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Caption: Louis Tisa, professor of molecular, cellular and biomedical sciences at UNH, in a plant growth chamber at the Institut de Recherche pour le Developpement in Montpellier, France, where he is collaborating on research that explores the symbiotic relationship between the bacteria Frankia and Casuarinas.
Credit: Courtesy of Louis Tisa

DURHAM, N.H. – University of New Hampshire microbiologist Louis Tisa has received two grants totaling $498,115 to advance understanding of the actinorhizal plants, widespread woody plants with potential to enrich nutrient-poor and contaminated soils.

The United States Department of Agriculture (USDA) awarded Tisa, a professor of molecular, cellular and biomedical sciences, $399,000 to explore the symbiotic relationship between the bacteria *Frankia* and Casuarina, an actinorhizal plant. *Frankia* forms root nodule structures on Casuarina that convert atmospheric nitrogen to ammonia, allowing Casuarina to access nitrogen – a nutrient essential to plant growth – from the air and to thrive in areas with nitrogen-poor soil.

Working with colleagues at the Institut de Recherche pour le Developpement in Montpellier, France, Tisa is researching the signaling process in the relationship between *Frankia* and Casuarina that lets each organism identify as beneficial.

"The plant has to know that the microbe is a friend, not a foe, and the microbe needs to tell the plant, 'build me a structure,'" Tisa says. "What we're interested in is, what are the words? How are they talking?" Tisa and his collaborators, who together will have sequenced 10 *Frankia* genomes, know that the signal is chemical but not whether it is secreted or exists on the surface.

The USDA grant will help fund five graduate students and one undergraduate student working with Tisa. "We're excited. There are lots of preliminary results," he says. "If we can figure out how these things communicate, we can figure out how to enhance the performance of these trees." Tisa notes that actinorhizal plants pose a more sustainable solution to stabilizing and enriching soils than the introduction of chemicals.

His second grant, $99,115 from the U.S.-Egypt Science and Technology Joint Research program through the USDA Foreign Agriculture Service, will fund outreach, exchange and collaboration with Egyptian scientists to study Egyptian *Frankia* strains and their relationship with Casuarina, which is being used in Egypt to reclaim desert areas. The three-year grant supports collaboration with Samira Mansour from Suez Canal University in Egypt, who was a visiting scientist in Tisa's laboratory.

Tisa's work receives additional funding from the Agricultural Experiment Station and the College of Life Sciences and Agriculture at UNH.

The University of New Hampshire, founded in 1866, is a world-class public research university with the feel of a New England liberal arts college. A land, sea, and space-grant university, UNH is the state's flagship public institution, enrolling 12,200 undergraduate and 2,200 graduate students.

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Photographs available to download:

http://www.unh.edu/news/cj_nr/2009/nov/23tisa_02.jpg
Caption: Louis Tisa, professor of molecular, cellular and biomedical sciences at UNH, in a plant growth chamber at the Institut de Recherche pour le Developpement in Montpellier, France, where he is collaborating on research that explores the symbiotic relationship between the bacteria *Frankia* and Casuarinas.
Credit: Courtesy of Louis Tisa

http://www.unh.edu/news/cj_nr/2009/nov/23tisa_01.jpg
Caption: Casuarina trees colonizing a lava field on La Réunion island in the Indian Ocean.
Credit: Y. Dommergues