NSF Microbial Observatory
Nymph Creek, Yellowstone National Park

Press Release, Dec 2002:

PLANT-FUNGAL SYMBIOSIS FOUND IN HIGH-HEAT EXTREME ENVIRONMENT

ARLINGTON, Va. -- Researchers examining plants growing in the geothermal soils of Yellowstone National Park and Lassen Volcanic National Park have found evidence of symbiosis between fungi and plants that may hold clues to how plants adapt to and tolerate extreme environments.

The research was funded in part through the National Science Foundation's (NSF) Microbial Observatories Program and published in the Nov. 22 issue of the journal Science.

Biologists Regina Redman of the University of Washington and Joan Henson of Montana State University and their colleagues examined 200 samples of Dichanthelium lanuginosum, also called "Geyser's Dichanthelium," for fungal colonization. They found what may be a new species of the fungus Curvularia that survives only in temperatures greater than 98 degrees when it associates with plants.

The researchers suggest that thermotolerance may occur through symbiotic mechanisms like heat dissipation by pigment, such as melanin, or the activation of a "biological trigger" that tells the plant to react to temperature changes more rapidly or strongly than plants that lack the fungus.

The researchers grew sample plants with and without the symbiotic fungus in a laboratory and heated the soil to test thermal resistance. The plants without the fungus shriveled at 122 degrees, whereas those plants with the fungus tolerated the heat for three days. The plants were also subjected to intermittent temperatures as high as 149 degrees. The fungus-free plants died, but the fungus-bearing plants survived for 10 days.

The researchers also demonstrated that the plants provide thermal protection to the fungus by isolating it in plant roots that had a field soil temperature of 113 degrees.

"Scientific understanding of how life can thrive in such extreme environments is at its infancy," said Microbiologist Matt Kane, NSF's Microbial Observatories Program Director. "Research funded by NSF's
Microbial Observatories Program is demonstrating that when you look in interesting places, you discovery interesting life forms and interrelationships, such as these fungi and their plant partners."

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Microbial Observatory

Nymph Creek
Yellowstone
National Park

* Thermal (55-60 °C at source)
* Acidic (pH 2.7)
* Spring-fed creek flowing into Nymph Lake
* Vivid green algal mat dominated by Cyanidium caldarium-like species

* Water Chemistry data
  Iron (2.85 mg/liter)

Photo by D.J. Patterson