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A TRIAL OF SEVERAL SILVICIDES ON RED MAPLE, ASPEN AND WHITE PINE¹

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MANY SILVICIDES and methods of applying them are now available for controlling undesirable trees in forest stands. The injection method, and variations of the frill-girdle with solution method appear to be practical for use in many circumstances and were used in this study. These methods make use of a sharp-edged tool for cutting the bark, which permits the chemical to come directly into contact with the cambium layer of the unwanted stems. This study was made to compare the effectiveness of several chemicals as well as variations in the injection and frill-girdle methods of application.

METHODS

In the first portion of this study, six silvicide formulations were applied to red maple *Acer rubrum* L. For each formulation, 10 trees in the 2-inch d.b.h. class were treated with 1 ml. of undiluted chemical placed in a 1-inch cut located 1 foot from the ground. The cuts were made at an angle with a 1-inch wood chisel so that the liquid was held without any overflow.

The treatments were made on July 28, 1959 and the first examination of results was made on August 12. At that time, no effect was apparent. The following summer, two examinations were made, and the results for each silvicide used are listed in Table 1. Formulations 1, 2 and 3 are products of one company and are half the strength of formulations 4, 5 and 6, which are made by another company. If a minimum of approximately 80 percent crown kill is taken as an adequate result, then only formulations 2, 4 and 5 have achieved the desired effects.

In the second portion of the study, 2, 4, 5-T, 2-pound acid equivalent as an oil soluble amine, was applied to red maple using varying

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TABLE 1—Effect of various silvicides on red maple treated July 28, 1959

Silvicide formulation	Extent of crown kill on	
	7/25/60	8/25/60
	(percent)	
1. 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), 2 lb. per gallon acid equivalent as oil soluble amine.....	29	38
2. 2,3,6-trichlorobenzoic acid (2,3,6-TBA), 2 lb. per gallon acid equivalent as oil soluble amine.....	64	79
3. 2,4-dichlorophenoxyacetic acid (2,4-D), plus 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), 1 lb. per gallon acid equivalent of each as oil soluble amine.....	34	36
4. 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), 4 lb. per gallon acid equivalent, triethylamine salt, water soluble.....	96	99
5. 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), 4 lb. per gallon acid equivalent, propylene glycol butyl ether esters, oil soluble.	66	84
6. 2-(2,4,5-trichlorophenoxy) propionic acid (silvex) 4 lb. per gallon acid equivalent, propylene glycol butyl ether ester, water soluble.....	36	41

amounts and concentrations on trees 2, 3 and 4 inches d.b.h. Each treatment was applied to five trees within the diameter class. The treatments were made on July 9, 1955, and a month later some leaf browning and curling was evident in the 2-inch trees. There was little effect on the 3-inch trees, and no effect on the 4-inch ones. Two examinations were made the following summer, and the results for each treatment are listed in Table 2.

Examination of the results in Table 2 shows that, in the range of treatments used, at least one dosage and concentration achieved more than the minimum 80 percent crown kill in all tree sizes except the 4-inch class. In the 2-inch class, results with 1 ml. and up at full strength, and 1½ ml. and up at 50 percent strength are satisfactory. In the 3-inch class, 3 ml. in both full strength and 50 percent concentration were satisfactory, while in the 4-inch class, even the 4 ml. full-strength treatment was not effective.

Result with the 50 percent solution in oil are nearly comparable with those obtained with the full strength solution, indicating that this may be a practical means of reducing treatment costs.

The amount of solution required for effective results apparently does not vary as the diameter, but varies as the circumference, since the conducting tissue is located around the tree. On the larger trees, the number of cut required appears to be proportional to the circumference.

