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Biochar and the remediation of soil micropollutants

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Persistent Organic Pollutants (POPs) present a globally significant problem in soil and water management due to their recalcitrance, tendency to bioaccumulate and their suspected or confirmed effects on human health. Biochar, defined as biomass pyrolysed in the absence of oxygen, has strong potential for the long-term sequestration of POPs that could otherwise be mobilised into ground and surface waters and contaminate soil and sediment matrices.

The initial hypothesis is that biochar derived from green waste materials represents an effective means for sequestering these contaminants. The present work is investigating the potential of biochar to sequester POPs through adsorption isotherm sorption experiments, with current focuses being biochar material characterisation and contaminant behaviour. Contaminants of interest are polycyclic aromatic hydrocarbons (PAHs) as well as emerging contaminants of concern such as hormones and other micropollutants. Preliminary adsorption studies suggest that biochar shows significant promise for contaminant removal. Desorption studies address important questions that remain about long-term contaminant sequestration and potential remobilisation via fine particles and leachate from the biochar. The amounts of fine particles and leachate associated with each biochar are linked to the source material and pyrolysis process conditions used to create it. This work is attempting to establish a mass balance around the soil to determine the sequestration potential of a range of biochars. Analysis of contaminant concentrations is being carried out by GC-MS and HPLC. The ultimate aim of this work is to define the conditions where biochar and biochar-amended soils are able to effectively sequester trace levels of contaminants.