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# Research Note

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## CHEMICAL CONTROL OF BIGLEAF MAPLE TREES AND STUMP SPROUTS

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by

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Control of bigleaf maple (Acer macrophyllum) has become an important consideration in many western Oregon areas that are managed primarily for Douglas-fir (Pseudotsuga menziesii) and associated conifers. The problem is acute on areas where damaged and defective maples are left after harvest of commercial timber. They sprout vigorously from stump, trunk, and root crown, and interfere with the prompt establishment of a Douglas-fir or mixed conifer stand (fig. 1).

Early field trials had indicated that satisfactory control could be achieved on young, smooth-barked bigleaf maple trees under 10 inches in diameter by using basal applications of 2, 4, 5-T; 2-(2, 4, 5-TP); and a mixture of 2, 4-D and 2, 4, 5-T.[2/] This current study was started in 1956 to seek out effective treatments for larger and older rough-barked trees and for freshly cut stumps. It was carried out in cooperation with the Salem District office of the Bureau of Land Management and the Forest Research Division of the Agriculture Experiment

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[1/] Leader, Bend (Oreg.) Research Center. This study was conducted while the author was on the staff of the Corvallis Research Center, maintained in cooperation with the School of Forestry, Oregon State College, Corvallis, Oreg.

[2/] Heuschkel, Dexter Gouldin. Tests of some chemical herbicides in controlling brush, weed trees, and grasses on McDonald Forest. 1956. (Unpublished master's thesis. Copy on file Oregon State College Library, Corvallis, Oreg.)

*Figure 1.--Three years of profuse sprout growth from a cluster of untreated bigleaf maple stumps.*

Station, Oregon State College. Acknowledgment is also made to Willamette Valley Lumber Co. for use of company lands for study purposes.

## THE STUDY

The study site was located in the western foothills of the Cascade Range bordering the Willamette Valley. Fire, logging, and relogging during the past several decades had left only a few scattered young-growth trees of Douglas-fir and western hemlock (Tsuga heterophylla), an occasional cull old-growth Douglas-fir, and many mature bigleaf maples. Conifer reproduction was sparse in the almost continuous ground cover of brush and fern.

The study consisted of two phases: (1) basal spray or frill treatments with promising chemicals on 75 mature trees located on 6 plots, and (2) stump-spray treatments on 44 freshly cut stumps located on 10 plots.

Chemicals used were:

| | |
|---|---|
| 2, 4, 5-T | 2, 4, 5-trichlorophenoxyacetic acid |
| 2-(2, 4, 5-TP) | 2-(2, 4, 5-trichlorophenoxy) propionic acid |
| Amitrol | 3-amino-1, 2, 4-triazole |
| 2, 3, 6-TBA | A mixture of 6 isomers of trichlorobenzoic acid, mostly the 2, 3, 6-trichloro isomer |

For the first two chemicals, both the amine and propylene glycol butyl ether ester forms were used. Solutions contained 4 pounds acid equivalent per gallon of concentrate. Amitrol solutions were prepared, using a white powder containing 50 percent active ingredient. The 2, 3, 6-TBA was used as a sodium salt compound and as an oil soluble compound, containing 1.5 and 3 pounds acid equivalent per gallon of concentrate, respectively.

Treated trees had a maximum height of 60 feet, with diameters ranging from 9 to 29 inches. Diameters of the cut surface of treated stumps averaged 15 inches. Occasionally, clusters of two or more trees or stumps were treated as one individual observation. Before chemical application, moss and litter were removed from the surface of both trees and stumps. In all treatments, chemical solutions were applied to point of runoff, using a conventional backpack spray can. For basal application, the solution was sprayed on the lower 2 feet of tree trunks. For frill applications, chemical solutions were applied to ax cuts spaced 3 inches apart around the trunks. Stumps were treated within 2 days after felling by spraying chemical solutions over the entire surface.

Treatments were applied in June 1956, when leaves were fully developed. Weather was hot and dry, with temperatures of 80° to 100° F. and humidities of 30 to 35 percent.

