)
Diuron	Karmex 80WP	1.7	(1.5)
EPTC	Eptam 10G	3.4	(3)
EPTC	Eptam 7E	3.4	(3)
Hexazinone	Velpar 90WP	1.1	(1)
Linuron	Lorox 50WP	1.1	(1)
Oryzalin	Surflan 75W	2.2	(2)
Oxadiazon	Ronstar G	2.2	(2)
Oxyfluorfen	Goal 2E	0.84	(0.75)
Pronamide	Kerb 50W	2.2	(2)
Simazine	Princep WP	1.1	(1)
Simazine	Princep 4G	2.2	(2)
Trifluralin	Treflan 4EC	1.1	(1)
Trifluralin	Treflan 5G	1.1	(1)

[1]W or WP = Wettable powder
E or EC = Emulsifiable concentrate
G = Granular

ment and two trees per replication. Overhead irrigation was provided throughout the growing season when soil moisture tension reached -0.5 bar.

Tree heights and survival were recorded at the end of the first growing season. Weed control was recorded as percent bare ground in August. Weed cover by percent and species were also recorded for all treatments but were not analyzed. Major competing weeds include: quackgrass *Agropyron repens*, white cockle *Lychnis alba*, mustard *Brassica kaber*, barnyard grass *Echinochloa crusgalli*, lambsquarter *Chenopodium album*, and field bindweed *Convolvulus arvensis*.

RESULTS AND DISCUSSION

The seventeen treatments and unsprayed control were ranked by an ocular estimate of percent weed control at the end of the first growing season (table 2). Only those treatments with a survival greater than 80 percent were ranked. Differences were tested by the LSD method. Simazine wettable powder at 1.1 kg/ha worked best. The second group included bifenox, oxyfluorfen, pronamide, and oryzalin. This gives the land manager a number of alternative herbicides for weed control. The average height growth of the five best treatments was 1½ times the unsprayed controls while survival remained high in both, 97 or 100 percent.

Table 2.—*Herbicides oversprayed on transplanted European larch seedlings ranked by percent weed control at the end of the first growing season. (Any two treatments not next to a common line are significantly different (p=.05).*

Herbicide	Survival	Height	Weed control
	Percent	*Cm*	*Percent*
Survival >80 percent			
Simazine (Princep WP)	100	18	68
Bifenox (Modown EC)	100	16	53
Oxyfluorfen (Goal E)	100	17	47
Pronamide (Kerb WP)	83	18	47
Oryzalin (Surflan W)	100	18	42
Trifluralin (Treflan EC)	83	16	37
Diphenamid (Enide WP)	100	20	33
Alachlor (Lasso EC)	83	12	33
Oxadiazon (Ronstar G)	83	13	23
Trifluralin (Treflan G)	83	16	18
EPTC (Eptam EC)	83	10	8
EPTC (Eptam G)	100	11	7
Control	100	12	2
Survival <80 percent			
Simazine (Princep G)	67	12	33
Dichlobenil (Casoron G)	50	10	33
Hexazinone (Velpar WP)	17	13	95
Linuron (Lorox WP)	17	22	43
Diuron (Karmex WP)	0	0	47

Both EPTC and the control had excellent survival but poor weed control with reduced growth due to greater weed competition. The study area was irrigated to to provide sufficient moisture for both trees and weeds. In a non-irrigated plantation, competition for available moisture between trees and weeds could make good weed control the difference between plantation success and failure, particularly during dry years.

Linuron and diuron have post-emergent activity, which may account for their low ranking. If these herbicides had been applied before planting, they may have ranked higher.

Herbicide formulation may be important as evidenced by the poor showing of all of the granulars in this study. Rate is also important as can be seen by the excellent results of simazine at 1.1 kg/ha and the poor showing at 2.2 kg/ha. The best herbicide for a particular site is determined by the weed species to be controlled and the best rate is determined by the soil texture.

These results should not be used without further trials but the chemicals and rates described present a good starting point for future tests.

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