EVALUATION OF SEVERAL ALTERNATIVES TO BASAL APPLICATIONS OF 2,4,5-T[1]

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Abstract. Forty-four alternative treatments to basal applications of 2,4,5-T were applied to woody vegetation on a utility right-of-way in Broome County, New York. Alternative treatments included modification in herbicide formulations and application techniques, as well as non-chemical methods. Treatment evaluation occurred after two growing seasons for plots established in the spring of 1979 and after one growing season for plots established in fall 1979 and spring 1980.

A primary objective of system reliability establishes the need for vegetation control on electric utility rights-of-way. Through selective management of right-of-way vegetation, progress can be made toward the establishment of a relatively stable vegetative complex composed of those species compatible with the electrical facility above (1).

Prior to the suspension of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) by the U.S. Environmental Protection Agency in February 1979, basal application of this herbicide as an ester in fuel oil was a valuable technique in selective vegetation management. The objective of this study has been to test under field conditions available (or soon to be available) alternatives to selective basal applications of 2,4,5-T on woody species typically found on utility rights-of-way in New York State. A second objective has been to evaluate methods of reducing oil requirements through the use of alternatives to straight fuel oil as carriers of the herbicidal active ingredient.

Materials and Methods

One hundred ten plots each being 50 ft. by 50 ft. were established in Broome County, New York on a right-of-way corridor occupied by several electrical transmission lines. There had been no history of previous vegetation maintenance taking place on this site since the clearing for line construction which took place in the late 1960's.

It was felt that due to the abnormally large size of the vegetation, this site offered "worse case" conditions for a utility right-of-way. Typically stems reached heights of 20 ft. to 25 ft. Stem densities typically ranged from 2,000 to 4,000 stems per acre. Species present in abundance included quaking aspen (*Populus tremuloides*), red maple (*Acer rubrum*), red oak (*Quercus rubra*), white ash (*Fraxinus americana*), pin cherry (*Prunus pennsylvanica*) and black cherry (*Prunus serotina*).

An effort was made to simulate procedures currently in operational practice during chemical application on each 50 ft. by 50 ft. plot. Application was made by closely supervised experienced contract personnel following standard procedures for each treatment. Table 1 defines the methods of applications and Table 2 lists the herbicides which were evaluated in this study.

In most cases each formulation and method being evaluated was applied to three separate plots. The volume of chemical applied per plot was dependent upon the vegetative composition and stem density of each plot as they pertain to the specifications of each application technique, and not on a predetermined rate based on unit area. The only exception was in the application of the banding technique.

The field evaluation conducted during August 1980 involved a 100% inventory of a .01 acre sample area centered within each treatment plot. Species, diameter class, and defoliation rating (Table 3) were recorded for each undesirable plant within the .01 acre sample area. The location of foliage or regrowth on those stems not completely defoliated was recorded for each species. Additionally general observations of conditions within the plot were recorded.

Results & Discussion

Table 4 lists the method of application, herbicide formulation and effectiveness of each treatment investigated during this study.

[1]Presented at the annual conference of the International Society of Arboriculture at Boyne Falls, Michigan in August of 1981.

Table 1. Methods of application

Method	*Equipment*	*Treatment Specifications*	*Carrier*
Basal	5 gal. back tank	Lower 12"-18" of stem, thorough wetting, puddling at root collar	Oil
Modified basal	5 gal. back tank or hydraulic sprayer	Lower 3' of stem, thorough wetting, puddling at root collar	Oil & water + surfactant
Water basal	5 gal. back tank	Lower 3' of stem, thorough wetting, puddling at root collar	Water + surfactant
Injection	Basal tree injector	1 ml herbicide/incision, incisions at interval 2" around circumference of stem	None
Stump treatment	Squirt bottle	Spray cambium ring of freshly cut stumps	Undilute/water
Pellets	By hand	Around each stem at manufacturer's rate	None
Mist blower basal	Back pack power mist blower	Lower 18" of stem to point of thorough wetting	Oil
Spot treatment	Spot Gun	Liquid applied directly to soil around individual stem. Manufacturer's rate.	Water
Banding	Hand sprayer	Nonselectively to soil in two parallel bands	Water
Hack & squirt	Brush axe	Frills cut at waist ht. ½" between frills. Chemical applied in frills.	Water & undiluted
Burn Girdling	Kerosene sprayer	Stems burned at root collar until well blackened	None
Girdling	Girdling chain	Grove encircling stem cut to a depth of ¼"	None

Table 2. Herbicides evaluated[a]

