Fluorescent arsenic-resistant bacteria enhanced solubilization of arsenic and increased growth of arsenic hyperaccumulator *Pteris vittata* L.

Piyasa Ghosh[1*], Bala Rathinasabapathi[2] and Lena Q. Ma[1]

[1] *Soil and Water Science Department,* [2] *Horticultural Sciences Department, University of Florida, Gainesville, FL 32611, United States*

Arsenic hyperaccumulator *Pteris vittata* L (Chinese Brake fern) may accumulate up to 2.3% As in its biomass, making it a viable candidate for phytoremediation of arsenic contaminated sites. *P. vittata* is capable of extracting As from both soluble and insoluble forms. Arsenic uptake mainly occurs via the roots so soil rhizosphere characteristics significantly affect plant As accumulation. The availability of plant nutrients and As are impacted by the microbial community in the rhizosphere of *P. vittata*, including plant growth promoting rhizobacteria (PGPR). In this study, the role of arsenic-resistant bacteria (ARB) in arsenic solubilization from growth media and growth enhancement of arsenic-hyperaccumulator *Pteris vittata* L. was examined. Seven ARB (tolerant to 10 mM arsenate) were isolated from the*P. vittata* rhizosphere and identified by 16S rRNA sequencing as *Pseudomonas* sp., *Comamonas* sp. And *Stenotrophomonas* sp. During 7-d hydroponic experiments, these bacteria effectively solubilized arsenic from the growth media spiked with insoluble $FeAsO_4$ and $AlAsO_4$ minerals (from <5 μg L^{-1} to 5.04-7.37 mg L^{-1} As) and enhanced plant arsenic uptake (from 18.1-21.9 to 35.3-236 mg kg^{-1} As in the fronds). Production of pyochelin-type siderophores by ARB (fluorescent under ultraviolet illumination and characterized with thin layer chromatography) and root exudate (dissolved organic C) by *P. vittata* may be responsible for As solubilization. Increase in *P. vittata* root biomass from 1.5-2.2 to 3.4-4.2 g /plant dw by ARB and arsenic was associated with arsenic-induced plant P uptake. Arsenic resistant bacteria may have potential to enhance phytoremediation of arsenic-contaminated soils by *P. vittata*.