

TREE INJECTION METHOD TO CONTROL TREE REGROWTH¹

by Leo D. Creed

The Electric Power Research Institute (EPRI) was formed in 1973 to direct the research, both public and private, of all electric utilities. EPRI Project Number 214 was initiated to perform research to control regrowth of trees after pruning by injecting chemicals into trees under pressure. The Shade Tree and Ornamental Plants Laboratory located at Delaware, Ohio was chosen to do the research. This organization is a research arm of the United States Department of Agriculture. The staff of scientists who have been chosen to do the work are competent in every aspect to accomplish the research necessary to achieve our goals.

Trees and their regrowth are a major influence on service continuity and their control requires a substantial operating expense for electric utilities (approximately 500 million dollars annually). This was recognized by Edison Electric Institute (EEI) when they undertook a 9-year research project on chemical control of tree regrowth at Battelle Memorial Research Institute (EEI Project RP 24).

The EEI Battelle Project was started in August of 1958 and continued through December 31, 1967. The first five years were spent finding a material that would retard growth. The second five years were spent on the proper application techniques with ethyl ester of naphthalene acetic acid. In the summary of results it was stated that much more work should be done to find a better method of application and there should be additional screening of new chemicals for growth retardation.

It was agreed in the formation of Project 214 that the results from this research would be applicable for the control of tree regrowth by all power companies in the United States. The techniques developed should also be of considerable value to the public in maintaining

desirable growth rates for trees in yards, along streets, and in parks.

A number of chemicals have shown effectiveness with regard to tree regrowth. The limiting factor in using these chemicals has been inadequate means of applying them. Some chemicals can be applied as sprays, however, public pressure against spraying has rendered this approach unacceptable. A technique developed by the Agricultural Research Service allows the high-pressure injection of large volumes of soluble materials into trees in a relatively short period of time. Such injections result in the complete distribution of these materials into the above-ground parts of large trees.

Injection of chemicals into trees has a number of advantages. Public objections to spraying are circumvented. The injection results in efficient use of chemicals because none is wasted through evaporation into the atmosphere. Injection of a tree involves less labor cost than spraying or topical applications of wound dressings.

A number of chemical growth regulators have been recently developed that effectively retard tree growth. A number of these compounds profoundly reduce growth in a wide range of woody species with no adverse effects. Notable among these are the "morphactins" and such new experimental compounds as N/A 10637 and N/A 10656 developed by the Niagara Chemical Company. The Battelle Project demonstrated the high activity of carvadan.

Project 214 will involve the application of promising growth regulators to a broad range of tree species with subsequent observation of their effects on regrowth. Once the more promising compounds are identified, procedures will be worked out to determine effective timing of

¹Presented at the 50th International Shade Tree Conference in Atlanta, Georgia, August 20, 1974.

the application, dosages, and the environmental impact of the treatments.

Research will also be conducted on chemical formulations, volumes needed, effects of pruning on applications, seasonal effects, variation in response among species, geographic variation in response, and environmental impact of the treatments. Also, extensive research is needed to adapt the injection system for its most efficient use in the field. Information is needed on the number of injection points necessary, optimum pressure required, and the most efficient hook-up to the tree. This research will require at least five years for the proper evaluation of results. The primary evaluation procedure is designed to eliminate unsatisfactory candidate materials quickly.

Secondary evaluations and field trials will be limited to those compounds which show considerable promise in preliminary screening. No treatment can be recommended for use in regular clearance operations until it has been checked for at least two growing seasons in limited field use. This should provide reasonable assurance that it can be used without hazard to trees or operator and that it will perform effectively under varying field conditions.

The evaluation program described above is supplemented by basic research on the mode of action of selected compounds. This provides a sound basis for the development of a safe and effective treatment. Physiological factors controlling initiation of bud growth and stem elongation are being considered. An extensive research effort has already been given to these basic problems and all published data on the subject will be taken into account in planning and investigations.

The initial phases of the investigation are conducted in the laboratory and greenhouse. As rapidly as research developments warrant the more promising treatments are studied under field conditions. Ultimately it is planned that these treatments which have proven to be both safe and effective will be formulated for service trials on a limited scale in selective line clearance operations in cooperation with member companies of EEI.

Through research, economies could approach a 30 percent reduction in this cost by extending the tree trimming cycle. This for many companies will approach one-third of their operating budgets.

