Potential of Pyrolytic Tire Char Use in Agriculture

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Abstract : Concerns about climate change, food productivity, and the ever-increasing cost of commercial fertilizer products is forcing have spurred interest in the production of alternatives or substitutes for commercial fertilizer products. In this study, the potential of pyrolytic tire char (PT-char) to improve soil productivity was investigated. The use of carbonized biomass, which is commonly termed biochar or biofertilizer and exhibits similar properties to PT-char in agriculture is not new, with historical evidence pointing to the use of charcoal for soil improvement by indigenous Amazon people for several centuries. Due to minimal market value or use of PT-char, huge quantities are currently stockpiled in South Africa. This successively reduces revenue and decreases investments in waste tire recycling efforts as PT-char constitutes 40 % weight of the total waste tire pyrolysis products. The physicochemical analysis results reported in this study showed that PT-char contains a low concentration of essential plant elements (P and K) and, therefore, cannot be used for increasing nutrient availability in soils. A low presence of heavy metals (Ni, Pb, and Cd), which may be harmful to the environment at high application rates was also observed. In addition, the results revealed that PT-char contains very high levels of Zn, a widely known phytotoxicity causing agents in plants. However, the study also illustrated that PT-char is made up of a highly aromatic and condensed carbon structure. PT-char is therefore highly stable, less prone to microbial degradation, and has a low chemical reactivity in soils. Considering these characteristics, PT-char meets the requirements for use as a carbon sequestration agent, which may be useful in mitigating climate change.

Keywords : agriculture, carbon sequestration, physicochemical analysis, pyrolytic tire char, soil amendment.
Conference Title : ICSWDSE 2020 : International Conference on Solid Waste Disposal and Sustainable Environment
Conference Location : Cape Town, South Africa
Conference Dates : April 16-17, 2020