INJECTION TREATMENTS FOR CONTROLLING RESISTANT HARDWOOD SPECIES[1/]

Fred A. Peevy
Plant Ecologist
Southern Forest Experiment Station
USDA Forest Service, Pineville, Louisiana 71360

ABSTRACT

Herbicidal mixtures containing picloram were more effective than 2,4-D amine for injection of highly resistant species. Good kills were obtained with mixtures of 2,4-D + picloram or 2,4-D + 2,4,5-T + picloram. These mixtures were effective when applied undiluted in a 2-ml dose at 7- to 9-inch intervals around the tree, except that on dogwood the maximum effective spacing was 5 inches.

Introduction

Injection with small quantities of undiluted 2,4-D amine is a well-established technique for controlling cull hardwoods of both upland and bottomland species (1, 2, 3, 4). As with other methods, some species have proved difficult to kill. Two interrelated studies were therefore conducted with several new herbicides to find economical treatments for the most resistant species on a variety of sites.

Study Procedures

One study was installed in April 1968 and one in May 1969. Variables included herbicides, dosages, and spacing of incisions; these along with test species are described in the next section of this paper. All herbicides were injected without dilution.

In each study, incisions were made within 2 inches of the groundline with a commercial injector having a bit 1-3/4 inches wide. Spacings between cuts were measured from edge to edge. Herbicides were applied with a large hypodermic needle. Undiluted 2,4-D amine was the standard treatment in both studies.

A group of 10 trees of the same species comprised a plot. Treatments were replicated three times. Both studies were on a low terrace soil in the Coastal Plain of central Louisiana.

Effectiveness of treatments was gauged by the percent of average top growth dead in August of the second growing season after treatment. Topkill was estimated visually to the nearest 5 percent for each tree, then averaged by plot and treatment. Kill of 91 percent or more was considered satisfactory; 85 to 90 percent, marginal; and less than 85 percent, unsatisfactory. Because sprouting was negligible with all treatments, none is reported.

[1/] Cooperators in this study included Dow Chemical Company and the Kisatchie National Forest.

Results and Discussion

First Study

In the first study, five chemicals or mixtures were injected at 1 and 2 ml per incision. All formulations were injected at 1-, 3-, and 5-inch intervals on red maple (Acer rubrum L.) and sweetbay (Magnolia virginiana L.). Trees ranged from 4 to 8 inches in diameter at breast height.

The herbicides were 2,4-D amine (4 lb ae per gal); a 4:1 mixture of 2,4-D and picloram, i.e., Tordon 101[2/] (2.5 lb ae); a 3:1 mixture of 2,4-D and hexafluoroacetone trihydrate, i.e., GC-7887 (5.5 lb ae); a 5:1:1 mix of 2,4-D + 2,4,5-T + picloram (3.5 lb ae); and a 4:1 mixture of 2,4,5-T + picloram in a 1:1 mix with diesel oil (2.5 lb ae).

On red maple, 2,4-D amine was ineffective even in 2-ml doses at 1-inch intervals (table 1). All other herbicides were considerably better, though 2,4-D + GC-7887 was less effective than mixtures containing picloram. Tordon 101 gave 95-percent kills when 1-ml injections were spaced 5 inches apart. The 3-chemical mixture of 2,4-D, 2,4,5-T, and picloram was comparable to Tordon 101, although kills at the widest spacing of incisions averaged slightly lower. A mixture of 2,4,5-T, picloram, and diesel oil was effective with 1- and 3-inch spacings of incisions but gave marginal kills with incisions 5 inches apart. Both dosages of a 3:1 mixture of 2,4-D + GC-7887 were effective with incisions 1 inch apart, and the 2-ml rate gave marginal results with 3-inch spacings.

With sweetbay, all herbicides gave marginal to satisfactory control with a 1-ml dose injected 5 inches apart, except for the control.

Second Study

Near-perfect kills obtained with some of the formulations in the 1968 study suggested that incisions might be spaced wider than 5 inches. Consequently, the follow-up study in May 1969 tested spacings of 5, 7, and 9 inches. The chemicals were 2,4-D amine, Tordon 101, and a 1:1:1 mixture of 2,4-D + 2,4,5-T + picloram in the amine form and containing 3 lb ae per gal, i.e., Tordon 144. Dosages were 1 and 2 ml. American hornbeam (Carpinus caroliniana Walt.) and flowering dogwood (Cornus florida L.), both difficult to kill, were added to the test species. All trees were 5 to 10 inches d.b.h.

