Can Carbon Storage in Forest Soils be Enhanced by Additions of Biochar Produced from Forest Thinning Materials?

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Sandy forest soils characteristically contain little organic matter and dissolved organic carbon (DOC) from leaf litter, as it is easily leached from the system. One potential strategy to sequester this carbon in course textured forest soils is through additions of forest thinning materials as biochar. The unique chemical and physical properties of biochar make it a promising amendment to enhance carbon sequestration in soils. Therefore, the objective of this study is to determine if biochar soil amendments produced by pyrolysis of biomass from forest thinning for bioenergy can enhance carbon storage in forest soils. Biochar from chipped and dried Ponderosa pine trees was produced at 300, 500, 700, and 900 °C. Physical and chemical properties of these four chars (total C/H/O, ash content, surface area, cation exchange capacity, and pH) have been analysed. Soil column leaching experiments were conducted to quantify changes in the retention of DOC in the leachate of forest soils with 2% char additions. Further analysis using benzene polycarboxylic acids (BPCA) as molecular markers to differentiate transport of pyrogenic carbon from native soil carbon is ongoing. The data suggest that biochar soil amendments can effectively reduce DOC leaching and enhance soil carbon stocks.