Pulp Fiction?! Lead Remediation with Biochar Made from the Apiacae (Carrot) Plant Family

Padiyath, Manashree (School: Woodbury High School)

There remains a continued need for inexpensive techniques for filtering out heavy metals from contaminated water. Studies have shown efficacy of biochar (pyrolyzed organic matter) for heavy metal removal from soil and water. Last year, biochar made from the herb, cilantro, from the Apiaceae or carrot plant family, was shown to be extremely efficient in lead removal from contaminated water. The purpose of this year's research was to compare the effectiveness of biomass and biochar, made from other plants of Apiaceae family, for lead remediation. I hypothesized that all the plants, with such similar leaf appearance, will be comparable in lead removal capability. The effectiveness of lead removal was studied for cilantro, parsley and carrot tops. Carrot pulp, organic matter from the same plant family, was also evaluated. The amount of lead was quantified using ICP Spectroscopy. Results showed that carrot tops biochar was far more effective compared to parsley and carrot pulp biochar and decreased lead content over 80-95% at a very wide range of concentrations. Lead levels of 1.7 ppm lead contaminated water were rendered undetectable (<0.005 ppm) after remediation with carrot tops biochar. Carrot tops biochar adsorption isotherms could be fitted well by the Freundlich model whereas cilantro, parsley and carrot pulp fitted the Langmuir model. Carrot top biomass itself was also very effective, with over 85% lead removal, while it was much lower for the other plants studied. These findings are important for the development of a more sustainable means for lead removal from contaminated water.

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