

FOLIAR APPLICATION

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Aerial application of herbicides is the most rapid and efficient method of controlling southern upland hardwoods in large areas. (Fig. 1.)

CULL hardwood control now ranks as a leading method of stepping up production on forest lands of the South. For the past 25 years, the volume of cull hardwoods on upland sites has risen to the point where dense stands of small to medium-size trees of undesirable species occupy practically one-third of the growing space.

The usual method of controlling such trees is to apply sprout-inhibiting herbicides on an individual-tree basis. However, this is not practicable for controlling dense stands of small trees, or for use on large acreages for immediate control of a multi-storied stand.

For this reason, tests on control of woody plants by ground foliar application of herbicides with several types of spray equipment were started at the Alexandria Research Center

in 1945. On top of this, two experiments for aerial application of herbicides were initiated in 1957 and 1958 in cooperation with Louisiana State University, private landowners, and the Kisatchie National Forest.

Results show that foliar application of herbicides is effective for controlling woody plants growing in dense stands where single-stem treatments are not feasible, and aerial application has proved to be a fast and effective method of treating large areas covered with dense stands of trees (Figure 1). Herbicides may be applied with ground equipment, such as hand sprayers, small portable power sprayers, or power sprayers mounted on trucks or tractors (Figures 2, 3, and 4). Common compressed-air hand sprayers are suitable for low brush on small areas, if pressures of 25 pounds per square inch (PSI) or greater are used. Pressure for power sprayers varies with the type of equipment used. All spraying should be done according to state regulations.

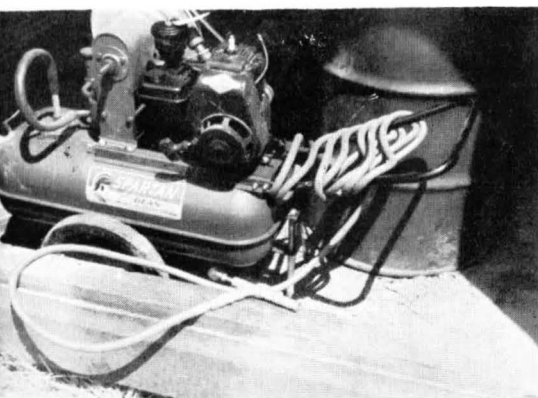
Foliar Treatments From Airplanes

Foliar sprays applied with airplanes are most effective soon after leaves are fully developed, during May and June in the lower South. The principal advantages of aerial application are that low volumes can be applied uniformly over large areas, and large trees can be treated along with the small ones. The disadvantages include possible drift of herbicides to sensitive crop plants, failure of material to reach all understory brush, and failure to kill species resistant to foliar application.

For foliar treatment from the air, 2 pounds of acid equivalent of low-volatile ester of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) per acre in an oil-water emulsion



Pressure-type hand sprayers may be used for spraying low brush on small areas or sparse stands. (Fig. 2.)



Small portable power sprayers are suitable for small jobs of applying herbicides to brush up to 15 feet tall. (Fig. 3.)

Tractor-mounted equipment is being used in Louisiana and Arkansas for foliar application of herbicides. (Fig. 4.)



by other herbicides. This treatment kills blackjack oak, post oak, and sweetgum regardless of stem size (Figure 5). It is more effective on the large stems than on small ones of red and black oaks. A partial to a complete kill of blackgum, hickory, and white oak has been obtained. Red maple and water oak have been difficult to kill.

In comparison, aerial application of a low-volatile ester of 2,4,5-trichlorophenoxypropionic acid (silvex) at 2 pounds per acre in a similar oil-water emulsion is effective for killing blackjack and post oaks of all sizes, and small red oak, hickory and blackgum. For sweetgum, the herbicide did the most damage to small trees, whereas for black and white oaks it was more effective on large trees. Poor results were obtained for water oak and red maple of all sizes.

The amine formulations of 2,4,5-T and silvex were considerably less effective than the ester formulations. Although some species are severely damaged by the amine formulations, these formulations are not considered to be suitable for general application for woody plant control.

Herbicides applied from an airplane are more effective on species that normally grow on ridges than on species that grow in creek bottoms. These upland species are usually killed or severely damaged



A mixed hardwood stand in southwestern Louisiana one growing season after aerial spraying with 2 pounds per acre of 2, 4, 5-T ester. (Fig. 5.)

even though some small trees may be overtopped by larger trees. However, under conditions where a heavy multi-storied stand exists, the under story trees may not be killed. For foliar treatments from the air, a swath width should be used that will give uniform coverage of the trees to be sprayed. For most of the spraying that has been done with an



Blackjack oak and post oak sprouts killed with 4 pounds of 2, 4, 5-T ester per acre in 100 gallons of water as a foliar spray applied from ground equipment. (Fig. 6.)

pinus. Almost all of this damage disappeared within one year after spraying.

Foliar Treatment With Ground Equipment

Foliar applications made with ground equipment are useful for controlling brush on small or isolated areas that cannot be treated efficiently by aerial application. Also, foliar applications made from the ground are useful for control of brush where over-story conditions do not warrant or permit other methods of chemical control.

Two to four pounds of acid equivalent to low-volatile ester of 2,4,5-T per 100 gallons of carrier, made up of 98 gallons of water and 2 gallons

of oil and herbicide, is an effective treatment for applying to woody plants with ground equipment. Species such as blackjack oak, post oak, red oak, sweetgum, black gum, hickory, and myrtle can be controlled successfully when stems do not exceed 15 feet in height (Figure 6). Up to 30 acres can be sprayed per day with some types of equipment. The rate of application may vary from 30 to 200 gallons of spray mixture per acre, the amount depending on the density and height of brush. The foliage and twigs should be wet thoroughly. The best time for applying foliar treatments with ground equipment is when leaves have fully expanded in the spring. However, they are effective any time during the growing season.

Solutions of ammonium sulfamate applied in concentrations of $\frac{3}{4}$ to 1 pound per gallon of water are effective foliar treatments. However ammonium sulfamate is more costly than 2,4,5-T ester and has corrosive properties that may damage equipment if proper precautions are not taken. It has the advantage of being safer than 2,4,5-T to use around sensitive crop plants, such as cotton, legumes, and vegetables. Herbicides, such as 2,3,6 trichlorobenzoic acid (2,3,6-TBA), 2,2-dichloropropionic acid (dalapon), 3-amino-1,2,4 triazole (amitrol), 3-(phenyl)-1, 1-dimethylurea (fenuron) amine salts of 2,4,5-T, and amine salts of silvex have not been as effective for foliar application from the ground as 2,4,5-T ester on most species. The application of 2,3,6-TBA in a solution con-

taining 8 pounds of acid equivalent per 100 gallons of water is effective on cherokee rose.