

# Órbottyán - Nyírlugos (Hungary)

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## EXPERIMENT GOALS

This paper presents a long-term field study, being the final step of a scale-up technology development, on grain husk and paper fibre sludge biochar application for soil improvement with focus on two degraded soil types of a temperate region. The aim was to compare the short- and long-term effects of biochar treatments on the discussed soils.

## 2.5-years experiment



## SITE DESCRIPTION

The field experiment took place simultaneously at two sites: at Órbottyán (47°40'N, 19°14'E) with calcareous sandy soil Mollic Umbrisol (Arenic) and at Nyírlugos (47°43'N, 22°00'E) with acidic sandy soil (Lamellic Arenosol).

Field plots of 20 m<sup>2</sup> (4 × 5 m) area each were established including a 1 m wide margin all along, thus resulting plots of 6 m<sup>2</sup> net area.

The experiment was carried out in a random block design at both sites and each treatment was applied in 4 replicates. Soil samples were taken from the 0–25 cm layer within the net area of each small plot (6 m<sup>2</sup>)

## BIOCHAR AND ITS APPLICATION IN THE FIELD

Applied biochar (BC) was produced from **grain husk** and **paper fibre sludge feedstock** (the ratio of components is 1:1) and was provided by Sonnenerde GmbH Austria.

The biochar addition rates at both sites were the following: 0 t/ha (code: C+NPK), 3 t ha<sup>-1</sup>, 15 t ha<sup>-1</sup>, 30 t ha<sup>-1</sup>.

Each plot was fertilized with half of the recommended NPK mineral fertilizer dose (acidic sand: 61 kg N ha<sup>-1</sup>, calcareous sand: 54 kg N ha<sup>-1</sup>).

### **Measured parameters**

**Soil analysis and interactions with biochar:** soil analysis at T0, periodic soil analysis, pH, WHC, OM,  $\text{NH}_4^+$ ,  $\text{NH}_3^-$ , C:N, CEC, EC

**Other production parameters:** AWCD (Average Well Colour Development), Substrate Richness and Shannon diversity index

**Plant-soil dynamics and interactions:** aerobic heterotrophic bacterial and fungal cell concentrations

### **Key findings**

- Effect of biochar in soils was dependent on soil pH, OM and carbonate content.
- Biochar addition had favorable effects mainly in the acidic sandy soil.
- Long-term positive effect of biochar on the availability of P and K was revealed.
- Biochar increased microbiological activity and provided good habitat for white worm.

### **Planned activities or potential experimental activities**

During the 2.5-year long field experiment samples were taken on 7 occasions: 1 month, 3 months, 5 months, 13 months, 18 months and 30 months after the start. Since the aim was to compare the short- and long-term effects of biochar treatments.

## PRESENTATION OF THE WORKING GROUP

The work was supported by the EEA Grants and the Norway Grants within the “Green Industry Innovation Programme” (Terra Preta project, registration number HU09-0029-A1-2013), the BMEBiotechnology FIKP grant of EMMI (BME FIKP-BIO) and by the National Research, Development and Innovation Fund in the frame of the K\_16 Program (K\_16 120464 project 2016–2019).

## Bibliography and publications of the experiment, online information material, websites

Farkas, Éva, Viktória Feigl, Katalin Gruiz, Emese Vaszita, Ildikó Fekete-Kertész, Mária Tolner, Ivett Kerekes, et al. 2020. Long-Term Effects of Grain Husk and Paper Fibre Sludge Biochar on Acidic and Calcareous Sandy Soils – A Scale-up Field Experiment Applying a Complex Monitoring Toolkit’. *Science of The Total Environment* 731 (August): 138988.  
<https://doi.org/10.1016/j.scitotenv.2020.138988>.

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