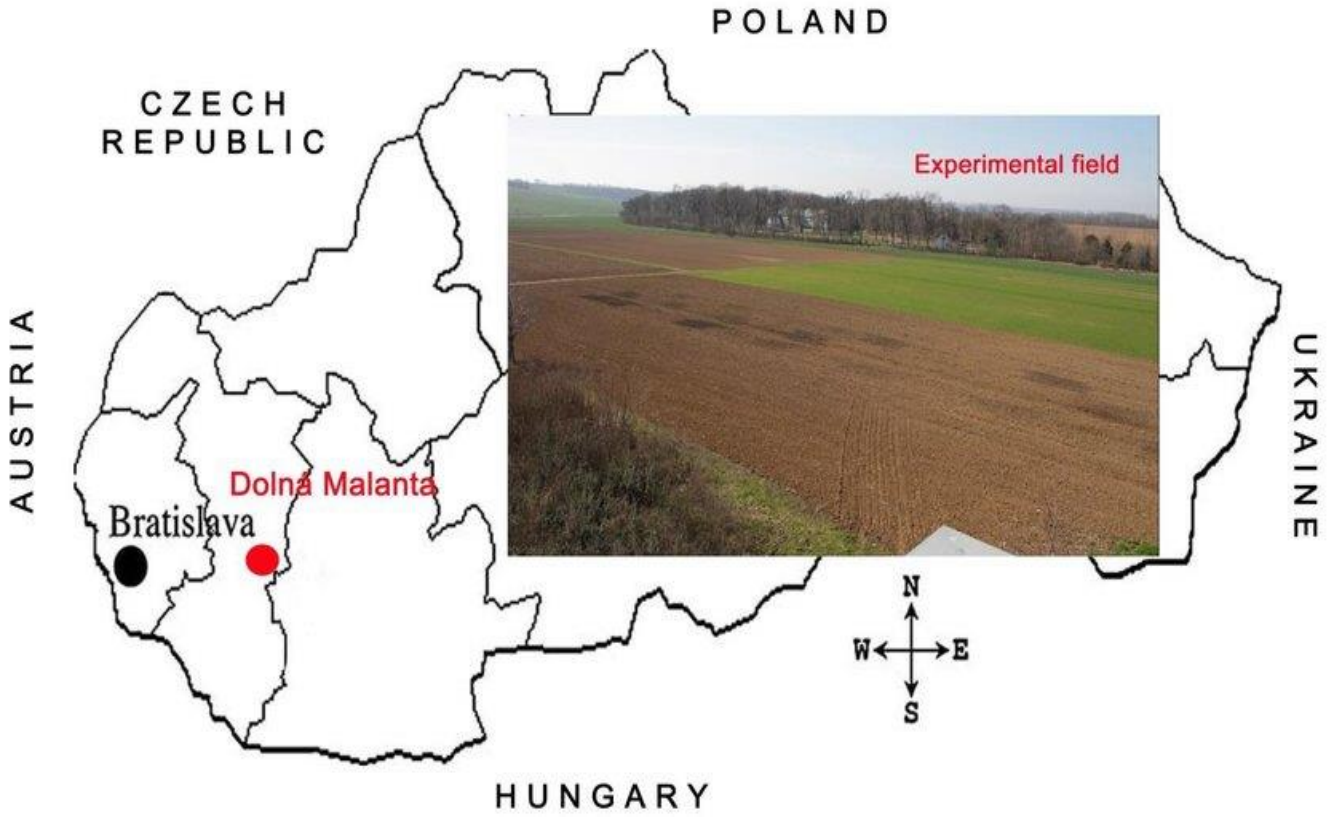
Dolná Malanta (Slovakia)

EXPERIMENT GOALS

The aim of this work was to quantify the extent of the effect of applied biochar during the fourth and fifth year after its application in combination with N-fertilization on soil pH, sorptive characteristics and soil organic matter parameters, including humus as well as crop yields.

4-year experiment



SITE DESCRIPTION

The experimental site of the Slovak University of Agriculture in Nitra is in Dolná Malanta (lat. 48°19'00"; lon. 18°09'00"). The study area is characterized by a warm lowland climate with long, warm, dry summers, short dry winters, and only a very short duration of snow cover (14–30 days). The mean long-term air temperature and precipitation according to the 30-year climatic normal for the period 1961–1990 was 9.8 °C and 540 mm, respectively. The experiment was established on a loamy Haplic Luvisol. The crop were Maize and Spring barley. Nine different treatments were organized into a randomized block design at 27 plots of agricultural land (4 x 6 m) representing one of three replications

BIOCHAR AND ITS APPLICATION IN THE FIELD

The biochar was produced by pyrolyzing paper fiber sludge and grain husks (1:1 w/w) and had particle sizes between 1 to 5 mm. Biomass was pyrolyzed at **550 °C** for 30 min in a Pyreg reactor (Pyreg GmbH, Dörth, Germany). Riedlingsdorf, Austria). The biochar was manually applied into the top of the soil (0–10 cm) at rates of 10 and 20 t ha^{-1}. The treatments performed in each site were : **B0N0** (no biochar, no N fertilization), **B10N0** (biochar at rate of 10 t ha^{-1},no N fertilization) **B20N0** (biochar at rate of 20 t ha^{-1}, no N fertilization), **B0N1** (no biochar combined with first level of N fertilization: doses of N were 160 and 40 kg N ha^{-1} in 2017 and 2018, respectively), **B10N1** (biochar at rate of 10 t ha^{-1} with N: doses of N were 160 and 40 kg N ha^{-1} in 2017 and 2018, respectively), **B20N1** (biochar at rate of 20 t ha^{-1} with N: doses of N were 160 and 40 kg N ha^{-1} in 2017 and 2018, respectively), **B0N2** (no biochar combined with second level of N fertilization: doses of N were 240 and 80 kg N ha^{-1} in 2017 and 2018, respectively), **B10N2** (biochar at rate of 10 t ha^{-1} with N: doses of N were 240 and 80 kg N ha^{-1} in 2017 and 2018, respectively) and **B20N2** (biochar at rate of 20 t ha^{-1} with N: doses of N were 240 and 80 kg N ha^{-1} in 2017 and 2018, respectively).

Measured parameters
Field conditions: rainfall / meteorological data,
Soil analysis and interactions with biochar: total organic C, pH, Ha (hydrolytic acidity), SBC (sum of basic cations), CEC, Bs (base saturation), HS (humic substances), HA(humic acids), CL (Labile carbon),
Crop production: maize and spring barley
Production data: nutritional status of the plant , quality and quantity
Plant-soil dynamics and interactions: carbon and nitrogen soil-plant dynamics

Key findings

- Through the application of biochar, the soil pH and soil organic carbon content both increased.
- The hydrolytic acidity decreased, while the sum of basic cations and cation exchange capacity increased because of the application of biochar.
- The positive effect of biochar application on the alternation of crop yields in the third and fourth year after biochar application was visible only for a higher application rate of biochar with a combination with N fertilizer.

Planned activities or potential experimental activities:
studying the effects of biochar (**0, 10 and 20 t ha^{-1}**) and its combinations with N-fertilization on improving soil characteristics and crop yield.

PRESENTATION OF THE WORKING GROUP

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

Aydin Elena, Vladimír Šimanský, Ján Horák, and Dušan Igaz. 2020. 'Potential of Biochar to Alternate Soil Properties and Crop Yields 3 and 4 Years after the Application'. *Agronomy* 10 (6): 889. https://doi.org/10.3390/agronomy10060889.

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