Now You See It, Now You Don't: Investigating the Effectiveness of Various Agri-Waste Biochars as Adsorbents for Methylene Blue in Aqueous Solutions

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Non-degradable organic dyes are used by many industries, like textiles, printing, plastics, leather, paper, and cosmetics. Many of these dyes have carcinogenic, mutagenic, and teratogenic effects that are harmful to humans and aquatic life. The dyes often remain in water and not only cause aesthetic problems, but environmental problems as well. One common method of removing these dyes is the use of activated carbon. However, activated carbon is often cost prohibitive. An economic and eco-friendly alternative should be found. The purpose of this project was to determine if biochars from agri-waste products could be used as adsorbents for removal of methylene blue from tap water. The agri-waste biochars tested included: poultry litter, shredded corn cob, brewer spent grain, and walnut shell. To test the effectiveness of the various agri-waste biochars, batch reactors were prepared. Each experimental batch reactor consisted of one gram of the adsorbent placed into 30 milliliters of the methylene blue solution (50 ppm). Each treatment group had five replicates for a total of 35 batch reactors. The batch reactors were placed on a rotator for mixing. After 30 minutes, one hour, two hours, four hours, and twenty- four hours of treatment, one mL samples were removed from the batch reactors. The samples were analyzed for methylene blue concentration after treatment using a spectrophotometric plate reader. All biochars removed some dye. Even the walnut shell biochar which removed the least amount of methylene blue removed 42% of the dye. The poultry litter biochar was most effective. It removed 98% of the methylene blue at 24 hours.

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