UF/IFAS
Soil and Water Sciences Department

2181 McCarty Hall A
PO Box 110290
Gainesville, FL 32611-0290
352-294-3151
352-392-3399 Fax

Soil and Water Sciences Department
Graduate Student Exit Seminar

Speaker: **Evandro Barbosa da Silva**
Ph.D. Degree Candidate

Advisor: Dr. Lena Ma & Dr. Ann Wilkie

Title: **Phytoremediation of Arsenic Contaminated Soils by *Pteris vittata*: Arsenic Removal and Biomass Disposal**

Date: Monday, March 19th

Time: 3:00 pm – 4:00 pm

Location: McCarty Hall A, Room G186

Pteris vittata (PV) is an arsenic-hyperaccumulator and has the ability to extract insoluble forms of As and P. In this study, its ability to continuously remove As from two contaminated soils (26–126 mg kg^{-1}) over 5 years were investigated as well as a biomass disposal method was developed. The goals of this research were to: (1) investigate PV's ability to continuously remove As from two contaminated soils and identify how soil As was affected by *P. vittata* under different P conditions, (2) optimize As removal from PV biomass by testing different extractants, extraction times, particle sizes and pH; and 3) assess As removal and biomass degradation under anaerobic condition. Sequential extraction was used to determine changes in metal distribution among soil fractions. Arsenic-rich PV biomass was extracted by different extractants followed by different Mg-salts to recover soluble As via precipitation. Then, PV biomass before and after being extracted with ethanol were digested under anaerobic condition for 35 d. The highest frond biomass occurred during 9-10th harvests, though frond As concentration decreased with time. Arsenic from all fractions was affected by plant uptake, except residual fraction. The largest reduction occurred in the amorphous and crystalline fractions for both soils. Soil As concentrations were reduced by 46-49% from 26.7 and 129 to 13.7 and 69.5 mg kg^{-1} for the two soils. Water-soluble As in PV biomass was up to 61% pending on extraction time, with 99% being arsenate (AsV). Among the extractants, 35% ethanol was the best to remove As from PV biomass. ~90% As was removed from PV biomass using particle size < 1 mm at solid:liquid ratio 1:50 and pH 6 for 2 h. And further anaerobically digesting the ethanol-treated biomass As concentration in PV biomass decreased from 2,665 to 60 mg kg^{-1} or by ~98%. At this level, PV biomass would be considered a safe material by USEPA regulations (< 100 mg kg^{-1}). Besides, anaerobic digestion reduced PV biomass by 64-83%. As a last step, 90-51% of As in anaerobic digestate was recovered by As–Mg precipitation by adding $MgCl_2$ at As:Mg ratio of 1:400 with pH 9.5. Our data indicated that *P. vittata* efficiently solubilized non-labile As under P-limiting condition without impacting As depletion. Besides, effective As removal from PV biomass prior to disposal improves its phytoremediation process.

For our off-campus students, off-campus faculty, and on-campus students who cannot attend, this seminar can be viewed via live or watched at a later date via this link: Evandro Da Silva. In addition, all seminars are archived for viewing on our SWSD Seminar Page.