

CHANGES IN SATURATED HYDRAULIC CONDUCTIVITY AFTER BIOCHAR APPLICATION IN WATER-REPELLENT SOIL

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Abstract

Saturated hydraulic conductivity (Ks) is a fundamental hydrophysical parameter of soil. Its values tend to be particularly high in sandy soils due to their coarse texture and the abundance of macropores, which facilitate rapid water infiltration into deeper soil horizons. Water-repellent soils, however, present a contrasting behaviour, where water infiltration is often severely limited at the surface layer.

Keywords: biochar, water-repellent soil, saturated hydraulic conductivity

MATERIALS AND METHODS

- The field experiment was established in spring 2024;
- Experimental plots measuring 1.5 x 1.5 m were marked out at two sites with water-repellent sandy soils near the village of Sekule;
- one site is located in a pine forest and the other in a birch forest;
- Biochar: white willow, pyrolysis at 520 °C, applied to a depth of 0-10 cm, dose 20 t ha⁻¹;
- Soil samples were collected at regular intervals during the first year of application at sites with biochar application, as well as without biochar (Control);
- Saturated hydraulic conductivity (Ks) was determined using the falling head method.

CONCLUSION

In Control plots (without biochar), Ks values remained relatively stable over time (Fig. 1 and 2). In contrast, plots amended with biochar initially exhibited higher Ks values compared to controls. This initial increase of Ks (in comparison to the Control) was caused by soil aeration after the application of biochar. However, a gradual decline was observed over time, averaging a 5% reduction in the pine forest (Fig. 3) and an 8% reduction in the birch forest (Fig. 4). These preliminary results suggest that the application of biochar to sandy, water-repellent soils may contribute to a reduction in saturated hydraulic conductivity, particularly over time.

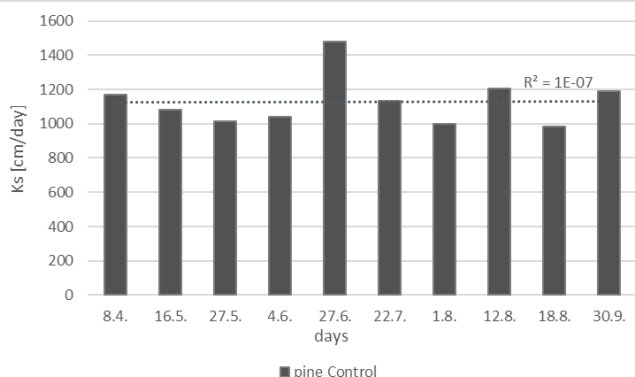


Fig. 1 Ks measurements at the pine Control site during the 2024 period.

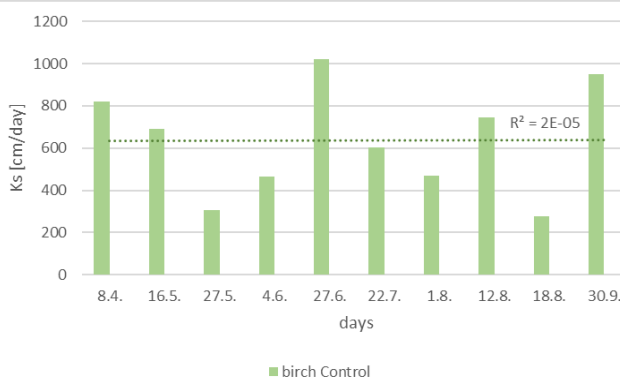


Fig. 2 Ks measurements at the birch Control site during the 2024 period.

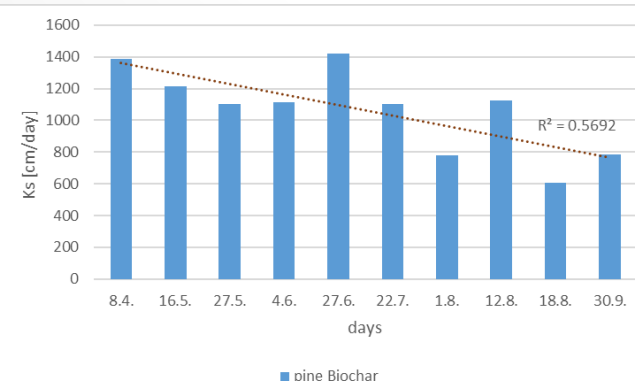


Fig. 3 Ks measurements at the pine Biochar site during the 2024 period.

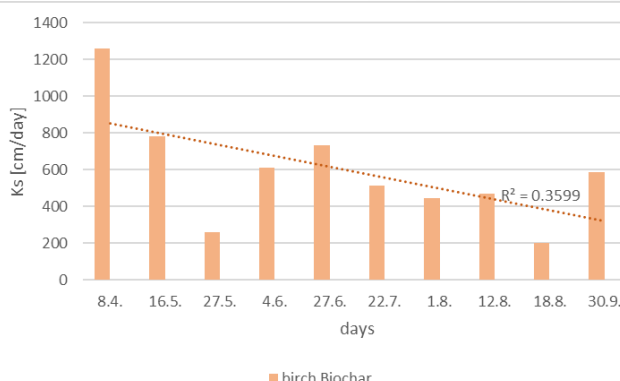


Fig. 4 Ks measurements at the birch Biochar site during the 2024 period.