2,4-D, (2,4-dichlorophenoxy) acetic acid
Dicamba, 3,6-dichloro-o-anisic acid
Dichlorprop, 2-(2,4-dichlorophenoxy) propionic acid
Glyphosate, N-(phosphonomethyl) glycine
Hexazinone,[b] 3-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4(1H,3H)-dione
Mecoprop, 2-(4-chloro-o-tolyl) oxylpropionic acid
Picloram, 4-amino-3,5,6-trichloropicohnic acid
Tebuthiuron, N-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-N,N'-dimethylurea
Triclopyr, [(3,5,6-trichloro-2-pyridinyl)oxy] acetic acid

[a]*Herbicide Handbook of the WSSA*, Fourth Edition 1979
[b]DuPont Product Label, EPA Reg. No. 352-392

Table 3. Defoliation rating classes

Rating	*Class Requirements*
100	Plant is completely lacking of foliage
80	Plant has experienced a 80 to 99 percent reduction in foliation
60	Plant has experienced a 60 to 79 percent reduction in foliation
30	Plant has experienced a 30 to 59 percent reduction in foliation
0	Plant has experienced a 0 to 29 percent reduction in foliation

Recognizing the small sample size of each treatment, the following is a brief discussion of results and observations. A complete reporting of results to date for each treatment has been made in "A preliminary assessment of several potential vegetation management techniques as a substitute for basal applications of 2,4,5-T" (2).

Basal. The evaluated results of applications of several combinations of 2,4-D, dichlorprop and dicamba in oil were variable with no strong relationship readily apparent between treatment and effectiveness (Figure 1). Variation in species composition between plots may be influencing this relationship.

Basal application of 4 lbs. triclopyr ester and 2 lbs. picloram ester (treatment #13) after two growing seasons had the best overall effectiveness rating. Application of these two materials at lower rates look promising over a broad spectrum of species after one growing season and may show similar results when evaluated after two growing seasons. Triclopyr alone was observed to be somewhat variable on black cherry and oak (Quercus spp.). The ester of picloram alone was variable on oak and was slow to effect red maple. White ash appeared to be somewhat resistant to basal applications of picloram ester. Figure 2 compares the percentage of stems totally defoliated (defoliation rating 100, Table 3) for the six most effective treatments evaluated.

Modified basal & water basal. None of the formulations was effective enough to be considered of operational value. Significant phytotoxic effects were observed on the understory of nontarget vegetation.

Injection. Results were poor. This may be due to the fact that incisions were widely spaced on stems that were difficult to treat (i.e., large clumps of stump sprouts). There seems to be a relationship between incision spacing and treatment effectiveness.

Stump treatment. In general there was a 75% reduction in stem density determined by a count of sprouting stumps.

Pellets. Picloram (as the potassium salt) in pellet form has proven to be effective after two growing seasons (Figure 2). White ash and red oak were observed to exhibit some degree of resistance.

Mist blower basal. Results show this method to be fairly effective. The extent of oil reduction over conventional basal applications should be tested on larger areas. There was significant damage evident on nontarget vegetation.

Banding & spot treatments. The results after one growing season are inconclusive. There was significant damage evident on nontarget vegetation.

Hack & squirt. Evaluation occurred less than one growing season after treatment application. It is too early to determine anything of significance.

Burn girdling. Stems were heavily foliated after one growing season. Many stems have sprouted below the burn.

Girdling. Stems were heavily foliated after one growing season. Most stems have sprouted below the burn. Most quaking aspen stems have broken off at the girdle.

In conclusion, several alternatives to basal applications of 2,4,5-T have been evaluated. Recognizing the small sample size of each treatment, no single formulation or method can be singled out as the best in all cases. Based on an evaluation of effectiveness after two growing seasons several treatments can be eliminated as ineffective. A more intensive review may now be directed toward the most promising alternatives identified here.

Figure 1. Combinations of 2,4-D, dichlorprop and dicamba.

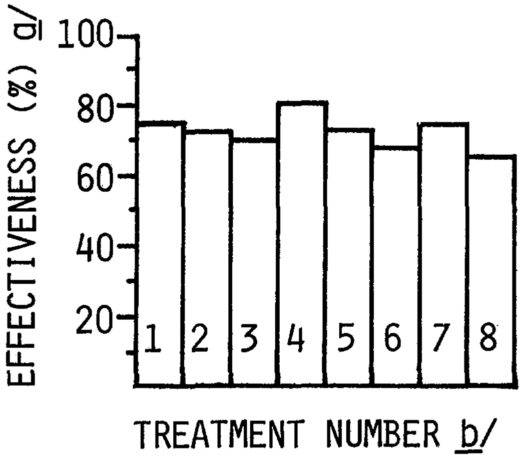
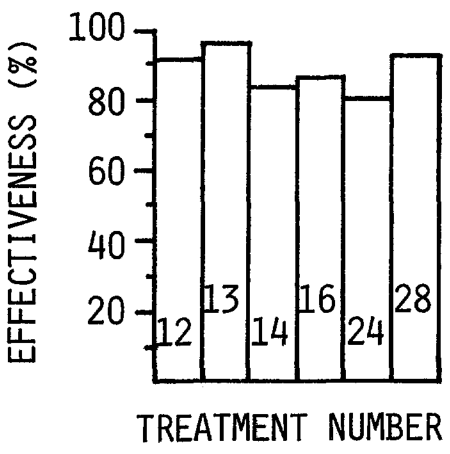


