EGU24-6636, updated on 25 Jul 2024
https://doi.org/10.5194/egusphere-egu24-6636
EGU General Assembly 2024

Soil fauna presence in post-mining area after afforestation with diverse tree species

Wiktoria Ogar[1], Rüdiger M. Schmelz[2], Bartłomiej Woś[3], Tomasz Wanic[4], Marcin Pietrzykowski[3], and Agnieszka Józefowska[1]

[1]University of Agriculture in Krakow, Faculty of Agriculture and Economics, Department of Soil Science and Agrophysics, Poland (wiktoria.ogar@student.urk.edu.pl)

[2]A Coruña (rmschmelz@gmail.com)

[3]University of Agriculture in Krakow, Faculty of Forestry, Department of Ecological Engineering and Forest Hydrology, Poland

[4]University of Agriculture in Krakow, Faculty of Forestry, Laboratory of Forest Environment Geochemistry and Reclaimed Areas, Department of Forest Ecology and Silviculture, Poland

Soils around the world are facing increasing degradation due to human activities such as mining. This degradation adversely affects soil functioning and, consequently, the ecosystem services it provides. Therefore, our research concerns various strategies for restoring forest ecosystems at such sites. Soil fauna can play a key role in restoring degraded soils, positively influencing their properties, especially in the case of newly formed soils. Providing an influx of organic matter, such as through afforestation, can promote the growth of microorganisms and subsequently facilitate the emergence of soil fauna and the process of soil formation.

Our main research question is how different tree species and soil disturbances, in this case especially mining, affect enchytraeid and earthworm communities and how soil fauna contribute to the soil-forming process in post-mining soil. We selected sandy soil in sandpit excavations afforested with various tree species, including Scots pine (*Pinus sylvestris* L.), European larch (*Larix decidua* Mill.), Silver birch (*Betula pendula* Roth) and European oak (*Quercus robur*). Soil profiles were described and samples were taken for basic soil analysis, including pH, soil organic carbon and nitrogen content, and soil porosity. In addition, earthworms and enchytraeids were collected from all plots to assess the density and species diversity of the soil fauna.

Based on the WRB classification, the studied soils were classified as Arenosols. The studied soils generally showed acidic pH, subangular structure in the upper layers and slightly acidic pH with a lack of structure in the subsoil. Slight differences were observed in the thickness of the humus layer between the soil profiles. Areas undergoing reclamation after sand mining were characterized by low enchytraeid densities. The Shannon index reached the highest value for the birch site and was 0.64 and the lowest for the pine site and was 0.08. In turn, the highest density of enchytraeid occurred at the oak site and was 34574 ind. m^{-2} and the lowest at the larch site and was 10123 ind. m^{-2}. Soils under deciduous species show higher density and biomass of earthworms compared to soils under coniferous species. The highest density of earthworms was

noted at the birch site and was 25 ind. m^{-2} and the lowest at the larch site and was 0 ind. m^{-2}. It is worth noting that the birch site showed the highest diversity of enchytraeid species and highest abundance of an earthworm species. The density of the studied soil fauna was not high, but their presence and diversity may indicate a positive trajectory of changes occurring in these soils.

This research was funded by The National Science Centre, Poland, grant No. 2021/42/E/ST10/00248. The analyses were performed in the Laboratory of Forest Environment Geochemistry and Reclaimed Areas, University of Agriculture in Krakow.

Key words: earthworm, enchytraeid, sand mine, sandy soil