

Changes of soil aggregate stability with vegetation types, soil depths and altitudes in the Qilian Mountains, China

Xia Wei¹, Ning Wei², Yan He¹, Wenzhu Yu¹, and Kejian An¹

¹Lanzhou University

²Northwest A&F University

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Abstract

Soil aggregate stability (SAS) is a significant indicator of soil structure stability, soil quality and soil erosion, however, very few researches have concentrated on SAS in the Qilian Mountains, China. In this research, three main vegetation types, desert grassland, steppe and meadow were taken as the research object. The characteristics of indices of SAS including water-stable aggregate (WSA), mean weight diameter (MWD) and geometric mean diameter (GMD) under different vegetation types, different soil depths, and different altitudes were studied. The results showed that SAS was greatest in meadow, followed by steppe and desert grassland. Generally, SAS decreased with the increasing of soil depths, however, only this decrease in meadow were significant. Two-way ANOVA results showed effects of vegetation types were more powerful than soil depths. Soil aggregate stability increased initially and then decreased with altitude under the same vegetation types. The strongest stability occurred at 2600, 2739 and 2971 m, respectively, in desert grassland, steppe and meadow with the corresponding range of altitudes of 1692~3522, 1696~3257 and 2965~3579 m in this research. In addition, the relationship between soil aggregate stability and environment factors showed that there were significantly ($P < 0.01$) positive relationships between soil aggregate stability and mean annual precipitation, soil organic carbon and macro-aggregates (> 0.25 mm). The present study provides insight into the assessment of soil quality and the sustainable development in this region.

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