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Influence of biochar on the physical, chemical and retention properties of an amended sandy soil

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Soil porosity plays an important role in soil-water retention and water availability to crops, potentially affecting both agricultural practices and environmental sustainability. The pore structure controls fluid flow and transport through the soil, as well as the relationship between the properties of individual minerals and plants. Moreover, the anthropogenic pressure on soil properties has produced numerous sites with extensive desertification process close to residential areas.

Biochar (biologically derived charcoal) is produced by pyrolysis of biomasses under low oxygen conditions, and it can be applied for recycling organic waste in soils and increase soil fertility, improving soil structure and enhancing soil water storage and soil water movement.

Soil application of biochar might have agricultural, environmental and sustainability advantages over the use of organic manures or compost, as it is a porous material with a high inner surface area.

The main objectives of the present study were to investigate the possible application of biochar from forest residues, derived from mechanically chipped trunks and large branches of *Abies alba* M., *Larix decidua* Mill., *Picea excelsa* L., *Pinus nigra* A. and *Pinus sylvestris* L. pyrolysed at 450 °C for 48h, to improve soil structural and hydraulic properties (achieving a stabilization of soil).

Different amount of biochar were added to a desertic sandy soil, and the effect on soil porosity water retention and water available to crops were investigated.

The High Energy Moisture Characteristic (HEMC) technique was applied to investigate soil-water retention at high-pressure head levels. The adsorption and desorption isotherms of N₂ on external surfaces were also determined in order to investigate micro and macro porosity ratio.

Both the described model of studies on adsorption-desorption experiments with the applied isotherms model explain the increasing substrate porosity with a particular attention to the macro and micro porosity, respectively.