Characterisation of High Temperature Biochar from Green Waste Woody Biomass

James P Robinson[1], Dr Jason Reynolds[1]
[1]*Western Sydney University*

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James P Robinson & Jason K Reynolds
School of Science and Health, Hawkesbury
james.robinson@westernsydney.edu.au

The production of biochar and its storage in soils has been suggested as a means of abating climate change, by sequestering carbon. Substantial uncertainties exist surrounding the application of biochar to mitigate carbon emissions. This research explores the characteristics of multiple forms of biochar produced from green waste biomass.
In this work the physical and chemical characteristics of both biochar and initial biomass were investigated following a range of treatment protocols. Previous studies suggest that high temperature pyrolysis degrades much of the plant structure in biochar, following protocols in this work SEM investigation has shown that the pyrolysis conditions retained the structure of the initial biomass. NMR and Raman data shows that the amorphous structure of biomass has been converted into turbostratic crystalline structures; which have been previously used as a proxy for soil stability. SIMS demonstrated that levels of heavy metal are well within safe levels for application to soils, which will have no deleterious effects on fertility. NMR has shown that there is a slight peak that correlates to possible polycyclic aromatic hydrocarbons, which will need to be investigated further. Through the characterization of green waste we hope to tailor pyrolysis conditions thus engineering a homogenous product whose characteristics would be suitable to a wider range of soils.

This research demonstrates that the management of the pyrolysis conditions has relevant impacts onto the structure and chemical composition of the final char; this has a flow on effect particularly on soil hydrological properties and processes. Analysis showed that high temperature pyrolysis ameliorates the apparent differences between biomass, providing a stable and homogenous product.