Fungus may help stop invasive spread of tree-of-heaven

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A naturally occurring fungus might help curb the spread of an invasive tree species that is threatening forests in most of the United States, according to researchers.

Researchers tested the fungus—Verticillium nonalfalfae—by injecting it into tree-of-heaven, or Ailanthus, plots, according to Matthew Kasson, who recently received his doctorate in plant pathology and environmental microbiology from Penn State. The treatment completely eradicated the tree-of-heaven plants in those forests.

"It appears that this treatment is effective in Pennsylvania and could be used as a bio-control agent throughout the United States," said Kasson.

Since tree-of-heaven's introduction into Pennsylvania in the 1780s, the tree has spread from a rare and prized plant for collectors to a nuisance in at least 40 of the 48 contiguous states, according to Kasson.

"Trying to find the best way to get rid of tree-of-heaven has become a serious land-management issue," said Kasson. "Fire doesn't seem to work and chemicals and mechanical means are expensive and ineffective, too."

Using a hatchet that is designed to pump fungal spores into the trees, the researchers tested the fungus on 14 tree-of-heaven stands in south-central Pennsylvania. Usually, it takes three blows of the hatchet to deposit the entire inoculation of about 30 million spores for each tree.

The inoculation kills the entire tree, including the sprouts.

"It's important that the sprouts are killed, too, because, tree-of-heaven has an extensive system of sprouts that spread just above the ground surface, which is one of the reasons the tree is so difficult to manage," said Kasson. "The sprouts can immediately grow even if the top canopy of trees dies."

Don Davis, professor of plant pathology, Penn State, said that in 2003, he noticed a large number of tree-of-heaven deaths in a southwestern Pennsylvania forest. The foresters in the area then took him to a site where large-scale wilt was affecting the trees.

"There were hundreds if not thousands of dying and dead tree-of-heaven in the area, which is very unusual, because tree-of-heaven is very hard to kill," said Davis.

The researchers noticed a number of Ambrosia beetles near the infected stands, leading them to theorize that the fungus, often carried through the forests by beetles, was involved in the tree deaths.

"The Ambrosia beetles may explain some of the long-range spread of the disease," said Davis. "One theory is that the beetles feed on an infected tree and then take those spores to another healthy tree, which could be miles away."

The effect that the fungus has on other plants will be the subject of further research, Kasson said. However, preliminary studies on the vegetation that surrounds Ailanthus groves indicate the fungus may not harm nearby plants and trees. Only a small percentage of plants near the infected tree-of-heaven plots showed signs of being harmed by the fungus.

"There are still tests and studies that need to be done in the future to make sure it's completely safe," said Kasson. "As a researcher, you can't be sure until the results of all of those tests are in, but, at this point, I am cautiously optimistic."

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