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Opinion

Soil Biodiversity and Pedodiversity: Disregarded Realm of Knowledge

Owais Bashir[1]*, Shabir AB[2], Shuraik K[2] and Lizny Jaufer[3]

[1]Division of Soil Science, Sher-e-Kashmir, India

[2]School of Natural Sciences, United Kingdom

[3]School of Architecture, United Kingdom

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Abstract

Soil biodiversity and pedodiversity are closely related concepts that are essential for maintaining healthy and sustainable ecosystems. Soil biodiversity refers to the variety of living organisms that inhabit soil, while pedodiversity refers to the diversity of soil types and landscapes. These two concepts are linked, as different soil types and landscapes can support different communities of soil organisms, which occupies a critical role in the longevity of soil health and fertility. Changes in pedodiversity can have significant impacts on soil biodiversity, which can, in turn, impact ecosystem functioning. Preserving and enhancing soil biodiversity and pedodiversity are therefore essential for maintaining healthy and sustainable ecosystems, and strategies for doing so may involve promoting organic farming, reducing tillage, and restoring degraded soils. Conclusively, addressing the links between soil biodiversity and pedodiversity can assist guide efforts to increase soil health and biodiversity, therefore sustaining a diverse variety of ecosystem processes and services.

***Corresponding author:** Owais Bashir, Division of Soil Science, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Kashmir, India

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Introduction

Soil biodiversity and pedodiversity are two closely related concepts that are essential for maintaining healthy and sustainable ecosystems. Soil biodiversity refers to the variety of living organisms that inhabit soil, including bacteria, fungi, protozoa, nematodes, insects, and larger animals like earthworms. On the other end, Pedodiversity refers to the diversity of soil types and landscapes, which includes variables including soil texture, structure, and chemistry [1]. Soil biodiversity and pedodiversity are closely linked, as different soil types and landscapes can support different communities of soil organisms. For example, soils with higher clay content may support different microorganisms than those with higher sand content. Similarly, different types of soil landscapes, such as wetlands or grasslands, can support different communities of soil organisms. Together, soil biodiversity and pedodiversity contribute to ecosystem functioning by supporting a wide range of processes, such as nutrient cycling, decomposition, and plant growth. Soil biodiversity is responsible for breaking down organic matter and converting it into forms that plants can use for growth, while pedodiversity can influence factors such as water availability and nutrient availability. Soil biodiversity analyses encounter various challenges, such as the extraction and identification of numerous species, as well as the identification of the most relevant abiotic factors influencing soil community assemblages. Anthropogenic activities like agriculture, deforestation, and urbanization can have negative impacts on both soil biodiversity and pedodiversity and lead to the increase of contaminated farmlands and brownfield sites [2]. Agricultural practices that involve the use of synthetic fertilizers and pesticides can reduce soil biodiversity by eliminating beneficial microorganisms and insects, while deforestation can lead to soil erosion and loss of soil structure, reducing pedodiversity. These impacts can have serious consequences for ecosystem functioning. For example, loss of soil biodiversity can lead to reduced crop yields, increased greenhouse gas emissions, and reduced carbon sequestration [3]. Similarly, loss of pedodiversity can lead to reduced water infiltration, increased runoff, and reduced soil fertility. Efforts to preserve and enhance soil biodiversity and pedodiversity are therefore essential for maintaining healthy and sustainable ecosystems. Strategies for preserving and enhancing soil biodiversity include promoting organic farming, reducing tillage, and restoring degraded soils.

Organic farming practices can help support soil biodiversity by reducing the use of synthetic fertilizers and pesticides and promoting the use of cover crops and crop rotations [4]. Reduced tillage can also help maintain soil structure and reduce soil erosion, which can support soil biodiversity. Depending on the context, efforts to conserve and improve pedodiversity may include a variety of tactics. Preserving natural landscapes such as wetlands or grasslands, for occasion, can assist to sustain a range of soil types and landscapes. Similarly, conservation methods such as decreased tillage can assist retain soil structure and prevent erosion, so encouraging the formation of a diverse range of soil species. These functional prominence prove that the soil biodiversity and pedodiversity are two of the most essential components for healthy and sustainable ecosystems. Understanding the connections between these two concepts can help guide efforts to preserve and enhance soil health, supporting a wide range of ecosystem processes and services (Figure 1).