As before, 2,4-D was ineffective with red maple (table 2). At 5-inch intervals, Tordon 101 again gave high kills of this species, but at wider spacings it was unsatisfactory except in a 2-ml dose at 7-inch intervals. Tordon 144 gave 96 percent kill with 1 ml at 9-inch spacings.

On sweetbay, 2,4-D was less effective than the Tordon mixtures, though the 1-ml dose at 5-inch intervals gave a marginal kill. Tordon 101 was satisfactory at the 9-inch spacing when applied in 2-ml, but not in 1-ml dosages. At this same spacing Tordon 144 was satisfactory in 2-ml dosages and marginal in 1-ml dosages.

[2/] Names of commercial products are mentioned for information only. Such mention does not constitute endorsement by the U. S. Department of Agriculture.

Table 1.--Topkill of red maple and sweetbay 17 months after treatment with five herbicides

Species and spacings	Dosages	2,4-D amine (4 lb ae per gal)	4:1 mix of 2,4-D and picloram (2.5 lb ae)	3:1 mix of 2,4-D + GC-7887 (5.5 lb ae)	5:1:1 mix of 2,4-D + 2,4,5-T + picloram (3.5 lb ae)	4:1 mix of 2,4,5-T + picloram in 1:1 mix of diesel oil (2.5 lb ae)
Inches	Ml.	- - - - - - - - - - - - - - - - - Percent - - - - - - - - - - - - - - - - -				
Red maple						
1	1	14	100	93	97	86
	2	26	100	95	90	100
	Aver.	20	100	94	93	93
3	1	20	100	67	100	98
	2	1	96	86	100	100
	Aver.	10	98	76	100	99
5	1	5	95	54	89	89
	2	4	100	53	97	83
	Aver.	4	97	53	93	86
Species aver.		12	98	75	95	93
Sweetbay						
1	1	100	92	88	93	93
	2	100	100	100	100	97
	Aver.	100	96	94	96	95
3	1	100	100	100	100	91
	2	100	93	100	100	100
	Aver.	100	96	100	100	95
5	1	81	94	97	100	86
	2	97	100	100	100	94
	Aver.	89	97	98	100	90
Species aver.		96	96	97	99	93

Table 2.--Average topkill of four hardwood species 16 months after treatment

Species and spacings	Dosages	2,4-D amine	Tordon 101	Tordon 144
Inches	Ml.	- - - - - - -	Percent	- - - - - - -
Red maple				
5	1	3	95	100
	2	34	94	100
7	1	1	74	97
	2	0	100	100
9	1	5	67	96
	2	7	68	96
Sweetbay				
5	1	89	87	96
	2	84	100	98
7	1	53	93	99
	2	68	89	92
9	1	79	62	85
	2	68	93	94
Hornbeam				
5	1	91	100	100
	2	96	100	100
7	1	86	98	100
	2	73	99	98
9	1	80	98	80
	2	88	96	97
Dogwood				
5	1	21	47	86
	2	33	73	91
7	1	10	67	75
	2	43	47	83
9	1	15	33	50
	2	20	40	46

Hornbeam seemed to be about as difficult as sweetbay to kill. The control was satisfactory at both rates when incisions were 5 inches apart. Tordon 101 was highly effective, near-perfect kills being obtained with 1 ml at 9-inch intervals. Tordon 144 gave similar results except that kills with the 1-ml dose were unsatisfactory at 9-inch spacing.

Dogwood was the most difficult of the four species to control. 2,4-D amine and Tordon 101 were unsatisfactory at all dosages and intervals. Tordon 144 was satisfactory in a 2-ml dosage at 5-inch spacing but was unsatisfactory at wider spacings.

Conclusions

Both studies showed that several herbicides are more lethal to resistant species than 2,4-D amine. The best seems to be picloram in mixtures with 2,4-D and 2,4,5-T. These mixtures can be injected in 2-ml dosages at 7- to 9-inch intervals except with dogwood, which requires 2 ml in incisions 5 inches apart.

Mixtures containing picloram are much more costly than 2,4-D amine. Consequently, they should not be used for normal injection jobs until research can determine if their higher prices can be offset by spacing incisions widely. Further, Tordon 144 is not registered for tree injection and hence cannot be recommended in any circumstances. Tordon 101 is registered, and may prove useful at present dosages when stands contain substantial numbers of hard-to-kill species.

Precaution

A responsible State or Federal agency should be consulted as to the status of each pesticide because registration is under constant review by government agencies.

Literature Cited

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