

研究论文

黄土高原沟壑区小流域坡地土壤养分分布特征

魏孝荣^{1, 2}, 邵明安^{1, *}

1.黄土高原土壤侵蚀与旱地农业国家重点实验室, 中国科学院水利部水土保持研究所(西北农林科技大学水土保持研究所),

陕西 杨凌712100 2.中国科学院研究生院, 北京100039

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摘要 坡地土壤质量退化以及生产力下降是限制坡地植被恢复的主要因素, 而坡地土壤质量和生产力在很大程度上取决于土壤养分状况。通过野外调查和室内分析相结合的方法, 研究了黄土高原沟壑区坡地土壤养分分布特征, 结果表明坡地土壤主要养分含量均随土壤层次的加深而降低, 其中以有机碳和全氮降低最多, 而硝、铵态氮和全磷降低较少; 坡地不同土层土壤有机碳和全氮表现出较大的变异性, 土壤铵态氮和全磷的变异较小。0.005~0.05 mm土壤颗粒含量随土层加深而增加, 0.05~1 mm颗粒含量随土层加深而降低; <0.005 mm土壤颗粒含量在0~40 cm土层变异很大, 而0.005~0.05 mm和0.05~1 mm的土壤颗粒在所有土层变异都很小。有机碳、全氮、全磷和<0.005 mm颗粒从坡顶向下呈增加的趋势, 其分布与坡度和坡长有关, 其变异性随坡度和坡长的增加而增大。坡面较长时, <0.005 mm颗粒易于在坡面中、下部累积, 坡度较大时则易于迁移出坡面。坡面土壤有机碳、全氮和全磷均在坡底部富集, 其富集程度和位置因坡长和坡度而异, 长缓坡有利于养分富集, 短陡坡利于养分迁出。坡度较小时坡面不同位置土壤养分剖面分布主要由坡面土壤性质变异引起, 随坡度的增加, 土壤侵蚀便逐渐成为坡面养分分布的主导因子。坡上部碳、氮养分流失的深度也随坡度的增加而加深, 而不同坡位全磷的剖面分布与坡度的关系较差。因此, 在坡地土壤养分调控中必须综合考虑坡度和坡长因素。

关键词 [黄土高原](#); [沟壑区](#); [坡地](#); [土壤养分](#); [颗粒组成](#)

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The distribution of soil nutrients on sloping land in the gully region watershed of the Loess Plateau

WEI Xiao-Rong^{1, 2}, SHAO Ming-An^{1, *}

1 State Key Laboratory of Soil Erosion and Dryland Farming on the Loess Plateau, Institute of Soil and Water Conservation, CAS and MWR (Institute of Soil and Water Conservation, Northwest Sci-Tech. University of Agriculture & Forestry), Yangling 712100, China

2 Graduate School of CAS, Beijing, 100039, China

Abstract The deterioration of soil quality and the decline in productivity on sloping land are the main factors that limit the revegetation of the Loess Plateau. However, these two factors largely depend on soil nutrient status. The purpose of this study was to investigate the distribution of soil nutrients on sloping land located in the gully region of the Loess Plateau. The results showed that the soil nutrient content generally decreased with soil depth. Among the soil nutrients, soil organic carbon and total nitrogen decreased most compared with nitrate nitrogen, ammonium nitrogen, and total phosphorus. In addition, the variation of soil organic carbon and total nitrogen was greater compared to the variation of ammonium nitrogen and total phosphorus among different soil layers. The amount of 0.005-0.05 mm soil particles increased with soil depth, but the amount of 0.05-1 mm soil particles decreased with depth. There was little change in the content of 0.05-1 mm and 0.005-0.05 mm particles in 0-60 cm layer soils, but there was a large change in the < 0.005 mm particles in the 0-40 cm layer soils. Soil organic carbon, total nitrogen, total phosphorus, and <0.005 mm soil particles all increased as the distance from the top of the slope increased. Furthermore, soil properties were closely related with the length and gradient of the slope. Specifically, variation in the soil nutrient content of sloping land increased as the length and gradient o

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· 魏孝荣	
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· 邵明安	
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f the slope increased. For long and gentle slopes, the middle and lower positions of the slope tended to be enriched in nutrients and <0.005 mm soil particles; however, for short and steep slopes the nutrients and <0.005 mm soil particles tended to be transported away from the slope. As the gradient of the slope increased, soil erosion and sediment deposition became the predominant factors controlling nutrient distribution in the soil profile at different points along the slope. Slope gradient also affected the depth of carbon and nitrogen loss from the upper positions on the slope. In contrast, the distribution of total soil phosphorus in the soil profile was only slightly related with slope gradient. The results in this study recommended that the length and gradient of the slope should be considered in the soil nutrients management on sloping land.

Key words [the Loess Plateau](#) [gully region](#) [sloping land](#) [soil nutrients](#) [particle fraction](#)

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通讯作者 邵明安 mashao@ms.iswc.ac.cn