Effects of tillage systems on earthworm abundance, biomass and species composition in the Pannonian Basin

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Introduction

Soil tillage has major impacts on biological, physical and chemical soil parameters. Soil fauna, such as earthworms are particularly threatened by increasing intensification of soil tillage. Soil tillage affects the whole earthworm community in abundance, biomass and species composition (Briones and Schmidt 2017).

Objectives

The **objective** was to study two long-term soil tillage experiments in North-East Austria and Central-North Hungary between 2020 and 2021 to get deeper insights for the dry Pannonian climate.

Materials and Methods

Long-term trials:
- North-East Austria (AT) (Est. 1996) and Central-North Hungary (HU) (Est. 2002)

Tillage methods:
- mouldboard ploughing (P), shallow cultivation (SC), and no-till (NT).

Examined parameters:
- Physical parameters (soil moisture content, bulk density, soil penetration resistance, texture),
- Chemical (pH, soil organic carbon, $CaCO_3$ content),
- Biological (earthworm abundance, biomass, species (hand-sorting - 20 × 20 × 30 cm block) (**Figure 1**).

Figure 1. Field work on experimental site in HU

Results

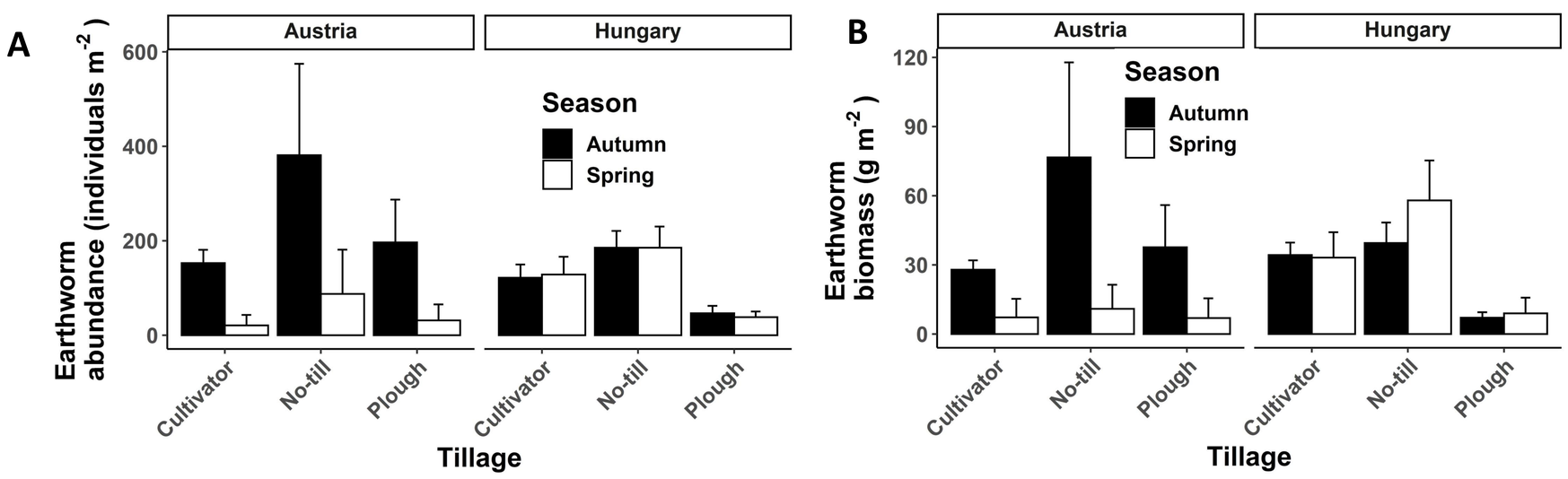

Figure 2. Earthworm A) abundance and B) biomass in AT and HU in autumn and spring 2020 and 2021 in two long-term soil tillage trials with plough, cultivator and no-till.

AT site showed seasonal variations in earthworm numbers with lower numbers in spring and higher numbers in autumn, but with similar abundance in HU throughout the year. Overall, highest earthworm abundance were determined at both sites in NT. In HU NT was followed by SC and then P, but without differences between SC and P in AT (**Figure 2 A,B**).

As for species composition, *Lumbricus terrestris* was mainly found in NT in AT with four species in total. In HU, only two earthworm species (*Ap. rosea*, *Ap. caliginosa*) were detected in P, and two additional species (*Ap. georgii*, *All. chlorotica*), and greater abundance were found especially in NT, but also in SC.

Conclusions

According to these results, NT systems provided a better environment for earthworms and a slightly higher species richness also in dry areas like the Pannonian Basin.

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