Soil Particle Size and Organic Matter Characteristics of Different Land Use Types in the Mu Us Sandy Land (Postprint)

Authors: Mao Li, Su Zhizhu, Ma Yijuan, Li Xiang, Su Zhizhu

Date: 2019-09-10T00:00:00+00:00

Abstract

In the Mu Us Sandy Land, four land use types—semi-fixed dune land, stubble land, tilled land, and grassland—were selected. Soil samples were collected from the surface layer (0-5 cm) and subsurface layer (5-10 cm) to determine and analyze variations in particle size and organic matter content and their interrelationships.

The results indicated: The dominant particle size fraction in stubble land, tilled land, and grassland was silt (0.002-0.05 mm). Surface layer silt content exhibited the following trend: grassland (61.06%) > stubble land (53.09%) > tilled land (48.28%); subsurface layer: grassland (61.25%) > tilled land (49.43%) > stubble land (48.42%). The dominant particle size fraction in semi-fixed dune land was fine sand (0.1-0.25 mm), comprising 52.69% in the surface layer and 54.53% in the subsurface layer.

Soil organic matter content in the surface layer followed the sequence: grassland (18.75 $g \cdot kg^{-1}$) > tilled land (12.53 $g \cdot kg^{-1}$) > stubble land (11.25 $g \cdot kg^{-1}$) > semi-fixed dune land (8.13 $g \cdot kg^{-1}$); in the subsurface layer: grassland (13.36 $g \cdot kg^{-1}$) > stubble land (13.05 $g \cdot kg^{-1}$) > tilled land (12.67 $g \cdot kg^{-1}$) > semi-fixed dune land (7.73 $g \cdot kg^{-1}$).

The correlation between soil particle size and organic matter revealed that organic matter was significantly positively correlated with silt in stubble land and semi-fixed dune land, whereas in tilled land, organic matter exhibited positive correlations with medium sand and fine sand, indicating that soil organic matter in tilled land is unstable and vulnerable to other influencing factors.

Full Text

Soil Particle Size and Organic Matter Content of Different Land Use Types in the Mu Us Sandy Land

MAO Li[1], SU Zhizhu[2], WANG Guoling[1], MA Yijuan[3], LI Xiang[1]

[1]College of Environmental and Resources Sciences, Shanxi University, Taiyuan 030006, Shanxi, China
[2]College of History and Culture, Shanxi University, Taiyuan 030006, Shanxi, China
[3]College of Geographical Science, Taiyuan Normal University, Jinzhong 030619, Shanxi, China

Abstract

In the Mu Us Sandy Land, where the ecological environment is fragile and soil wind erosion is severe, this region represents one of the key areas for desertification control in the Beijing-Tianjin sand source zone. This study investigated soil particle size distribution and organic matter content across different land use types to provide fundamental data and a scientific basis for rational land utilization and desertification control. Through field investigations in the Mu Us Sandy Land, topsoil samples were collected from four land use types: semi-fixed dune land, stubble land, ploughed land, and grassland. Soil grain size and organic matter content were analyzed, and the relationship between soil organic matter content and particle size distribution was examined. The results revealed: (1) Silt particles (0.002–0.05 mm) dominated in stubble land, ploughed land, and grassland. In the topsoil, silt content followed the order: grassland (61.06%) > stubble land (53.09%) > ploughed land (48.28%), while in the sub-surface layer, the order was: grassland (61.25%) > ploughed land (49.43%) > stubble land (48.42%). Fine sand (0.1–0.25 mm) dominated in semi-fixed dune land, comprising 52.69% in topsoil and 54.53% in the sub-surface layer. (2) Topsoil organic matter content generally followed the order: grassland (18.75 g·kg^{-1}) > ploughed land (12.53 g·kg^{-1}) > stubble land (11.25 g·kg^{-1}) > semi-fixed dune land (8.13 g·kg^{-1}), while sub-surface layer organic matter content followed: grassland (13.36 g·kg^{-1}) > stubble land (13.05 g·kg^{-1}) > ploughed land (12.67 g·kg^{-1}) > semi-fixed dune land (7.73 g·kg^{-1}). (3) Correlation analysis between soil particle size and organic matter content showed a significant positive correlation between organic matter content and silt content in stubble land and semi-fixed dune land, and a highly significant positive correlation between organic matter content and medium/fine sand in ploughed land, indicating that soil organic matter content in ploughed land is unstable and vulnerable to other factors.

Keywords: soil particle size; soil organic matter content; land use type; Mu Us Sandy Land

Note: Figure translations are in progress. See original paper for figures.