# BIOCHAR UTILISATION IN ERYTHROMYCIN RESIDUES REMOVAL FROM AQUEOUS ENVIRONMENT

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## ABSTRACT

The presence of residual antibiotics in soil and water ecosystems has harmful effects on the environment, ecological food chain, and human health. It is also a driving factor for bacterial antibiotic resistance. Erythromycin is an antibiotic found in the water bodies in several countries due to improper disposal or inefficient wastewater treatment. Biochar is an adsorbent material prepared by the pyrolysis of discarded waste items including food and garden waste that could provide a cost-effective and efficient method for eliminating antibiotics from wastewater. This study evaluated whether biochar is successful in removing the antibiotic erythromycin from an aqueous environment through adsorption. It also investigated whether various factors such the pH of the aqueous environment or the concentration of erythromycin impacted its adsorption. Lastly, commercially available activated charcoal and biochar were compared to determine which material adsorbs erythromycin more effectively. The biochar is obtained from the pyrolysis of solid domestic waste including food, paper, and garden waste at 300$^{o}$C. All experiments were conducted over three hours and the adsorption onto 1.0 g (±1 mg) of biochar was calculated in mg/g. The solutions were continuously stirred at 200 rpm and the temperature was set to 23°C. Samples were analysed using reverse-phase high-performance liquid chromatography (HPLC) at 210 nm, the mobile phase contained a mixture of methanol-water at alkaline pH (80:20, v/v). It was found that the highest concentration of erythromycin, 100 mg/L showed a better adsorption capacity (3.71 mg/g) compared to samples at a concentration of 50 mg/L (1.90 mg/g) and 25 mg/L (0.95 mg/g). In addition, samples obtained from the neutral (pH 7) solution showed a greater drug adsorption in comparison to samples obtained from the acidic (pH 5) and alkaline (pH 9) solutions. Lastly, biochar was more effective than activated charcoal in adsorbing erythromycin where a 1.0 g of biochar adsorbed almost twice the amount of the drug in comparison to activated charcoal over the three-hour period. Overall, this study suggested the use of a biochar prepared from discarded materials as a simple cost-effective additional method for removing erythromycin from water which could be further optimised achieve a full elimination.