

Evaluating soil degradation based on earthworm community characteristics: A case study on loess soils

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Abstract

Soil degradation restricts the development of agriculture and the degree of soil degradation is related to land use type. Quick and efficient evaluation of the degree of soil degradation is needed for the timeous implementation of remedial measures to ensure soil sustainability. Earthworm community characteristics are closely related to soil management practices and soil quality and could be used for evaluation purposes. In this Loess Plateau study, the degree of soil degradation under nine different land use types (natural and planted woodland, shrubbery, and grassland, plus cropland, orchard, and abandoned land) was related to the earthworm community characteristics (density, biomass, and the Shannon-Wiener, Species richness, and Pielou's evenness indices) using a soil degradation index calculated from soil physicochemical properties determined for each land use type. The earthworm community characteristics associated with a low degree of degradation were significantly higher than those associated with a high degradation degree. Compared to the artificially managed land use types, earthworms in the natural ones showed higher biomass, density, and diversity. The earthworm density, biomass, and Shannon-Weiner index were significantly correlated with soil organic matter and total nitrogen content. These findings indicate that earthworm community characteristics can comprehensively characterise the physicochemical properties and biological characteristics of soils under different land use types. Linear correlations showed a significant relationship between the soil degradation index and the earthworm community characteristics, indicating that the latter could be used effectively to evaluate and represent the degree of degradation of soils on the Loess Plateau over a certain degradation range.

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