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USDA/AFA

Crossing American (left) and Siberian elms may create a healthier strain.

### GENETIC MANIPULATION

## Elms for the Future

by John Ludwigson

An American city without elm trees would be something like a baseball game without hot dogs. The tall, stately trees have shaded many an American home for generations, made cool, green tunnels of our streets and diverted the icy blasts of winter in towns from coast to coast.

But the elms as we know them are doomed. An incurable fungus—Dutch Elm Disease—is gradually spreading through the United States, choking off the life of tree after tree, leaving only peeling stumps in its wake.

Though the disease first appeared in this country in 1930, brought in on elm logs from the Netherlands, it has done most of its damage in the last 10 years. Efforts to contain it have been sporadic, ranging from mobilization of entire towns in some places to shoulder-shrugging acceptance of the pestilence in others.

Even those who know most about it admit they really understand very little—just why some trees seem to be immune, exactly how the disease attacks a tree are still mostly mystery.

There are two ways to deal with the disease, the botanists say. Present stands of American elm can be largely protected by DDT spraying to kill the beetles that transmit the disease or new, disease-resistant varieties of elm can be developed.

This latter effort has occupied the minds of a good many plant biologists

for more than three decades without producing a really satisfactory solution. There are disease-resistant elms now available, but they are not as desirable shade trees as the native American elm. All efforts to cross American elms with resistant species such as Siberian elms, combining the best features of both, have failed.

The first successful such cross may be in the offing, however, if the theories of scientists at the Department of Agriculture's Plant Industry Station in Beltsville, Md., prove out.

American elms have twice the number of chromosomes as any other species. Concluding that the failure of earlier hybrids was due to that fact the scientists have prepared a tailor-made mate by doubling the chromosome count in Siberian elm seedlings.

They did it by daubing each plant, as soon as a growing bud appeared, with a drug called colchicine that is also used in the treatment of gout. Colchicine, for some reason that is not yet clear, stops the cells in the bud from dividing, but not until the chromosomes in each cell have replicated, creating an extra set of chromosomes.

As each seedling grew, the scientists carefully pinched off every unaltered leaf and stem, permitting only the branches with doubled chromosomes to grow. Even then, they did not get entirely altered plants.

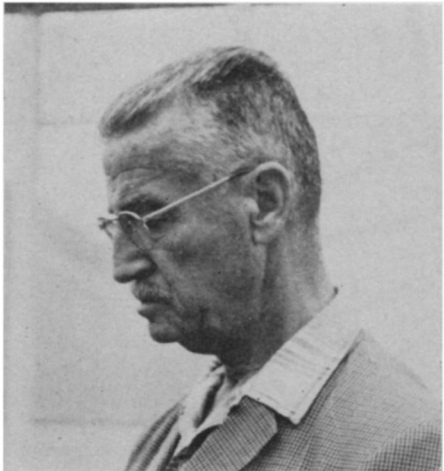
But, by patient selection and rooting

of the twigs that seemed most promising, they slowly developed plants that were more and more completely composed of double-chromosome cells.

Recently, they sent a dozen healthy, 15-inch high double-chromosomed Siberian elms to the research station at Delaware, Ohio, the center of Dutch Elm Disease research in the United States. There, the elms will be raised to adulthood and mated with American elms.

The hitch in this, right now, is that it normally takes 15 years for an elm to grow to the point where it flowers. Until it flowers there is no way of crossing it with any other tree.

"We hope to speed this up to five



Gary Laurish

Dr. Dermen: Still a long way to go.

years," observes Dr. August E. Kehr, chief of the Vegetable and Ornamentals Research Branch of the ARS Crops Research Division. By crowding their roots in pots, he explains, the scientists hope to get the Siberian elms to flower while they are still immature trees.

If they succeed, the program will still have taken eight years from the time Drs. Haig Dermen and Curtis May began work on the Siberian elm seedlings to the day botanists at the ARS station in Delaware, begin the attempt to cross them with normal American elms.

Even if the crossing is successful, it will be many more years before they can determine what sort of hybrid they have produced, or if, indeed, it is resistant.

The key to the project is the genetic manipulation of the Siberian elms. It took Drs. Dermen and May three years to come up with a dozen Siberian elm seedlings with double the normal numbers of chromosomes in each cell.

With a large dose of luck, their hybrid descendants will line the streets of 21st-century America with graceful, green, disease-resistant branches. At least until a new disease comes along.

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