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Testing established method for the determination of the Cation Exchange Capacity in soils for the characterization of Biochars

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Numerous studies have shown that the application of biochar to soils with low fertility may increase the cation exchange capacity (CEC), the water holding capacity and the organic carbon content of the latter [1]. Furthermore, biochar provides a habitat for microorganisms and also improves nutrient availability due to a depletion of leaching [2]. As expected, the ability of biochar to improve soil fertility depends on its physical and chemical properties, which varies with the pyrolysis process or the choice of feedstock. Thus, a better understanding of the most common agronomic characteristics of biochar is crucial. Nevertheless, there is not a standard method valid for the measurement of CEC of biochar. Literature values for the CEC of biochar are surprisingly variable, commonly ranging from 5 to 50 cmol+/kg even as high as 69 to 204 cmol+/kg and often poorly reproducible, suggesting methodological problems [3]. Ashes and very fine pores in biochar may complicate the analysis and thus compromise the results. This study assesses two modifications of the common method for the determination of CEC and exchangeable cations (EC_{at}) in six different biochars produced from residual biomass of *Acrocomia aculeata* and *Oryza sativa* (rice husks). In addition, one standard soil was examined for comparative purposes. The methods were the typical ammonium acetate (NH4-OAc) method, described first by Jackson [4] and a method specifically designed for organic amendments based on successive extractions with Barium chloride ($BaCl_2$ 0.1 M). Both methods seemed to overestimate the EC_{at}, in fact results showed that none of the methods tested are appropriate to determine the CEC and EC_{at} at these biochars, thus improvements are still mandatory.

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