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## How do grain size and dose of sunflower husk biochar influence the water retention of sandy soil?

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Biochar is a carbon-rich material obtained from the process of biomass pyrolysis. Due to its desirable properties, it is discussed as a soil amendment to improve soil quality; for example, adding biochar can change soil water retention by modifying soil textural and structural properties. However, the optimal fabrication conditions and proportions of biochar particles sizes, that would improve soil properties are still not precisely known. In our research, we investigated the influence of grain size and a dose of biochar on water retention of sandy soil. For this purpose, water retention curves (pF) were measured, as it indicates such important properties as plant available water, field water capacity, wilting point. The studies were carried out on podzol soil samples taken from meadow located in Sekow, Poland, mixed with different percentage mass content of sunflower husk biochar produced in 650-750°C (0.95, 2.36, 4.76 and 9.52% of sample weight). Samples contain one of biochar granulometric fraction: 250-100, 100-50 or less than 50 µm. The control included soil samples with the addition of mixed fractions of biochar and soil without biochar. The research method we used allows obtaining information about plant available water content by comparing differences in water content between 0.06 and 5 bar pressure points which corresponding to a 1.85-3.7 pF. In this range, most plants can use water for their growth and development. Our results revealed that, surprisingly, soil with all fractions of biochar reduces the amount of available water for plants compared to the control (soil without biochar), regardless of the biochar dose applied. However, fractionated biochar can both increase or decrease the soil water content, depending on the particle size and dose. Small doses of sunflower husk biochar (0.95 and 2.36%) and the finest fraction (<50µm) have the most beneficial effects for water retention of investigated soil. Our research may strongly suggest the biochar producers that the production of biochar with the right fraction may be more favourable for increasing soil water retention.

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