Fungi Transplants Could Help Restore Native Plants on Shrinking Prairie Land

Wed, 06/06/2018 - 3:50pm Comments by **Kenny Walter** - **Digital Reporter** - **@RandDMagazine**

Megan Brauner, an undergraduate student student in Tanya Cheeke's lab, is researching the ability of fungi to restore native plant environments. Credit: Washington State University

Transplanting fungi may be the key to restoring the tall grass plants in the prairies, which are becoming increasingly endangered, said Tanya Cheeke, an assistant professor of biology at Washington State University.

According to Cheeke, less than 1 percent of prairie land remains. The ultimate demise of this land began with European settlement and western expansion, where the majority of prairie land eventually became agricultural sites.

Cheeke said prairie plants are important because they provide a pollinator habitat, have deep roots that hold soil in place, and aid in increasing soil carbon storage. Threatened or endangered insects and butterflies also utilize the plants.

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However, common restoration efforts are often inadequate.

"A lot of times in restorations, people focus on the seeds," said Cheeke in an interview with *R&D Magazine*. "What happens is only a subset of those actually establish and grow. It turns out those are what we call more of the early successional plants, they are able to colonize disturbed ecosystems pretty easily. These more rare plants, we call them late successional plants, and they are really only found mostly in undisturbed environments."

For the last two years, Cheeke's research team has focused on restoring the tall prairie grass native to Kansas

Some native plants are more dependent on mycorrhizal fungi than invasive species, so when the fungi is disturbed, the plants do not compete as well with invasive species, ultimately disrupting the natural ecosystem and inhibiting many natural processes, said Cheeke.

"It turns out that a lot of these slow growing native plant species really won't grow without their microbial symbiont," Cheeke said. "So having these restorations, restoring the below ground community at the same time as the above ground restorations turned out to be really important."

Mycorrhizal fungi form a symbiotic relationship with many plant roots, which helps stabilize the soil, conserve water and provides a habitat for many birds and insects.

In recent months, the researchers have analyzed the spread of fungi from an inoculated soil environment in Kansas to see how far the fungi had spread into a restoration area. Soil samples were collected at 0.5 meter, one meter, 1.5 meters, and two meters from the site of the inoculation in each plot one year after planting.

The researchers then tested the samples for the presence of fungal DNA to see if the inoculated mycorrhizal species had reached the various distances from the inoculation points.

"The ones that respond most strongly to fungi are the ones that are the most dependent, suggesting that they need to innolculate before they go into the field," Cheeke said.

Cheeke said the team has developed a pair of methods to

transplant the fungi into the plants.

"We are trying two different methods, one is going into these remnant prairies that have never been disturbed and take small amounts of soil and use that as whole soil inoculant," she said. "Another method is to go and take out small pockets of soil and then isolate just the fungi.

"We then grow the fungi in the greenhouse where basically we have a never-ending supply of fungi, we just keep propagating them," she added. "That actually turns out to be more sustainable."

Cheeke is working with a team of undergraduate and graduate students to complete the research. A group of her undergraduate students recently presented their project during the WSU Tri-Cities Undergraduate Research Symposium and Art Exhibition. Those students include Catalina Yepez, Jasmine Gonzales, Megan Brauner and Bryndalyn Corey.

The researchers are now working in the Palouse area of Eastern Washington, which has a drier climate than Kansas. They now plan to look at how microbes change across gradients of disturbed environments compare to pristine environments and eventually develop soil restoration strategies that can be implemented in other environments. The undergrad team also plans to collect data on plant-pollinator interactions in the prairie restoration plots.

"By using mycorrhizal fungi to help establish a greater variety of native plants in disturbed ecosystems, we're hoping to improve habitat for native and/or imperiled pollinators," Cheeke said.

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