Early in 1974, a steering committee was formed consisting of Henry M. Ezzard, Georgia Power Company; H. J. Stefanetti, Pacific Gas and Electric Company; Eric S. Ulrich, Metropolitan Edison Company; J. F. Doering, Ohio Edison Company (EEI representative); Leo D. Creed, Ohio Edison Company (chairman); and F. S. Young, EPRI representative. The first meeting was held in Columbus, Ohio in May, 1974. At this meeting, plans were formulated and, after discussion, a course of action was developed for the first two years of research.

The highlights of these plans are as follows: 1) the process and materials will need EPA recognition and approval; 2) a secure label will be a necessity. It was felt desirable to try for a material that is already labeled thus making the labeling much simpler to obtain; and 3) the experiment would be applied by the injection method, basal treatment, spraying, and capuled material. This group of methods would assure the proper checks to prove the most effective to use.

A timetable of events follows:

1974

1. Repeat treatment on 200 trees injected in 1973.
2. Experiment with nine of the most promising chemicals.
3. Treat 400 additional trees.
4. Correlate injections with pruning.
5. Assess damage from the injection process.
6. X-ray examination to determine chemical movement in the plant.
7. Screen candidate compounds in the greenhouse.
8. Growth measurements to be correlated with 1973 growth.
9. Bioassay materials, study the phototoxicity. This will be done with greenhouse plants.
10. Study procedures on greenhouse plants.
11. Determine the right time to treat trees.
12. Determine the best pressures/species to be used.

1975

1. Try for one chemical for further development.
2. Try for proper procedure for treatment.

1976

1. Best application method will be needed.
2. Move research to the streets and roads in the different geographical sections of the country.

The first quarterly report by Dr. Charles L. Wilson of the Shade Tree and Ornamental Plants Laboratory included:

1. First injections were made in June 1974. These trees were topped in April, 1974.
2. Materials used consisted of Cycocet, Slo-Gro, Sustar 2-S, Regim 8, Alar 85, Maintain CF125, and Arest. The trees were photographed and measurements were recorded. Measurements will continue during the growing season to determine the rate of regrowth.
3. A second series of injections were made July 15 to 18. Only three chemicals were used at this time—Main-

- tain CF125, Slo-Gro, and Arest, including a set of check trees. All trees were topped prior to injection.
4. The fall activities will include work on 180 elm and 405 silver maple seedlings in the greenhouse.

The next meeting of the steering committee is planned for November 1974. At this time data accumulated over the summer will be evaluated and a plan of action formulated for the growing season of 1975.

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ABSTRACT

Smith, E. M. and K. W. Reisch. 1974. **Fertilizing trees in the landscape — Progress report.** Research Summary 79, OARCD, Wooster, Ohio.

A fertilizer study was conducted in a relatively poorly drained, Blount and Morley silt and Pewamo silty clay-loam area at the USDA Shade Tree and Ornamental Plants Laboratory in Delaware, Ohio. The trees were treated on May 5, 1971. All trees receiving fertilizer treatments also received 6 lb. of actual phosphorus and potassium per 1000 sq. ft. at the time of nitrogen application. The drill hole treatment consisted of 20 holes per tree, 12 inches deep, in two concentric rings covering an area of 100 sq. ft. under each tree. The trees were pruned as needed and the area between the trees was maintained in sod and mowed periodically. On Sept. 18, 1973, after three growing seasons, the caliper of the trees was measured 1 foot from the ground. The results of caliper measurements are shown in Table 1.

TABLE 1. — Effects of Fertilizer Treatments on the Caliper Growth of Three Tree Cultivars 3 Years After Treatment.

Treatment	Linden	Crabapple	Maple Inches	Average Three Cultivars
Control, No fertilizer, No holes	2.0	2.7	2.5	2.4
Holes and S. R. B. - No fertilizer	2.9	3.0	2.8	2.9
3 Lb. N/1,000 sq. ft. - Drill Hole	3.0	2.8	2.9	2.9
6 Lb. N/1,000 sq. ft. - Drill Hole	3.0	3.1	3.2	3.1
9 Lb. N/1,000 sq. ft. - Drill Hole	3.0	3.1	2.9	3.0
3 Lb. N/1,000 sq. ft. - Surface	3.0	2.8	2.8	2.9
6 Lb. N/1,000 sq. ft. - Surface	3.2	3.3	2.9	3.1
9 Lb. N/1,000 sq. ft. - Surface	3.1	3.1	3.1	3.1