Figure 2. Six most effective treatments.



a/ Effectiveness (%) = #stems in defoliation class 100 X 100

b Treatment number refers to Table IV

Table 4. Study treatments

Treatment number[a]	Method of application	Herbicide formulation	Effectiveness (%)[b]
1	Basal	8 lb ae 2,4-D, 4 lb ae dichlorprop, 2 lb ae dicamba as esters + 96 gal oil	74
2	Basal	10 lb ae 2,4-D, 6 lb ae dichlorprop, 2 lb ae dicamba as esters + 95 gal oil	72
3	Basal	12 lb ae 2,4-D, 8 lb ae dichlorprop, 2 lb ae dicamba as esters + 94 gal oil	70
4	Basal	10 lb ae 2,4-D, 4 lb ae dichlorprop, 3 lb ae dicamba as esters + 95 gal oil	80
5	Basal	12 lb ae 2,4-D, 6 lb ae dichlorprop, 3 lb ae dicamba as esters + 94 gal oil	72
6	Basal	14 lb ae 2,4-D, 8 lb ae dichlorprop, 3 lb ae dicamba as esters + 93 gal oil	67
7	Basal	6 lb ae 2,4-D, 3 lb ae dicamba as esters + 97 gal oil	74
8	Basal	8 lb ae 2,4-D, 8 lb ae dichlorprop as esters + 96 gal oil	78
9	Basal	2 lb ae picloram as an ester + 99 gal oil	73
10	Basal	4 lb ae picloram as an ester + 98 gal oil	72
11	Basal	4 lb ae triclopyr as an ester + 99 gal oil	65
12	Basal	8 lb ae triclopyr as an ester + 98 gal oil	91
13	Basal	4 lb ae triclopyr, 2 lb ae picloram as esters + 98 gal oil	96
14	Mist blower basal	24 lb ae 2,4-D, 12 lb ae dichlorprop, 6 lb dicamba as esters + 88 gal oil	83
15	Injection	1 lb ae 2,4-D, .25 lb ae picloram as amine salts per gal	60
16	Pellets	10% ai picloram as potassium salt	86
17	Modified basal	8 lb ae 2,4-D, 8 lb ae dichlorprop as esters + 1 lb ae picloram as potassium salt + 1 gal surfactant + 20 gal oil + 75 gal water	—[c]
18	Modified basal	12 lb ae 2,4-D, 6 lb ae dicamba as esters + 1 lb ae picloram as potassium salt + 1 gal surfactant + 15 gal oil + 78 gal water	—[c]
19	Modified basal	(6,8,12) lb ae 2,4-D, (3,4,6) lb ae dicamba as esters + 1 gal surfactant + 15 gal oil + (81,80,79) gal water	—[c]
20	Water basal	8 lb ae triclopyr as ester + 98 gal water	—[c]
21	Water basal	11 lb ae 2,4-D, 5.5 lb ae mecoprop, 1.1 lb ae dicamba as amine salts + 1 pt surfactant + 95 gal water	—[c]
22	Stump treatment	(.5,1) lb ae 2,4-D, (.125, .25) lb ae picloram as amine salts per gal	79
23	Basal	12 lb ae 2,4-D, 6 lb ae dichlorprop, 3 lbs dicamba as esters + 94 gal oil	72
24	Basal	4 lb ae tryclopyr as an ester + 99 gal oil	80
25	Basal	2 lb ae picloram as an ester + 99 gal oil	73
26	Basal	1 lb ae triclopyr, 1 lb ae picloram as esters + 99.25 gal oil	68
27	Basal	2 lb ae triclopyr, 1 lb ae picloram as esters + 99 gal oil	77
28	Basal	2 lb ae triclopyr, 1.5 lb ae picloram as esters + 98.75 gal oil	92
29	Modified basal	2 lb ae triclopyr, 1 lb ae picloram as esters + 2.5 gal surfactant + 20 gal oil + 76.5 gal water	50
30	Basal	1 lb ae picloram, 6 lb ae 2,4-D, 3 lb ae dicamba as esters + 96.5 gal oil	57
31	Basal	2 lb ae triclopyr, 6 lb ae 2,4-D, 3 lb ae dicamba as esters + 96.5 gal oil	82
32	Basal	2 lb ae triclopyr, 6 lb ae 2,4-D, 6 lb ae dichloprop as esters + 96.5 gal water	73
33	Hack & squirt	3 lb ae triclopyr as amine salt per gal	—[f]
34	Injection	1 lb ae 2,4-D, .25 lb ae picloram as amine salt per gal	72
35	Basal	1 lb ae picloram, 6 lb ae 2,4-D, 6 lb ae dichlorprop as esters + 96.5 gal oil	64
36	Water basal	2 lb ae triclopyr, 1 lb ae picloram as esters + 10 gal surfactant + 89 gal water	50
37	Hack & squirt	1 lb ae 2,4-D + .25 lb ae picloram as amine salt per gal	—[d]
38	Hack & squirt	4 lb ae glyphosate as amine salt per gal	—[d]
39	Banding	2.5 lb ai tebuthiuron per acre	19[e]
40	Spot treatment	2.5 lb ai tebuthiuron + 1 gal water	39[e]
41	Pellets	10% ai hexazinone	37[e]
42	Spot treatment	2 lb ai hexazinone per gal	0[e]
43	Burn girdling	None	—
44	Girdling	None	—