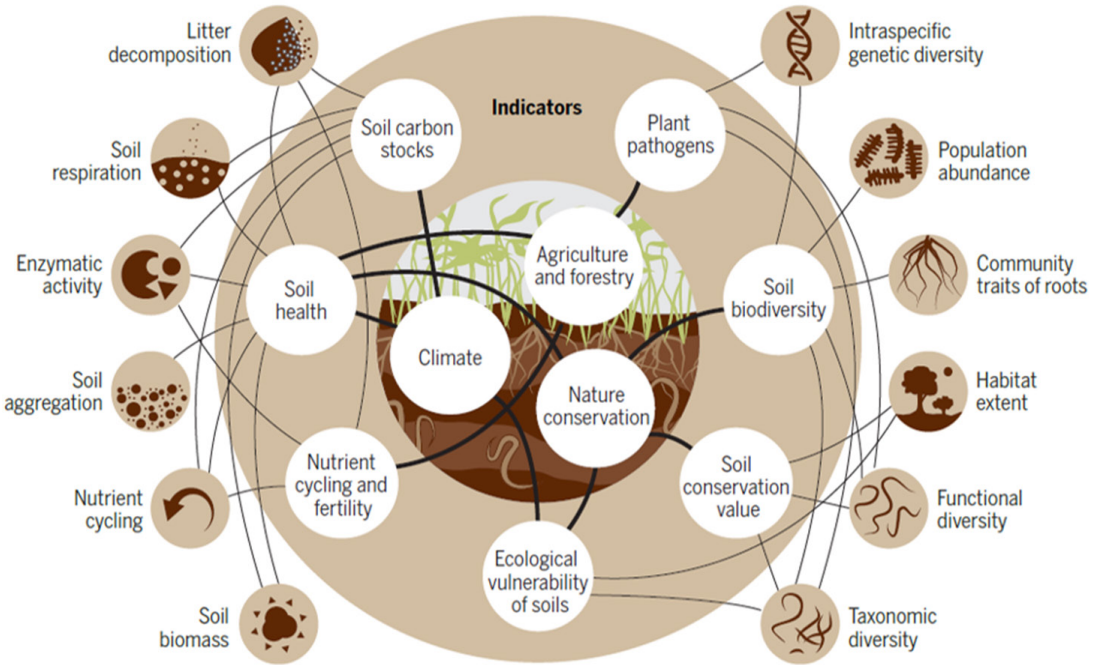

Figure 1

Relationship of Soil Biodiversity and Pedodiversity

The soil biosphere is understudied, despite the countless instances of soil ecology relevances in agricultural and natural ecosystems. The interactions among soil diversity and soil mechanisms, in addition to the driving forces of soil biodiversity configurations, are also relatively understudied, prompting soil ecologists to consider the feasibility of discovering relationships between soil biodiversity and soil pedodiversity in order to achieve ecofriendly and sustainable agriculture [5]. Soil biodiversity and pedodiversity are closely connected, as different soil types and landscapes can support different communities of soil organisms. Soil organisms play a critical role in maintaining soil health and fertility, contributing to processes such as nutrient cycling, soil structure formation, and plant growth. Changes in pedodiversity can therefore have significant impacts on soil biodiversity, which can, in turn, impact ecosystem functioning. For example, changes in soil structure and texture can impact the distribution and activity of soil organisms. Soil organisms may be more abundant in certain soil types or landscapes, and changes in soil type or landscape can impact the abundance and diversity of different soil organisms. Sandy soils may have less capacity to hold water and nutrients, which can impact the growth of certain types of plants and soil organisms [6]. In contrast, clay soils may have a higher capacity to hold water and nutrients, but may be more prone to compaction, which can limit the growth of plant roots and reduce the availability of oxygen to soil organisms. Changes in soil biodiversity can also impact pedodiversity, as soil organisms play a key role in soil formation processes. Soil invertebrates such as the earthworms can help to mix and move soil particles, promoting the development of soil structure and porosity [7].