In the third portion of the study, three silvicides were applied in frill girdles to white pine *Pinus strobus* L. and aspen *Populus tremuloides* Michx. The girdles were made with a hand axe and consisted of a single row of downward slanting cuts through the bark at stump height. The frill girdles were varied from a complete girdle of the circumference, to 50 and 25 percent of the circumference girdled. Just enough silvicide solution was placed in the cut to wet it without overflowing. The treatments were made on July 15, 1959. Examina-

TABLE 2—Effect of various concentrations and treatments of 2,4,5-T, 2 lb. acid equivalent on red maple applied July 9, 1959

DBH class	Dosage and concentration	Extent of crown kill on	
		7/25/60	8/25/60
(inches)		(percent)	
2	¼ ml. full strength in 1 cut.....	16	20
2	½ ml. full strength in 1 cut.....	26	25
2	1 ml. full strength in 1 cut.....	62	80
2	1½ ml. full strength in 2 cuts.....	78	98
2	2 ml. full strength in 2 cuts.....	66	100
2	¼ ml. 50% in oil in 1 cut.....	22	12
2	½ ml. 50% in oil in 1 cut.....	8	15
2	1 ml. 50% in oil in 1 cut.....	42	45
2	1½ ml. 50% in oil in 2 cuts.....	72	88
2	2 ml. 50% in oil in 2 cuts.....	70	92
3	½ ml. full strength in 1 cut.....	0	0
3	1 ml. full strength in 2 cuts.....	32	35
3	1½ ml. full strength in 2 cuts.....	44	40
3	2 ml. full strength in 2 cuts.....	48	58
3	3 ml. full strength in 3 cuts.....	84	92
3	½ ml. 50% in oil in 1 cut.....	0	5
3	1 ml. 50% in oil in 2 cuts.....	22	35
3	1½ ml. 50% in oil in 2 cuts.....	50	70
3	2 ml. 50% in oil in 2 cuts.....	30	48
3	3 ml. 50% in oil in 3 cuts.....	54	88
4	1 ml. full strength in 2 cuts.....	0	5
4	2 ml. full strength in 2 cuts.....	0	15
4	3 ml. full strength in 3 cuts.....	40	63
4	4 ml. full strength in 4 cuts.....	34	52
4	1 ml. 50% in oil in 2 cuts.....	12	10
4	2 ml. 50% in oil in 2 cuts.....	12	25
4	3 ml. 50% in oil in 3 cuts.....	30	37
4	4 ml. 50% in oil in 4 cuts.....	28	42

tions of the results were made on August 24, 1959, and July 18 and August 24, 1960. The results for each frill treatment and silvicide used are shown in Tables 3 and 4.

TABLE 3—Effect of various silvicides and treatments applied to white pine July 15, 1959

Silvicide and treatment	Extent of crown kill on		
	8/12/59	7/18/60	8/24/60
		(percent)	
1. Girdle, 2,4,5-T amine, 4 lb. full strength	60	100	100
2. 50% girdle, 2,4,5-T amine, 4 lb. full strength	40	88	96
3. 25% girdle, 2,4,5-T amine, 4 lb. full strength	40	30	56
4. Girdle, 2,4,5-T amine, 4 lb. 25% in water	24	58	49
5. 50% girdle, 2,4,5-T amine, 4 lb. 25% in water	8	58	57
6. 25% girdle, 2,4,5-T amine, 4 lb. 25% in water	8	24	35
7. Girdle, 2,4,5-T ester, 4 lb. full strength	40	64	72
8. 50% girdle, 2,4,5-T ester, 4 lb. full strength	24	18	8
9. 25% girdle, 2,4,5-T ester, 4 lb. full strength	0	18	17
10. Girdle, 2,4,5-T ester, 4 lb. 25% in oil	8	42	58
11. 50% girdle, 2,4,5-T ester, 4 lb. 25% in oil	0	26	20
12. 25% girdle, 2,4,5-T ester, 4 lb. 25% in oil	0	10	0
13. Girdle, 2,3,6-TBA amine 2 lb. full strength	30	70	100
14. 50% girdle, 2,3,6-TBA amine, 2 lb. full strength	0	40	42
15. 25% girdle, 2,3,6-TBA amine, 2 lb. full strength	0	40	8
16. Girdle, 2,3,6-TBA amine, 2 lb. 25% in oil	16	24	80
17. 50% girdle, 2,3,6-TBA amine, 2 lb. 25% in oil	0	18	5
18. 25% girdle, 2,3,6-TBA amine, 2 lb. 25% in oil	0	12	0
19. Girdle, 2,3,6-TBA amine, 2 lb. 10% in oil	0	34	49
20. 50% girdle, 2,3,6-TBA amine, 2 lb. 10% in oil	0	6	2
21. 25% girdle, 2,3,6-TBA amine, 2 lb. 10% in oil	0	6	4

RESULTS

The results demonstrate the superiority of the complete frill girdle over the partial girdles. On aspen, the complete girdle was effective with all formulations and concentrations, except the diluted 2, 3, 6-TBA product. On white pine, the complete girdle was effective only with the full-strength solution of 2, 4, 5-T amine and 2, 3, 6-TBA, and the 25 percent strength 2, 3, 6-TBA solution.

