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CACODYLIC ACID AS A SILVICIDE

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ABSTRACT

This report deals with the effectiveness of cacodylic acid (dimethylarsenic acid) as a silvicide for undesirable trees. Cacodylic acid has been used successfully as an herbicide for the destruction of grasses and weeds. Experimental work with this material was begun during the 1963 field season, and continued during 1964, to permit complete evaluation of the results. It appears that cacodylic acid has considerable potential as a silvicide.

THE MATERIALS USED were ANSAR[1] 138 and ANSAR 160. ANSAR 138 is a white powder containing 65 percent active cacodylic acid.[2] A basic solution for use in part of this study was made by adding 100 grams of ANSAR 138 to 100 milliliters of water. Weaker solutions of 50, 25, and 10 percent of this concentration were also used. ANSAR 160 is a liquid formulation of ANSAR 138, containing the equivalent of five pounds of technical grade cacodylic acid per gallon. It was used at full strength and in diluted solutions.

Applications were made using several variations of the cut-surface treatment. For treatments involving the use of an injector, a Cranco injector was used. In other treatments, both partial and complete frill girdles were made with a hand axe. In treating conifers, a power drill and a punch axe were used to make holes in the base of the tree.

Treatment was initially applied to 163 trees, mostly red maple, but including a few aspen and paper birch, during early July, 1963.

[1] Supplied by courtesy of Ansul Company, Marinette, Wisconsin.
[2] Cacodylic acid is a pentavalent organic arsenic compound with only moderate mammalian toxicity.

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During the 1964 field season, 690 trees, mostly aspen and red maple, but including 150 jack pines and some other species, were treated.

Results were evaluated on each tree at least twice during the year of treatment, and the trees treated in 1963 were also examined in mid-July, 1964. The results were expressed as percent of control, based on the degree of kill of each tree.

Effects of the treatments became noticeable very quickly. Within two weeks, many of the treated trees had lost most of their leaves. Because most silvicides act slower than this, the loss of leaves is an unique result, and may be an important effect where immediate release from shade is desirable.

Table 1 shows the results obtained with ANSAR 138 applied to red maple, aspen, and paper birch, in complete frills, and in cuts with 1-inch and 3-inch gaps. The 1964 examinations, approximately a year after treatment, showed a greater degree of control than the first-year results. Thus, results obtained by examination during the year of treatment will be conservative.

TABLE 1—First- and second-year results with full-strength ANSAR 138

Application method	Red maple			Aspen			Paper birch		
	Number of trees	Effective control		Number of trees	Effective control		Number of trees	Effective control	
		1963	1964		1963	1964		1963	1964
	No.	Percent		No.	Percent		No.	Percent	
Complete frill	27	99	100	7	94	100	1	90	100
1-inch gaps between cuts	26	89	99	1	90	100	3	96	100
3-inch gaps between cuts	31	85	92				6	89	100

Table 2 lists first-year results with ANSAR 160 at various concentrations on several species, using complete frills and 1-inch gaps

TABLE 2—First-year results with ANSAR 160 in various concentrations

Concentration used	Red maple		Aspen		Paper birch		Sugar maple		Ironwood		Serviceberry	
	No. trees	Control	No. trees	Control	No. trees	Control	No. trees	Control	No. trees	Control	No. trees	Control
Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
100	76	95	153	97	5	58	17	86	6	73	16	100
50	43	75	40	89			12	62	3	100	4	100
25	5	46	39	87			6	23	5	90	1	100
10	36	28	13	46	2	15	3	13			1	40

between cuts. With an increase in degree of control by the end of the second season, it appears that 85 percent control or more in the first year should be satisfactory for most forest management purposes.

One group of red maple was treated in 1963 with three different concentrations of ANSAR 138, using three methods of application, and the amount of solution used per cut was measured. The results of these treatments are shown in Table 3. The 1964 results show an improvement over 1963 results in degree of control. It is also significant that the smallest amount of solution, one-half milliliter per cut, was just as effective as larger amounts.

TABLE 3—First- and second-year results after treatment of red maple with ANSAR 138 (Treated July 11, 1963)

Concentration used	Application method									All concentrations combined		
	Complete frill			1-inch gaps			3-inch gaps					
	Number of trees	Effective control		Number of trees	Effective control		Number of trees	Effective control		Rate	Number of trees	Effective control
		1963	1964		1963	1964		1963	1964			
Percent	No.	Percent		No.	Percent		No.	Percent		ml.	No.	Percent
50	6	90	92	8	98	100	3	72	73	½ per cut	15	90
25	3	66	87	9	86	93	6	80	87	1 per cut	18	86
10	3	87	100	13	77	75	5	29	52	2 per cut	18	80

A group of 149 red maples treated in 1964 was used for a time study to compare two methods of application. The results show that the injector method was faster than the hatchet and oil can method. (Table 4).

Throughout the entire study, differences in degree of control resulted in part from difference in size of trees treated. Trees with large, dense crowns were more difficult to kill, and required more material.

TABLE 4—Time required to treat red maple with ANSAR 138 (60 percent)

Application method	Number of trees	Average d.b.h.	Time per inch of diameter	Effective control
	No.	Inches	Seconds	Percent
Hatchet and oil can.....	70	3.5	5.9	98
Injector.....	79	3.9	4.9	95

The amount of sprouting following treatment is important in evaluating a silvicide. Red maple, the main species treated, usually sprouts profusely. Sprouting was evident by the end of the first growing season. A check of 82 red maple treated in 1963 showed that 22 percent had no sprouts, 10 percent had one to three sprouts per tree, 30 percent had four to six sprouts per tree, and 38 percent had seven or more sprouts per tree. The amount of sprouting was not correlated with the strength of solution or method of treatment. If sprouting is not wanted, this product might be combined with some sprout inhibiting material before application.

In work at the New Zealand Forest Research Institute, cacodylic acid was used for killing certain conifers in a low-cost method of non-commercial thinning in pine plantations and other overly dense stands. The procedure was to bore a hole in the base of the tree with a power drill, and place 6 cc. of solution in the hole with a syringe.

A group of 44 jack pines in a 20-year-old plantation was treated with five to six milliliters of a 60 percent solution of ANSAR 138 in a one-half inch hole bored in the base of each tree. Within 10 days, browning of the foliage was evident in the tips of the trees, and within a month, the foliage on all treated trees was completely brown.

Another group of 106 jack pines was treated with ANSAR 160 placed in a hole made with a punch axe about three feet above the ground. Although this was done late in the growing season (early August), results were similar to those obtained with the first group. Results of treating a few pine trees other than jack pine indicate that results similar to those obtained with jack pine can be expected.