

## New method of growing tree clones may help scientists in conservation efforts

### What is this research about?

The American elm (scientific name *Ulmus americana*) was once a favourite urban landscaping tree admired for its stately, leafy canopy and valued for its high quality timber and ability to grow in an urban environment. Since the introduction of the Dutch elm disease (DED) to the United States in the 1930s and Canada around 1945, nearly 95% of American elms in North America have died off. Dutch elm disease, which was accidentally introduced from Europe, is caused by two species of *Ophiostoma* fungi. Efforts to breed resistant varieties of American elm have been slow, mostly due to long generation times and the large amounts of land needed for such breeding programs. Although a few DED-tolerant varieties have been developed, these are not truly “resistant”, as they all still harbour the fungus and show some signs of disease. Some scientists hope that new biotechnologies may be able to overcome these obstacles. Potential biotechnology approaches include: producing large numbers of plants quickly using in vitro propagation techniques (growing plant shoots in the laboratory), creating new hybrids using protoplast fusion, and identifying and/or introducing resistance genes through genetic techniques.

### What did the researchers do?

Fresh buds (in the spring) and dormant buds (in the fall) were collected from a mature elm tree that had survived several DED epidemics. “Microshoots” cut from each bud were grown on culture media with varying levels of different plant hormones. After 6 weeks, shoot height and the number of shoots and leaf buds (nodes) were measured for each microshoot. The newly created shoots were then used to start the next generation, and this was repeated for five generations. Microshoots from each generation were transferred to a “rooting” substrate, and after 4 weeks the percent of shoots that developed roots and the number and length of roots were measured. Next, these rooted plants were transplanted into successively larger pots and grown in a greenhouse.

### What you need to know:

Researchers developed a technique for growing clones of mature American elm trees, which may improve conservation of this and other endangered tree species. This method involved optimizing the levels of plant hormones in the growing substrate while blocking the action of naturally occurring growth-regulating hormones called auxins.

## What did the researchers find?

The best substrate for elm shoot development contained the plant hormones 6-benzylaminopurine (BA, 2.2 micromoles/L) and gibberellic acid (GA<sub>3</sub>, 0.29 micromoles/L). Adding PCIB (5.0 micromoles/L) also improved shoot production in later generations by countering naturally produced plant hormones called auxins. Spring shoots produced healthier and more vigorous plants. The best rooting substrate contained indole-3-butyric acid (IBA, 2.5 micromoles/L) and activated charcoal (0.8%). Rooted elm plants readily adapted to the greenhouse environment, with a survival rate of 90%.

## How can you use this research?

**Arborists and foresters** can use this research to develop and multiply American elm clones that are resistant to Dutch elm disease.

**Plant scientists** can further this research by using this technique to develop large “clone libraries” of mature American elm plants, in order to screen for resistance to DED or other desirable traits. Also, this technique could be modified for other hard to grow endangered tree species.

## Keywords:

American elm, *Ulmus americana*, microshoot, growing substrate, auxins, plant hormones, shoot development

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