

MORE Science at UTSA

Environmental Science and Engineering

Spring 2007 Seminar Series

Where: Loeffler room (3.03.02) in the BioScience Building

When: 4:00 PM – 5:00 PM on April 13, 2007

Refreshments will be provided

Speaker: Dr. Shivendra V. Sahi



Dr. Shivendra V. Sahi received his M.S. degree from Laurentian University in Canada and Ph.D. degree from North Carolina State University in Raleigh. He is currently a Professor in the Department of Biology at the Western Kentucky University in Bowling Green, KY. His laboratory examines the bioremediation of toxic metals using plants. He is also investigating mechanisms involved in the transport of toxic metals within plants. He collaborates with Drs. Sarkar and Datta at UTSA on the bioremediation arsenic and its localization within plant cells and tissues. Dr. Sahi also serves as the Assistant Director of the Applied Research and Technology Program, a State supported “Program of Distinction” within the Ogden College of Science and Engineering.

Topic: Phytoremediation, a novel strategy for the removal of toxic metals from the environment: biochemical and molecular mechanisms

Toxic heavy metals are constantly released into the environment. Thus, there is an urgent need to develop a low-cost, effective, and sustainable method for their detoxification. Phytoremediation is the use of plants to remediate metal contaminated soils and waters. This is an environmentally friendly technology that is safe. *Sesbania* plants are being grown in the presence of different concentrations of metals. Metal concentration in shoots as well as in the roots increased with increasing concentrations in the growth medium. The X-ray absorption spectroscopic studies showed that metals were biotransformed in *Sesbania* tissue. Scanning electron microscopy studies revealed that metals predominantly accumulated in the cortical and vascular (xylem) regions of root tissues. Transmission electron microscopy and X-ray microanalysis of tissue demonstrated the localization of metal nanoparticles in the plasma membrane, cell wall, and in the vacuole. Effects of chelators on metal uptake and the activities of anti-oxidative enzymes were also studied. Chelator applications increased lead uptake by four-five folds in roots and 40-folds in shoots compared to controls. Activities of antioxidant enzymes and glutathione content were also elevated in the presence of Pb. To investigate the overall molecular response of *Sesbania* to Pb exposure, suppression subtractive hybridization was used to construct a cDNA library enriched in Pb induced mRNA transcripts. Screening the library by reverse Northern analysis revealed that 20-25% of clones selected were differentially regulated in Pb treated plants. After differential screening, we isolated several differentially expressed cDNA clones, including a type 2 metallothionein (MT) gene which is involved in detoxification and homeostasis and shown to be differentially regulated in Pb treated plants. The mRNA levels of MT increased substantially after Pb treatment indicating a potential role for it under Pb stress in *Sesbania*.