

# SORPTION PROPERTIES OF TEA WASTE AND RICE HUSK BIOCHAR FOR CARBOFURAN REMOVAL FROM AQUEOUS MEDIA

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Modern agriculture is associated with pesticide application causing benefits as well as deleterious effects on the environment. Carbofuran (2, 3-dihydro-2, 2-dimethylbenzofuran-7-yl methylcarbamate) (CBF) is one of the most widely used insecticide and nematicide in agricultural application. Carbofuran has been detected in the natural water and soil due to its extensive application. This study aims at finding an environmental friendly and cost effective solution for the removal of carbofuran from aqueous solutions using biochars from two different waste materials, tea waste (*Camellia sennensis*) and rice husk (*Oryza sativa*) produced at two different temperatures (300 ° and 700 °C).

Different adsorption parameters, such as the initial carbofuran concentration, contact time, pH and temperature for carbofuran adsorption, were studied using a batch system. Adsorbent content of 1 g/L was used for the batch experiments with acetate and phosphate buffers to control the pH of the system. The isotherm and kinetics models were fitted to the experimental data. The equilibrium adsorption of carbofuran decreased when the initial pH of the aqueous solution was increased. The maximum adsorption was observed at pH 3 which means acidic conditions are preferable in carbofuran adsorption to biochar. The data fitted well with the Freundlich model in the studied concentration range of carbofuran, which implies non ideal heterogeneous adsorption of carbofuran on the surface of biochar. The data was best fitted to the pseudo second order kinetic model. Thermodynamic parameters showed that endothermic nature of sorption process for carbofuran.

Both Rice husk biochar (RHBC) and Tea waste biochar (TWBC) produced at 700 °C showed a higher potential to adsorb carbofuran than 300 °C. This may be due to the enlargement of micropores on the surface of biochar at high temperatures and increased aromaticity. The obtained results showed that RHBC has higher carbofuran adsorption capacity than TWBC at 300 and 700 °C. The adsorption of carbofuran in an aqueous solution at pH 3 by RHBC produced at 700 ° and 300 °C was 50 % and 40 % respectively; TWBC under similar conditions adsorbed 15 % and 10 % respectively. Thus the results revealed that the biochar made from TWBC have a good potential to remove carbofuran from aqueous solution.

Key words: - Carbofuran, Pesticide, Tea waste, Rice husk

