ROOTING AND AIR-LAYERING SOME SOUTHERN HARDWOODS

by

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For the past several growing seasons, studies in the vegetative propagation of southern hardwoods have been under way at the Athens-Macon Research Center of the Southeastern Forest Experiment Station. These studies have had two principal objectives: (1) to increase the number of tree species which can be successfully out-planted from cuttings in the Georgia Piedmont; and (2) to develop methods of vegetative propagation necessary for intensive work in hardwood genetics and tree improvement.

Several methods of vegetation propagation have been or are being explored, such as propagation by rooting of cuttings, air-layering, trench layering, and vertical splitting of seedling stock.

Rootings of Cuttings

Completed Studies: Vegetative propagation through rooting of cuttings has been attempted for eastern cottonwood, American sycamore, yellow-poplar, sweetgum, and water oak. Hardwood cuttings of eastern cottonwood, American sycamore, and yellow-poplar have been successfully rooted in the nursery bed.

Hardwood cuttings of eastern cottonwood, obtained and handled ac-=ding to the suggestions of Maisenhelder,[1/] have been successfully out-planted in the Georgia Piedmont. A half-acre outplanting of eastern cotton-wood in January, 1956, on a bottomland site near Athens, Georgia, had an 88-percent survival at the end of the first growing season. Average height of the stems was 7.0 feet. Ten percent of the stems were over 9 feet tall and maximum height growth was 10.8 feet.

Hardwood cuttings of American sycamore were also successfully rooted. The best trials gave 65 percent survival and maximum height growth of 8 feet during the first growing season.

Individual studies tested rooting and height growth in respect to the position of the cutting on the parent, size of cutting, and time of planting. The cuttings were 20 inches long made from 1-year-old sprouts of local origin in late October. Excluding the fall planting material, cuttings were packed in moist sphagnum moss and held in cold storage until the spring planting season. All plantings were made in beds in the nursery of the School of Forestry, University of Georgia, at Athens. Rooting was deter-

[1/] Maisenhelder, L. C., Planting and growing cottonwood on bottomlands. Miss. Agric. Expt. Sta. Bull. 485. 23 pp., illus. 1951.

mined by survival at the end of the first growing season.

The results of these studies on the rooting of American sycamore cuttings from first-year stump-sprout growth indicate that:

1. Butt cuttings have taller sprouts than cuttings taken from higher up the parent stem.

2. Thu best survival and height growth of butt cuttings were obtained from cuttings greater than 1/2 inch in diameter.

3. Sycamore cuttings were successfully rooted in fall plantings.

Yellow-poplar hardwood cuttings were rooted in fall plantings. Both stem and root cuttings of: 1-year-old yellow-poplar nursery stock were tested in the spring of 1955. Out of 150 root cuttings, none survived. Out of 500 stem cuttings treated with Rootone, twelve rooted (2.4 percent) and have developed into excellent stems. In cooperation with Dr. Reines, of Georgia Forestry School, 170 cuttings from the same stock were placed in the greenhouse with 16 combinations of various hormones and concentrations and a control. Only five of the 170 rooted, with no apparent difference due to hormone treatment.

Softwood cuttings of yellow-poplar, sweetgum, and water oak planted in nursery beds were unsuccessful. Yellow-poplar cuttings 12 inches in length from sprout growth of the current year and the previous year's growth were treated with indolebutyric acid at 1,000, 3,000, and 8,000 p.p.m, in talc. The check was untreated. No rooting was obtained from this series of treatments made in June or in a series of cuttings made in early July and treated similarly.

Sweetgum cuttings 12 inches in length from the current year's sprout growth were made in early June and treated with indolebutyric acid at concentrations of 1,000, 3,000, and 8,000p,p.m. in talc plus an untreated check. None of the treatments produced roots. Exploratory tests with cuttings taken in early July from water oak sprout growth were also unsuccessful.

Current Studies: Several studies in the rooting of cuttings are now under way. Hardwood cuttings of American sycamore, yellow-poplar, sweetgum, and green ash were installed in the Forestry School nursery in November, 1956. These studies primarily involve tests of the value of several hormones in rooting.

In addition, approximately 500 hardwood cuttings of American sycamore have been outplanted on an old-field bottomland site near Athens in a test of the effect of site preparation upon initial survival and first year growth of cuttings. These cuttings are 1-year-old sprout cuttings 1/2 inch or larger at the small end and 20 inches long. Site treatments included no preparation, double furrow plowing, disc harrowing, disc harrowing plus two cultivations, and TCA applied at the rate of 100 pounds per acre. Each

site treatment is being tested with and without fertilizer.

Air-Layering

The use of air layering as a method of vegetative propagation with southern hardwoods has been tested at Athens for American sycamore, green ash, sweetgum, eastern cottonwood, yellow-poplar, southern red oak, cherry-bark oak, red maple, and flowering dogwood.

The techniques for American sycamore, green ash, and sweetgum have not been perfected to the point that a high percentage of success can be expected. However, successful airs layers have been made with these species.

Although over 45 air-layers have been attempted on yellow-poplar, southern red oak, cherrybark oak, red maple and flowering dogwood, none has been successful.

Air layers with eastern cottonwood showed a relatively high percentage of success with the first attempts. Subsequent refinements in technique have made it possible to approach 100-percent root formation from cottonwood air-layers, With cottonwood, the most satisfactory results were obtained by applying indolebutyric acid at a concentration of 3,000 p.p.m. in talc to a scraped girdle of the current year's growth on young stems.

It was also found that the amount of root formation in eastern cottonwood correlated with the amount of photosynthetic surface above the air-layer:

Number of leaves above girdle	Ovendry weight of roots in grams
0	0.18
2	Dead
4	0.65
6	1.29
8	1.49
10	2.91

Working plans have been completed to further test air layers on species upon which preliminary tests were unsuccessful. A basic study on the influence of physiological factors on air layering is also in the planning stage.

In addition to vegetative propagation by rooting of cuttings and air layering, two other methods have been tested in exploratory studies. Trench layering of yellow-poplar has been tried, and excellent callous formation was obtained although no root formation occurred. Vertical splitting of seedlings, followed with a coating of the exposed plant tissue with lanolin in now being tested on yellow-poplar.

Summary

Exploratory studies on rooting and air layering of southern hardwoods have been in progress at the Athens-Macon *Research* Center for the past two

growing seasons. Although negative results were obtained on preliminary attempts at rooting cuttings and air layering of a number of species, they do not indicate that these species cannot be vegetatively propagated. Rather, they suggest that proper techniques have yet to be developed or those particular species.

Successful rooting of cuttings fr eastern cottonwood, American sycamore, and yellow-poplar and successful air layering of American sycamore, green ash, sweetgum, and eastern cottonwood are reported in this paper.