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Forest fungus factory: New technology fights hemlock pest

July 21, 2011

An invasive insect, hemlock woolly adelgid, has been marching north along the Appalachians, killing almost every hemlock tree in its path. The adelgid has devastated forests in Georgia, Tennessee, and Virginia. The pest recently arrived in Vermont and other parts of New England. So far, only extreme cold stops the adelgid.

But now a University of Vermont scientist has developed what he calls a "fungal microfactory" technology that promises to give forest managers and homeowners a tool to fight back.

Working with the U.S. Forest Service, the State of Vermont, and others, Scott Costa, a UVM entomologist, has combined sweet whey, a byproduct of cheesemaking, with an insect-killing fungus to create an EPA-registered bio-pesticide that, in trials, was able to reduce the pest's growth rate.

In Vermont trees with a high level of infestation, the treatment brought down the population of the adelgid, while in adjacent control trees, that were not treated, the pest population tripled.

This mixture, that Costa calls Mycomax, seems likely to provide cost-effective protection for hemlock trees in native forests as well as landscaping contexts.

In 2009, Costa had success with field trials on one-acre forest plots in Tennessee, using helicopters to drop the fungus mixture into the epicenter of the adelgid's devastating attack. Though no scientists think the pest can be wholly eliminated, these trials reduced the growth rate of adelgid by fifty percent. "That's the first time that's been demonstrated with an insect-killing fungus," Costa says. And slowing the pest's growth seems likely to give trees a fighting chance of recovery.

Over the last year, Costa has been testing the same technology on single trees in Townshend State Park in Vermont to see if ground-based spray applications will work, too. On June 7, 2011, he released a report to the State of Vermont that presents data showing that, "treatment by the fungus suppressed HWA population growth." These results are will also be presented in a forthcoming U.S. Forest Service publication.

The entire range of eastern hemlock and the less common Carolina hemlock, from southern Canada to Georgia, is currently at risk from the adelgid, a bug native to Asia that arrived in the United States in the 1920s and made its way to the East Coast in the 1950s.

The stakes are high: hemlock provides habitat for dozens of mammals and birds. Arching over streams, it creates deep shade critical for the survival of trout and other fish. Some scientists think hemlock is a so-called keystone species, holding up a whole ecosystem.

The fungus Costa is using, lecanicillium muscarium, is native to most parts of the world, including the US. Typically, fungal applications for pest control are used in high-value crops, like those grown in greenhouses, and the fungus is produced in a traditional brick-and-mortar factory and then released in the target location. This approach can be effective, but expensive.

Costa's innovation takes a low-value waste-product, sweet whey, and uses it as a growth medium to promote populations of the fungus out in the natural environment where it is wanted. This has the potential to greatly reduce the cost of treatment and to allow the fungus to self-replicate at significant rates after the initial treatment.

Hemlock is a major tree in Eastern forests; it's the third most common tree species in Vermont. But it could soon drop off the list, going the way of the now-vanished chestnut and elm. Costa's data suggests that there could be a less-bleak future for hemlock trees with help from fungal microfactories.

Provided by University of Vermont