Effects of weed control and fertilizer in establishing hardwood seedlings

by
W. A. Geyer
Research Forester
Kansas State University[1]

Climatic conditions in central Kansas make it more difficult to establish trees there than in many other areas. Once established, however, trees grow well in windbreaks, recreation lands. and forest plantations. Weed control programs and fertilization are suggested to help establish the trees.

The Experiments

I used two field studies to evaluate effects of weed control and fertilization practices on survival and growth of hardwood transplants on a sandy loam site near Manhattan, Kan. An additional greenhouse study was made to test effects of numerous fertilizers on seedling survival.

The experimental site was a small grain field uncultivated for a few years, with a moderate covering of herbaceous vegetation. The soil is sandy loam with a pH of 7.7, .6 percent organic matter, 20 pounds available phosphorus and 300 pounds exchangeable potassium per acre.. Annaul precipitation is 31 inches, primarily during the growing season.

In the first field study, weed control practices were continued 2 years; in the second, only during the first growing season. The entire area was mowed for 3 years. Bare root, 1:0 seedlings were planted in the spring in 8 x 9 feet spacing. 21 trees in each weed control fertilizer combination-in a randomized pattern. Treatments were analyzed by species.

Treatments were as follows:

C- Cultivation. Trees planted before cultivation, followed by rototilling in a 4 foot wide strip 4-6 inches deep, five times during summer.

M - Mowing. Weeds cut within 2 inches of trees with a rotary mower, five times during summer.

S-Simazine. Applied at 2% lbs/a in a 2 foot wide strip with a hand sprayer 3 days after planting in study one. Trees not shielded, but attempt made not to spray them. In study two, simazine was applied 3 (lays before planting in a 5 foot wide strip.

N - No*Fertilizer.*

G -Granules. Two ounces (50 cc) of a common lawn fertilizer (11-11-11 +chlordane) were placed in a hole l ~linches from tree.

P - Pellet. One pellet (22-9-2 Forest Starter Tablet 9g.) placed in hole *1'* inches from tree. Soil from the experimental site was used in a greenhouse-pot study to test close placement of fertilizer. In addition to fertilizers used in the field, a slow release, granular turf fertilizer (38-0-0) and common field fertilizer (18-46-0) were used. Five trees were used for each treatment, plus control, for a total of 100 trees. The fertilizer was placed in a second hole about 1 inch front the tree and 2 inches deep.

Field Study One (2-year control)

Of the species tested (cottonwood, sycamore, black walnut, and yellowpopular) survival of the last two was unsatisfactory-less than 60 percent. Cultivation significantly (Least Significant Difference 5 percent) improved total height (50 to 100 percent) of the first two species after two growing seasons (table 1). That pattern continued into the third year (fig. 1). Weedy vegetation in the cultivated strips was scant 2 years after tilling ceased.

TABLE 1.—*Two-year weed control results after two growing seasons*

Weed Control	Survival		Height	
	Cottonwood	Sycamore	Cottonwood	Sycamore
	Percent		*Feet*	
Cultivate only	90	81	9.2	5.9
Plus granules	71	24	7.7	4.4
Plus pellet	100	80	6.8	3.8
Mow only	76	62	4.4	2.9
Plus granules	29	29	4.2	2.1
Plus pellet	52	14	3.9	2.0
Simazine only	24	71	4.3	3.4
Plus granules	0	5	0	2.3
Plus pellet	0	19	0	1.8

Simazine killed nearly 75 percent of both cottonwood and sycamore. Fertilizing with granule: reduced survival 25 to 75 percent with sycamore affected more than cottonwood. Neither fertilizer affected growth response.

Field Study Two (1-year control)

Survival was satisfactory for all species studied. Mortality was greater in cottonwood than in Russian olive, hackberry, or green ash. Again. cultivation was the best weed control method. significantly increasing total height (50 to 200 percent) after two growing seasons (table 2). Simazine, a cu though applied before planting. caused considerable mortality to all species except green ash. Fertilizing with granules again reduced survival 25 to 75 percent with green ash affected least. Growth response of tree- fertilized did not differ from that of control..

Pot Study (fertilizer tests)

After 5 months, fertilizer pellets had no effect on survival of any of the species tested-hackberry, sycamore, black walnut. or silver maple.

All granular fertilizer, reduced survival of all species to 0 to 40 percent, except silver maple. which was not affected.

Summary and Conclusions

Of three common weed control practices used on new tree plantings on the Plains. cultivation was far superior to either mowing or chemical treatment *with simazine*. *Simazine applied at 2 1/2 lbs./a.* killed nearly all the cottonwood and Russian olive and secured to substantially reduce the survival of sycamore and hackberry. Green ash was not affected.

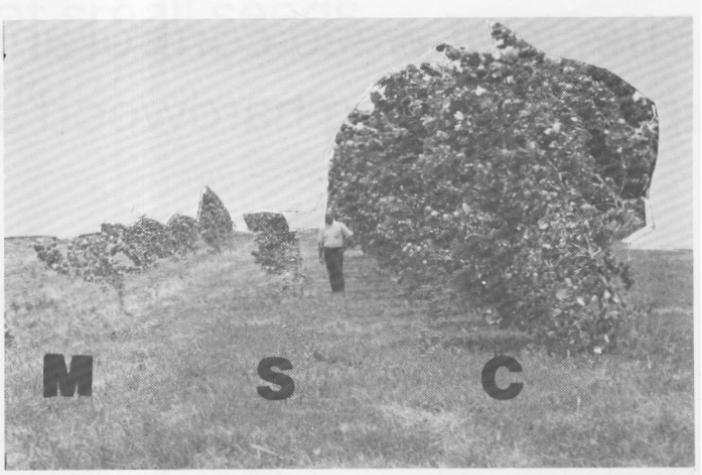

Figure 1.—Cottonwood in third growing season. *Left* — mow (7.1 ft.). *middle* — simazine (7.7 ft.). and *right* —cultivate (14.9 ft.). Simazine caused 75 percent mortality.

Average total height after either the first or second growing season sea, increased 50 to l00-percent with postseason cultivation of cottonwood, sycamore, green ash, hackberry, and Russian olive. Cultivating beyond the first growing season on sandy loam sites does not appear to be necessary, because weeds remained markedly reduced 2 years later.

placing fertilizer in a second planting hole did not benefit seedlings. Granule fertilizers appreciably reduced survival and should not be used. Pellet fertilizers have had mixed results on seedling growth *(1*. 2. 3). but in my tests they had no effect. Apparently soil moisture.

was more critical than soil nutrient supply.

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TABLE 2.—*One-year weed control results after two growing seasons*

Weed control	Survival				Height			
	Cottonwood	Russian olive	Hackberry	Green ash	Cottonwood	Russian olive	Hackberry	Green ash
	Percent				*Feet*			
Cultivate only	76	100	81	100	7.4	4.5	4.5	4.1
Plus granules	29	90	71	81	7.8	8.5	3.5	3.7
Plus Pellet	81	76	95	100	6.1	7.0	4.9	3.5
Mow only	52	81	81	100	2.8	6.1	1.5	1.8
Plus granules	5	9	52	71	2.9	4.2	1.3	1.8
Plus pellet	67	95	90	100	3.4	5.5	1.7	2.3
Simazine only	0	14	28	67	0	5.6	1.7	1.5
Plus granules	5	0	48	81	1.3	0	2.0	1.7
Plus pellet	0	0	52	100	0	0	1.9	2.3