The Use of FeCl2 and CMC Treated Brazilian Pepper Fibers to Remove Phosphate from Real-World Contaminated Water, the Analysis of Used Fibers as a Potential Fertilizer, and the Cost of the Fibers as Both a Phosphate Filtration Medium and Fertilizer

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The purpose of my project was to determine if a technique to treat Brazilian pepper wood fibers with carboxymethyl cellulose (CMC) and ferrous chloride (FeCl2) to increase adsorption of phosphate was effective for phosphate removal from polluted natural waters, the economic viability of using the treatment process as compared to other techniques, and the potential of using the phosphate-laden wood fibers as a fertilization source for plants. Wood fibers were evaluated for adsorbance of phosphate by soaking different masses (g) in 200mL of waste water from Otter Creek (0.64ppm phosphate), using linear regression to predict a perfect zero-point for mass of wood fiber to remove 200mL of 0.64ppm phosphate. Fibers that sequestered 0.64ppm phosphate were used in evaluating phosphate-laden fibers as a potential fertilizer by adding 0.2 grams of wood fibers to each cell of radish plants. Concurrent tests were conducted for comparison and analysis; commercial fertilizer and distilled water. T-test indicated significant reductions of phosphate in the filtrate for all fiber masses. Linear regression, using Colorimeter readings, was used to predict the ideal mass of wood fiber: 2.11g. Using the predicted 2.11g fiber, the cost to remove one kilogram of phosphate from water is $1,562.50, using CMC/FeCl2 treated Brazilian pepper fibers for adsorption. Analysis indicated a significant ($p \leq 0.05$) relationship between the mass of plant material in the sample and phosphate concentration (ppm) in filtrate for two of three test treatments; distilled water ($r2=0.30$, $p=0.09$), commercial fertilizer ($r2=0.65$, $p=0.00$), CMC/FeCl2 treated Brazilian pepper fibers ($r2=0.54$, $p=0.01$).