[a]Treatment #1 through #23 established May 1979, #23 through #36 (exclusive #33) and #44 established November 1979, #39 through #43 established April 1980, #37 and #38 established August 1980.

[b]Effectiveness expressed as total # stems in defoliation rating class 100 (Table III) ÷ total # stems in sample X100. Evaluated August 1980.

[c]Plots not specifically evaluated. Visual observations made at the time of evaluation showed little or no effect of treatment on plot vegetation.

[d]Evaluation came less than one growing season after treatment.

[e]Most stems had completely defoliated and refoliated at time of evaluation. Due to mode of action of these materials, stems will probably defoliate again.

[f]Treatment not yet applied.

Literature Cited

1. Niering, W.A. 1958. *Principles of sound right-of-way vegetation management.* Econ. Bot. 12(3): 140-144.
2. Goodfellow, J.W. and R.H. Mider. 1980. A Preliminary Assessment of several potential Vegetation Management Techniques as a Substitute for Basal Applications of 2,4,5-T. NYSEG R & D project report 150.50.08, 9-25-80.

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ABSTRACTS

MULDER, MARTHA R. 1981. **Suiting up.** Michigan Science in Action 42: 7-11.

The exposure of the skin to toxic chemicals in pesticides lends a hidden and potentially dangerous element to the scene. Pesticide poisoning in humans is known to cause symptoms ranging from headache to vomiting to death. But even with such grim health hazards hanging over people who work with or apply pesticides, development of practical and comfortable protective clothing has prompted little attention, until recently. Since 1978, an interdisciplinary team of Agricultural Experiment Station scientists at Michigan State University has worked on and studied various fabrics and designs to determine where and in what amounts pesticides are deposited on clothing during spraying, as well as how much of the pesticide may penetrate through different fabrics to the skin. The investigations are nearly finished now, and national interest is piqued from government and industry. The single, most practical result of the studies is likely to come next summer when researchers expect to produce a model — or prototype — design for a comfortable protective garment which could be made from a fabric already on the market.

CHAPMAN, DOUGLAS. 1981. **Consider mature characteristics when selecting birch varieties.** Weeds, Trees & Turf 20(4): 17-18.

Birch (*Betula*) is one of the most extensively used yet least understood trees found in the landscape today. One would guess that a clump white birch is incorporated into every landscape from the Northeast to the Midwest. Generally, birch prefer a high water table, well-drained soil, being found native near lakes, streams, and edges of swamps. The most widely used native birch include sweet, river, paper, and gray birch. When planting birch, one should remember they are relatively short-lived. Most *Betula* thrive in moist, well-drained, high-water table soils. Ranking from least susceptible to most susceptible to bronze birch borer, they are sweet, river, gray, paper, and European birch. Pruning when considered, should be done only in August. Birch is a profuse bleeder and poor compartmentalizer. Shigo has clearly shown that summer (August) is a good alternative and probably the prime time to prune trees which are known bleeders. Birch adapt well to our many conditions but due to bronze birch borer, one should only use tolerant or resistant types. Further, nurserymen should inform the homeowner, *Betula* are relatively short-lived (25 to 30 years).