Soil microorganisms can contribute to the breakdown of organic matter, releasing nutrients and promoting soil fertility. Soil biodiversity alterations can thus have an influence on soil formation and development, resulting in variations in soil type and landscape [8]. Preserving and enhancing soil biodiversity and pedodiversity are therefore essential for maintaining healthy and sustainable ecosystems. Strategies for supporting soil biodiversity and pedodiversity may involve a range of approaches, including promoting organic farming, reducing tillage, and restoring degraded soils [9]. Integrated approaches that consider both soil biodiversity and pedodiversity may be particularly effective, as they can help to promote synergies between different soil conservation strategies. Overall, the connections between soil biodiversity and pedodiversity highlight the importance of understanding soil as

a complex and interconnected system. By considering the ways in which different soil factors interact with one another, we can develop more effective strategies for promoting soil health and biodiversity, supporting a wide range of ecosystem processes and services.

Conclusion

Soil biodiversity and pedodiversity are two essential components of healthy and sustainable ecosystems. Soil organisms play a critical role in maintaining soil health and fertility, contributing to processes such as nutrient cycling, soil structure formation, and plant growth. Changes in pedodiversity can impact soil biodiversity, which can, in turn, impact ecosystem functioning. Strategies for supporting soil biodiversity and pedodiversity include promoting organic farming, reducing tillage, and restoring degraded soils. In the future, advancements in soil microbiology and genetic sequencing techniques may provide new opportunities to enhance our understanding of soil biodiversity and support more targeted soil conservation strategies. Additionally, innovative approaches such as agroforestry and regenerative agriculture hold promise for promoting soil health and biodiversity while also addressing broader challenges such as climate change and food security.

References

1. Mikhailova EA, Zurqani HA, Post CJ, Schlautman MA, Post GC (2021) Soil diversity (pedodiversity) and ecosystem services. Land 10(3): 288.
2. Mahammedi C, Mahdjoubi L, Booth C, Butt TE (2022) Framework for preliminary risk assessment of brownfield sites. Science of the Total Environment 807(3): 151069.
3. Kader S, Jaufer L, Spalevic V, Dudic B, Sreenivasulu C (2022) Green roof substrates-A literature review. Frontiers in Built Environment 8: 207.
4. Kader SA, Spalevic V, Dudic B (2022) Feasibility study for estimating optimal substrate parameters for sustainable green roof in Sri Lanka. Environment Development and Sustainability.
5. Ibanez JJ, Krasilnikov PV, Saldana A (2012) Archive and refugia of soil organisms: Applying a pedodiversity framework for the conservation of biological and non-biological heritages. Journal of Applied Ecology 49(6): 1267-1277.
6. Naikoo NB, Mir AH, Jianjun H, Nazir S, Yasin G, et al. (2022) Aggregation-dependent phosphorus adsorption under different land uses of district Kupwara of Kashmir Valley. Journal of Plant Nutrition and Soil Science 185(5): 668-676.
7. Lowe CN, Butt KR, Sherman RL (2023) Current and potential benefits of mass earthworm culture. In Mass Production of Beneficial Organisms 581-597.
8. Zejak D, Spalević V, Popović V, Markoski M, Dudić B, et al. (2022) Analysis of the presence of heavy metals in the soils of the hilly-mountainous areas of Balkan Peninsula with the assessment of its potential for the fruit growing: Case study of the Ljubovidja river basin, Polimlje, Montenegro. Paper presented at the Proceedings, 26 International Eco-Conference and 12 Safe Food Novi Sad.
9. Kuzyakov Y, Zamanian K (2019) Reviews and syntheses: Agropedogenesis-humankind as the sixth soil-forming factor and attractors of agricultural soil degradation. Biogeosciences 16(24): 4783-4803.