## RESULTS

### Basal Spray and Frill Application

Three years after basal spray application of 2-(2, 4, 5-TP) ester in an oil carrier, mature maple trees were 61 percent defoliated (fig. 2, table 1). Seven of fifteen trees receiving this treatment were 90 percent or more defoliated, including several trees that were killed. None of the five other basal spray or frill treatments provided an average defoliation greater than 20 percent.

*Figure 2.--Two mature bigleaf maple trees completely defoliated 3 years after basal applications of 2-(2, 4, 5-TP) ester.*

Poor results of frill treatments were due in part to limited lateral translocation. Evidence of some upward and downward movement of treatment solution was found, but the area between frills remained relatively undamaged.

The basal spray of 2, 3, 6-TBA at first caused slight marginal chlorosis and cupping of leaves and retarded sprout growth. These effects, however, were followed by almost complete recovery the third year after treatment.

Basal sprouting occurred on many treated trees. Sprouting was negligible on trees less than 10 percent defoliated, heaviest on trees 40 to 50 percent defoliated, and almost absent on trees 90 percent or more defoliated.

Table 1.--Defoliation of bigleaf maple trees 3 years after treatment

| Method of application | Chemical | Concentration (lb. ahg[1]) | Carrier | Number of trees[2] | | | Average defoliation per treatment (percent) |
|---|---|---|---|---|---|---|---|
| | | | | 50 percent or more defoliated | 90 percent or more defoliated | Killed | |
| Frill | 2-(2,4,5-TP), amine | 200 | Water | 0 | 0 | 0 | 20 |
| Frill | 2,4,5-T, amine | 200 | Water | 0 | 0 | 0 | 2 |
| Frill | 2,3,6-TBA, sodium salt | 150 | None | 0 | 0 | 0 | 4 |
| Basal spray | 2-(2,4,5-TP), ester | 32 | Stove oil + 5 percent bentonite[3] | 11 | 7 | 4 | 61 |
| Basal spray | 2,3,6-TBA, oil soluble | 32 | Stove oil + 5 percent bentonite[3] | 0 | 0 | 0 | 10 |

[1] ahg = acid equivalent per 100 gallons of solution.

[2] Total of 15 trees for each treatment.

[3] Bentonite is a clay mineral used to increase viscosity and deposition of spray on treated surfaces. It was added by percent weight.

## Stump Treatments

Sprouting of freshly cut, bigleaf maple stumps was effectively controlled for the 3-year study period with treatments using ester forms of 2-(2, 4, 5-TP) in either water or oil and 2, 4, 5-T in oil (table 2). Sprouting was not completely eliminated in these three treatments but sprouts that appeared were few in number, small, and generally no threat to conifer regeneration (figs. 3 and 4).

*Figure 3.--Three years after treatment with 2-(2, 4, 5-TP) ester with an oil carrier, this bigleaf maple stump had no sprouts.*

*Figure 4.--Sprouts were few and stunted on treated stumps (left) compared with heavy sprouting on untreated stump (right). Treatment was 2, 4, 5-T ester in oil.*

Table 2.--Sprout control on bigleaf maple stumps, 3 years after treatment

| Chemical[1/] | Carrier[2/] | Stumps treated (number) | Stumps developing sprouts (number) | Average sprouting per treatment[3/] |
|---|---|---|---|---|
| 2,3,6-TBA, sodium salt | Stove oil with 5 percent bentonite and 5 percent pyrrolidone | 4 | 4 | M |
| 2,3,6-TBA, oil soluble | Stove oil with 5 percent bentonite and 5 percent pyrrolidone | 4 | 4 | H |
| 2,4,5-T, ester | Water | 5 | 5 | H |
| 2,4,5-T, ester | Stove oil with 5 percent bentonite and 5 percent pyrrolidone | 5 | 3 | L |
| 2,4,5-T, amine | Stove oil with 5 percent bentonite and 5 percent pyrrolidone | 4 | 3 | M |
| 2-(2,4,5-TP), ester | Water | 4 | 3 | L |
| 2-(2,4,5-TP), ester | Stove oil with 5 percent bentonite and 5 percent pyrrolidone | 5 | 3 | L |
| 2-(2,4,5-TP), amine | Stove oil with 5 percent bentonite and 5 percent pyrrolidone | 4 | 4 | M |
| Amitrol | Stove oil with 5 percent bentonite and 5 percent pyrrolidone | 4 | 4 | H |
| Amitrol | Water | 5 | 5 | H |

