Smithsonian Tropical Research Institute

Mar. 18, 2010

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Smithsonian Hosts 2010 International CAM Workshop in Panama

Plants can't escape from stressful environments, but they can be surprisingly flexible when subjected to extreme temperatures and shifting rainfall patterns—both likely to become more common under current climate-change scenarios.

Researchers from nine countries will discuss one system that plants use to cope with stress at the 2010 International CAM Workshop, hosted by the Smithsonian Tropical Research Institute at the Earl S. Tupper Research and Conference Center in Panama City, Panama from March 22-24, 2010. They will present new information about sources of biofuels, plants' abilities to adapt to extreme temperatures and drought, and models of flexible plant gene expression in response to environmental change.

Some of the most conspicuous tropical plants, the orchids and bromeliads, grow high on exposed tree branches where water is scarce even during the rainy season. In Panama, there are more than 1,150 orchid species and 180 species of bromeliads. The most extreme epiphytes—plants that grow on other plants—include the nearly rootless air plant Tillandsia usneoides, Spanish moss.

A key innovation that makes it possible for these plants to occupy such stressful environments is their water-conserving form of photosynthesis. By taking in atmospheric carbon dioxide at night when it's cool outside--plants that have CAM, for Crassulacean Acid Metabolism, lose less water in carbohydrate production than do plants that take up carbon dioxide during the day and use the more standard C3 photosynthesis.

The astonishing diversity of CAM species including pineapple, aloe, cacti and Clusia trees native to Panama, makes them a major focus of the tropical plant physiology program at the Smithsonian. All trees are not alike in terms of water use. For example, because of its water-conserving CAM pathway Clusia rosea, called Copé in Spanish, needs 80% less water for biomass production than teak, a C3 plant.

Because they are so diverse, CAM plants provide excellent systems to understand the range of ways that plants photosynthesize and how these systems evolved. Katia Silvera, doctoral student at the University of Nevada, Reno, Department of Biology and Biochemistry, whose father is one of Panama's most well-respected orchid collectors, will discuss the genetic regulation of CAM in orchids.

Biofuels proponents usually focus their attention on corn or sugar cane as new sources of energy. To produce biofuels without cutting down rainforest or competing with crop plants, one solution is to grow agave, a CAM plant, on marginal land. Joe Holtum, School of Marine and Tropical Biology, James Cook University, Australia will talk about turning agave, usually grown to produce tequila, into alcohol to fuel cars instead of all-night binges.

STRI Staff Scientist and conference organizer Klaus Winter will present his latest findings on highly specialized plants that are able to switch back and forth between CAM and C3 photosynthesis depending on rainfall.

CAM and other adaptations to changing conditions reflect life's evolutionary history, help to explain plant distribution and aid in predicting plant species response to climate change.

The Smithsonian Tropical Research Institute, headquartered in Panama City, Panama is a unit of the Smithsonian Institution. The institute furthers the understanding of tropical nature and its importance to human welfare, trains students to conduct research in the tropics and promotes conservation by increasing public awareness of beauty and importance of tropical ecosystems. www.stri.org