Changes in physical properties of hydrochar pellets due to enriching with wood ash

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Abstract

Hydrothermal carbonization (HTC) process is considered as environmentally advantageous conversion of wet biomass to value-added products. However, handling and dustiness of hydrochar, a solid product from HTC, in powder may adversely affect its potential applications. Pelletizing hydrochar can reduce nuisance dust, and facilitate transportation and distribution. In this study, hydrochar from pulp mill sludge were enriched with plant-beneficial nutrients in the form of base cations through addition of ash at different rates ranging from 0% to 50%, and then were pelletized with a single pellet press. The purpose of hydrochar-ash pellet production is to be used in forest production systems as an addition to the peat growing media. Thus, the desired physical properties are different from fuel pellets. Physical properties of the enriched hydrochar pellets including solid density, mechanical strength and moisture absorption were investigated at two compressive forces of 4 and 8 kN. The results demonstrated that ash declines mechanical strength of pellets, and increases solid density relative to pure hydrochar pellets. The mechanical strength of all pellets also reduced with a decrease in compressive force. Therefore, the weakest pellets with highest density were with the 50% of ash produced under 4 kN compressive force. The results of this study can be used to determine the potential of enriched biochar pellets in providing a substrate to grow seedlings in forestry nurseries.

Keywords: Ash, Biochar, Forestry nursery, Pelletization process, Soil amendment

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