[1/] All treatments were applied at the rate of 32 pounds ahg.

[2/] Bentonite was added by percent weight; pyrrolidone by percent volume.

[3/] L = light, few small retarded sprouts 1 to 3 feet tall; M = medium, several individual sprouts and a few sprout clusters 1 to 5 feet tall; H = heavy, many individual sprouts and clusters up to 12 feet tall.

A water solution of 2, 4, 5-T ester was less effective than the oil solution of this chemical. Amine forms of 2, 4, 5-T and 2-(2, 4, 5-TP) and 2, 3, 6-TBA sodium salt in an oil carrier produced only moderate control of sprouting. Amitrol and oil soluble 2, 3, 6-TBA were ineffective.

Effect of Additives

Bentonite and pyrrolidone were added to several treatments on the assumption they would increase the effectiveness of herbicides. No pronounced improvement in control occurred, however, that could be ascribed to the additive even though bentonite in an oil carrier increased the amount of active ingredient adhering to trees or stumps by about 50 percent (table 3).

In recent trials by a cooperator at Oregon State College, a 90-percent defoliation of bigleaf maple was obtained, using 2-(2, 4, 5-TP) without bentonite or pyrrolidone.[3/] This contrasts with a 61-percent defoliation by a comparative treatment in this study in which bentonite was used.

## SUMMARY

A study to develop methods for the control of large bigleaf maples and the sprouting of bigleaf maple stumps through the basal application of herbicides was established in 1956. Chemicals used were 2, 4, 5-T; 2-(2, 4, 5-TP); 2, 3, 6-TBA; and amitrol. Although bigleaf maple showed strong resistance to herbicides, the study showed that satisfactory control can be obtained if treatments are carefully selected.

For the control of large or mature trees, a basal spray of 2-(2, 4, 5-TP) ester in an oil carrier is recommended. In treating trees, a basal spray proved more effective than the application of the chemical solution to frills.

For the control of stump sprouting, freshly cut stumps should be sprayed with ester forms of 2-(2, 4, 5-TP) in oil or water or the ester form of 2, 4, 5-T in oil.

Additions of bentonite, a thickener, and pyrrolidone, a penetrant, did not increase the effectiveness of spray solutions.

Repeat treatments, although not studied, may provide for more effective and more lasting control of bigleaf maple where this species aggravates the regeneration problem on coniferous forest lands.

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[3/] Newton, Michael. Progress in chemical control of certain weed trees, shrubs, and grasses on forest lands in western Oregon. 1960. (Unpublished master's thesis. Copy on file Oregon State College Library, Corvallis, Oreg.)

Table 3.--Average volume of solution and concentrate used per tree or stump

| Method of application | Average diameter of tree or stump | Carrier | Additive | Lb. ahg[1/] | Volume used per tree or stump | |
|---|---|---|---|---|---|---|
| | | | | | Solution | Concentrate[2/] |
| | Inches | | | | Liquid ounces | |
| Ax frill | 19 | Water | None | 200 | 4 | 2.0 |
| Basal spray | 19 | Stove oil | 5 percent bentonite | 32 | 30 | 2.5 |
| Stump spray | 15 | Water | None | 32 | 16 | 1.3 |
| Stump spray | 15 | Stove oil | 5 percent bentonite | 32 | 25 | 2.0 |

[1/] ahg = acid equivalent per 100 gallons of solution.

[2/] Calculated only for chemical concentrates containing 4 pounds acid equivalent per gallon.