

Original Research

Soil mesofauna diversity in agricultural systems of Slovenia using the QBS index and its modifications

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Abstract

Soil mesofauna plays a key role in maintaining soil health by supporting the decomposition of organic matter, nutrient cycling and the maintenance of soil structure. In this study of Slovenian agricultural ecosystems, we used four modifications of the QBS index, a soil biological quality index based on soil mesofauna. We compared diversity in arable fields under different tillage intensities, a strawberry field and an orchard, managed with either organic or integrated pest management methods (IPM). The results show significant differences in the mesofaunal communities in the soil. Minimum tillage promoted higher biodiversity, especially of Collembola, compared to conventional tillage. In fruit production systems, the ratio of Collembola to Acarina differed from that of arable fields, skewing in favour of Collembola, possibly related to the use of copper-containing pesticides in organic orchards and systemic herbicides in IPM systems. The QBS index values for soil health varied considerably between systems. Only QBS modifications considering the abundances of organisms (QBS-ab and QBS-a) were able to distinguish between different system-management groups. This study provides insights into the limitations of the originally proposed QBS-ar index to discern the effects of farming intensity on the soil mesofaunal community. Results suggest that minimum tillage and organic management practices can promote healthier soil ecosystems, emphasizing the importance of sustainable soil management for the promotion of soil biodiversity. Future research should aim to incorporate a broader range of agricultural practices and assign fauna to a higher taxonomic rank to further explain the effects on soil mesofauna diversity.

Keywords

Soil health, Soil microarthropods, Biodiversity, Agroecosystems, Tillage intensity, Organic farming

