Bringing them back, one clone at a time

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The anticipated recovery of the American Chestnut may have been sped up by years thanks to a grafting technique developed by Dragan Galic at the Simcoe Research Station.

It involves sprouting a nut and than attaching a twig from a resistant tree to the sprout. The following year, new wood from the cloned tree can be propagated using vegetative means.

Dragan Galic

Trees grown using the technique will produce pollen in a year or two instead of the five or six that's normally required. It could also prove useful in increasing the supply of resistant nursery stock.

"This is could help us to propagate resistant chestnuts for commercial purposes quickly," Galic said.

Galic works with Adam Dale, professor emeritus, at the University of Guelph's Simcoe Research Station. Together with the university, the project is supported by the Canadian Chestnut Council and a variety of other funding partners.

It's been a long road to resistance. In the U.S., a breeding program has been in place for decades.

The program at the Simcoe station dates back to 2000. There are now three plantations where trees are being tested for resistance, two in Elgin County and one near Brantford.

Dale and Galic have made use of U.S. genetics brought to Canada in the form of pollen from Sandra Anagnostakis at the Connecticut Agricultural Experimental Experiment Station. The US program has focused on crossing the American chestnut with Chinese, Japanese and European chestnuts which have blight resistance.

Through a backcross process, the resistance can be brought forward while reducing the level of introduced genetics.

The two are also working with what is felt to be Canadian resistance from 26 surviving "mother trees" in Ontario.

"We couldn't find any statistical difference in the level of resistance between our native stock and the American stock," Galic said.

There are three main forms of resistance.

One relates to the bark which provides a barrier to disease entry. Another concerns the ability of trees to cover wounds with callusing. The third relates to the production of phytoalexins – plant-derived antibiotics – that attack the blight.

The breeding program in simplistic terms involves crossing the most resistant trees – those that develop the smallest lesions when exposed to the disease. Through successive generations, it's hoped the level of resistance can be incrementally increased to the point that American chestnut populations can be reestablished throughout their former Ontario range, Gale said.

That could begin in a small way in as little as five years, Galic said.

"These are fast growing trees. I'd like them to be able to live at least 50 years (before succumbing to the disease)," he said.

"We already have about 30 people on a list who are interested."

Once established in the wild, nature will take over, Gale said. As the years, decades and centuries past those trees with greatest resistance will be favoured.

Along with blight resistance, tree structure, nut size and other aspects of the American chestnut are being considered.

Prior to the arrival of the Chestnut blight in the early 1900s, the species – Castanea dentata – was valued for its high quality lumber and as a food source for people and wildlife.

It was a dominate species in much of the Eastern United States, especially through Appalachia.

In Southwestern Ontario, the Eastern forest giant may have comprised as much as 40 per cent of the canopy. Today, there may be as few as 1,000 to 2,000 left.

There are few large surviving American Chestnut trees in Ontario. Some appear to possess resistance; others have been able to avoid the tree-killing blight out of sheer luck. In the photo is the late Mike Nemeroski, a chestnut breeder and grower.

Pollen was used to introduce Chestnut blight resistance from the U.S. to Canada

Callusing is one mechanism used to fight Chestnut blight in resistant trees.