

HOW DOES GRAIN SIZE AND DOSE OF SUNFLOWER HUSK BIOCHAR INFLUENCE THE WATER RETENTION OF SANDY SOIL?



RETENTION OF SANDY SOIL?

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INTRODUCTION

Biochar is a carbon-rich solid obtained from the pyrolysis process. Due to its favourable properties, it is perceived as an amendment that improves soil quality (for example, soil water retention). However, the optimal fabrication conditions and proportions of biochar particle size, which will enhance soil properties, are still not precisely known. In our research, we investigated the influence of grain size and dose of sunflower husk biochar on water retention of sandy soil. For this purpose, water retention curves (pF) and the plant available water content (AWC) were determined for the soil-biochar sample mixture differing in dose and particle size of biochar.

METHODS



The studies were carried out on Podzol soil (sand – 90%, silt – 9%, clay – 1%) located in Sęków, Poland.

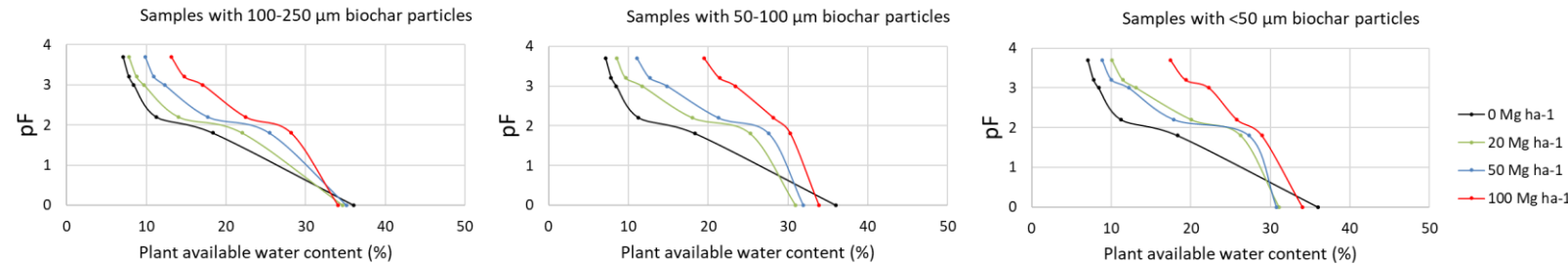
Samples were mixed with biochar made from sunflower husk (650-750°C) at various:

- doses: 20, 50, 100 Mg ha⁻¹
- particle sizes: 100-250 μm, 50-100 μm, <50 μm.

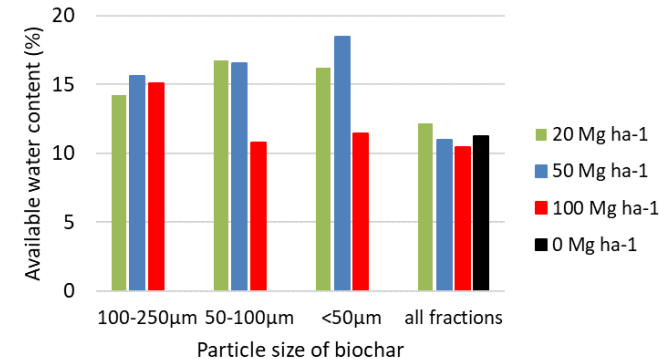
The control included soil samples with the addition of all fractions of biochar and soil without biochar.

Low and high-pressure chambers were used for the determination of the water retention curve by the Richards method (figure above). AWC defined as the difference between the soil water content at field capacity (pF 1.85) and the permanent wilting point (pF 3.7).

RESULTS



Soil water retention curves of soil-biochar mixtures containing different biochar doses (0, 20, 50, 100 Mg ha⁻¹) obtained for specific biochar particle size ranges (100-250 μm; 50-100 μm, < 50 μm).



AWC values (pF 1.85-3.7) of soil samples with different biochar particle size ranges and doses compared to the AWC for soil-biochar mixture without fraction distinction, and also the reference pure soil sample.

CONCLUSIONS

- The addition of unfractionated biochar increased the AWC only when added in small doses (20 Mg ha⁻¹). Higher doses of unfractionated biochar reduced the AWC.
- The addition of fractionated biochar increased the AWC comparing to control. Only the highest doses of biochar (100 Mg ha⁻¹) with small biochar particle size (<100 μm) did not increase the AWC.