Soil amendments enhance photosynthetic pigments and antioxidant enzyme activity under arsenic stress in pea (*Pisum sativum* L.)

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Abstract (300-word limit)

Arsenic (As) in soils alter photosynthetic pigment and antioxidant in food crops. As, a lethal metalloid, is recognized to affect farming of agriculture crops in many regions of the world; however, the changes in photosynthetic pigments such as chlorophyll and carotenoids, and in oxidative stress indicators such as catalase, proline, malondialdehyde (MDA), ascorbate peroxidase (APX) and Guaiacol peroxidase (POD) activity in response to As stress remain largely unknown in BARI released pea crops**.** In this study, biochars (BC), arbuscular mycorrhizal fungi (AMF), selenium (Se), silica-gel (Si-gel) and sulfur (S) were applied as stress relief substances in pea crops grown in 30 mg As kg^{-1} soils and the effects of BC, AMF, Se, S and Si-gel on chlorophyll, carotenoid, catalase, proline, MDA, APX and POD content were studied in these pea crops. Chlorophyll, carotenoid, catalase, proline, MDA, APX and POD content was found to be significantly different in pea crops grown in 30 mg As kg^{-1} soil. Chlorophyll a and total chlorophyll was increased 31-35% and 60-75% respectively with the treatment of AMF, Se, Si-gel and S. Likewise, catalase activity was increased 24%, 38%, 40%, 38% and 46% by BC, AMF, Se, Si-gel and S treated pea, respectively. APX and POD activity was also found to be increased with the treatment of BC, AMF and Se. In contrast, MDA and proline content was found to be significantly lower than that of control in pea varieties.

Conclusion & Significance: Soil amendments was potentially minimized oxidative damage, osmotic stress and cell injury in As-stressed pea crops. AMF and Se both were relatively more effective against As stress in comparison to BC. BC, AMF, Se, Si- gel and S are all highly effective in enhancing antioxidant defenses as well as the nutritional quality of pea crops grown in As soil.

Recent Publications (minimum 5)

Alam MZ*, Hoque MA, Ahammed GJ, Mcgee R and Carpenter-Boggs L. Arsenic accumulation in lentil (*Lens culinaris*) genotypes and risk associated with the consumption of grains. ***Scientific Reports*** 2019, 9, 9431

Alam MZ*, Hoque MA, Ahammed GJ and Carpenter-Boggs L*. Arbuscular mycorrhizal fungi reduce arsenic uptake and improve plant growth in *Lens culinaris*. ***PLOS ONE 2019***, 14,5, e0211441.

Alam MZ*, Mcgee R, Carpenter-Boggs L, Ahammed GJ, and Hoque MA. Effect of Arbuscular Mycorrhizal Fungi, Selenium and Bio char on photosynthetic pigments and antioxidant enzyme activity under arsenic stress in mung bean (*Vigna radiata*). ***Front. Physiol.*** 2019, 00193.

Haque MM, Mosharaf MK, Tanvir MZH, Khan AA, Molla A H, **Alam MZ,** Islam MS and Talukder MR. Metal-Adapted Bacteria Isolated from Wastewaters Produce Biofilms by Expressing Proteinaceous Curli Fimbriae and Cellulose Nanofibres. ***Front. Microbiol***. doi: 2018, 01334

Alam MZ*, Carpenter-Boggs L, Mitra S, Haque MM, Joan Halsey MEd, Rokonuzzaman M, Saha B and Moniruzzaman M. Effect of salinity intrusion on food crops, livestock and fish species at Kalapara coastal belt in Bangladesh. ***Journal of Food Quality***, 2017, https://doi.org/10.1155/2017/2045157



Biography (150-word limit)

Mohammad Zahangeer Alam has completed PhD from the collaborative PhD program between Washington State University (WSU), Pullman, USA and Bangladesh Agricultural University (BAU) in 2019. About 15 Master students has completed their Master of Science (MS) with thesis under his supervision. Mr. Alam has already visited several countries such as, India, Thailand, Malaysia, Vietnam, China, Philippines and USA for the research purpose. Before that Mr Alam worked as a **Scientific Officer** at Bangladesh Rice Research Institute (BRRI). During this time, Mr. Alam conducted research with International Rice Research Institute (IRRI) collaboratively. Mr Alam has been serving as an **Associate Professor** in the Department of Environmental Science at Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU) since 2012 to till date. Right now, he is involved with teaching and research at BSMRAU.

Notes/Comments: