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Predicting the impact of biochar additions on soil hydraulic properties

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Different physical and chemical properties of biochar, which is made out of a variety of biomass materials, can impact water movement through amended soil. The objective of this research was to develop a decision support tool predicting the impact of biochar additions on soil saturated hydraulic conductivity (Ksat). Four different kinds of biochar were added to four different textured soils (coarse sand, fine sand, loam, and clay texture) to assess these effects at the rates of 0, 1, 2, and 5 % (w/w). The Ksat of the biochar amended soils were significantly influenced by the rate and type of biochar, as well as the original particle size of soil. The Ksat decreased when biochar was added to coarse and fine sands. Biochar with larger particles sizes (60%; >1 mm) decreased Ksat to a larger degree than the smaller particle size biochar (60%; <1 mm) in the two sandy textured soils. Increasing tortuosity in the amended sandy soil could explain this behavior. On the other hand, for the clay loam 1% and 2% biochar additions universally increased the Ksat with higher biochar amounts providing no further alterations. The developed model utilizes soil texture pedotransfer functions for predicting agricultural soil Ksat as a function of soil texture. The model accurately predicted the direction of the Ksat influence, even though the exact magnitude still requires further refinement.