The 50 percent frill girdle was effective with some of the formulations, which indicates a possibility for reducing costs inasmuch as a partial girdle is cheaper to make and requires less silvicide. In white pine, the full strength 2, 4, 5-T amine was effective with 50 percent girdles. In aspen, the 50 percent girdles were effective with full strength 2, 4, 5-T amine and 2, 4-D amine. Even the 25 percent

TABLE 4—Effect of various silvicides and treatments applied to aspen July 15, 1959

Silvicide and treatment	Extent of crown kill on		
	8/12/59	7/18/60	8/24/60
		(percent)	
1. Girdle, 2,4,5-T amine, 4 lb. full strength.	84	100	100
2. 50% girdle, 2,4,5-T amine, 4 lb. full strength.	95	86	92
3. 25% girdle, 2,4,5-T amine, 4 lb. full strength.	36	54	53
4. Girdle, 2,4,5-T amine, 4 lb. 25% in water.	65	100	100
5. 50% girdle, 2,4,5-T amine, 4 lb. 25% in water.	40	80	63
6. 25% girdle, 2,4,5-T amine, 4 lb. 25% in water.	65	58	56
7. Girdle, 2,4-D amine, 4 lb. full strength.	100	100	100
8. 50% girdle, 2,4-D amine, 4 lb. full strength.	100	100	100
9. 25% girdle, 2,4-D amine, 4 lb. full strength.	60	78	81
10. Girdle, 2,4,5-T ester, 4 lb. full strength.	92	100	100
11. 50% girdle, 2,4,5-T ester, 4 lb. full strength.	28	48	50
12. 25% girdle, 2,4,5-T ester, 4 lb. full strength.	16	54	41
13. Girdle, 2,4,5-T ester, 4 lb. 25% in oil.	95	100	100
14. 50% girdle, 2,4,5-T ester, 4 lb. 25% in oil.	20	44	34
15. 25% girdle, 2,4,5-T ester, 4 lb. 25% in oil.	0	44	28
16. Girdle, 2,3,6-TBA amine, 2 lb. full strength.	0	93	97
17. 50% girdle, 2,3,6-TBA amine, 2 lb. full strength.	0	30	9
18. 25% girdle, 2,3,6-TBA amine, 2 lb. full strength.	0	24	8
19. Girdle, 2,3,6-TBA amine, 2 lb. 25% in oil.	0	missing	missing
20. 50% girdle, 2,3,6-TBA amine, 2 lb. 25% in oil.	0	18	8
21. 25% girdle, 2,3,6-TBA amine, 2 lb. 25% in oil.	0	28	18
22. Girdle, 2,3,6-TBA amine, 2 lb. 10% in oil.	0	80	60
23. 50% girdle, 2,3,6-TBA amine, 2 lb. 10% in oil.	0	12	4
24. 25% girdle, 2,3,6-TBA amine, 2 lb. 10% in oil.	0	26	28

girdle gave a kill of 81 per cent with the 2, 4-D amine in aspen. This latter product is cheaper than the 2, 4, 5-T, and indicates another opportunity to reduce costs.

Undesirable aspen can be efficiently controlled with one man carrying the 2, 4-D amine in a quart oiler and making the partial frill girdles with a hand axe. Dilute solutions of 2, 4-D amine may also be effective in treating aspen, but this study did not evaluate dilute solution of this product.

Wide variations were obtained in response of red maple, aspen and white pine to various silvicide formulations at different concentrations. Different methods of application also have a great influence on results obtained. The results should assist in determining economical and effective means of controlling undesirable stems of red maple, aspen, and white pine.