**Straw gasification biochar increases plant available water capacity and plant growth in coarse sandy soil**

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**Abstract**

Gasification biochar (GB) contains recalcitrant carbon that can contribute to soil carbon sequestration and soil quality improvement. However, the impact of GB on plant available water capacity (AWC) and plant growth in diverse soil types needs further reserach. A pot experiment with spring barley was conducted to investigate the effect of soil amendment of straw (SGB) and wood (WGB) GB on shoot and root growth under two levels of water supply in a temperate sandy loam and coarse sandy soil. In the sandy loam, the reduced water regime significantly affected plant growth and water consumption, whereas the effect was less pronounced in the coarse sand. Independent of the soil type, both GBs increased AWC, with the highest absolute effect in the coarse sand. In the sandy loam, soil application of GB had no effect on plant growth, however, the addition of SGB to coarse sand led to a substantial increase of plant biomass under both water regimes, most likely due to reduced mechanical impedance to root growth. No positive effects on plant growth were achieved by addition of WGB. Our results suggest that SGB has a great global potential to increase crop productivity on coarser soil types changing the characteristic low compressibility and high friction giving much better conditions for root penetration increasing yield potentials. Furthermore, risk of drought in dry periods, and nutrient losses in wet periods in coarser soil types is also reduced.

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