

研究论文

# 黄土丘陵区地形、土壤水分与草地的景观格局

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**摘要** 在黄土丘陵区, 地形因素和土壤水分是决定草地景观格局的主要因素, 同时草地景观格局在不同尺度上影响着景观中的流。地形因素、土壤水分和草地结构在不同尺度上有着密切的联系, 研究它们之间的关系对于了解生态系统的过程十分重要。针对黄土高原异质化的草地群落结构, 选取黄土丘陵区经过20多年自然封育形成的天然草地, 从坡面尺度对景观格局进行了调查研究, 在地形因素、土壤水分和草地结构中选取了有代表性的指标14个, 用多元统计分析对选取的指标进行了主成分分析和聚类分析。聚类分析将样方分成3种植被类型, 不同植被类型的海拔、坡度、20~140cm土壤含水量以及物种丰富度和生物多样性存在显著性差异。相关分析表明: 海拔对0~300cm土壤含水量影响显著; 海拔对草地群落盖度, 坡位、坡向对草地群落的物种丰富度和生物多样性有着重要影响; 而草地群落的物种丰富度和生物多样性与0~100cm土层的含水量关系密切。

**关键词** [黄土丘陵区](#); [地形因素](#); [土壤水分](#); [草地景观格局](#); [多元统计分析](#)

**分类号** [Q149](#), [Q948](#), [S154](#), [S812](#)

## Reciprocal relationships between topography, soil moisture, and native vegetation patterns in the loess hilly region, China

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**Abstract** In loess hill landscapes, the pattern of vegetation affects movement of water and soil across the landscapes at multiple scales; likewise topography and soil moisture influence the structure of the plant community. At smaller scales, soil moisture is heterogeneous. Small-scale heterogeneity has a large impact on the performance of individual plants, and therefore it influences the structure and dynamics of plant populations and communities. These relationships must be studied in order to gain an understanding of the ecosystem dynamics. We investigated at the slope scale the community structure of natural grassland on the Loess Plateau. The study site had been fenced off for more than 20 years. We selected 14 topography, soil moisture, and community structure metrics. Through the use of multivariate statistics (principle component analysis and cluster analysis) and canonical correlation analysis, we explain the complex relationships between topography, soil moisture and community structure. Three community types were identified by cluster analysis, distinguished by significant differences in elevation, slope, soil moisture at the 20140cm depth, species richness, and Shannon-Wiener index. Correlation analysis indicated that elevation impacted community coverage, and slope position and slope aspect affected biodiversity of the plant community. Elevation and slope position influenced soil moisture at 0300cm depth, while the biodiversity of the plant community had a reciprocal relationship with soil moisture at 0100cm depth.

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**Key words** [loess hill region](#); [topography](#); [soil moisture](#); [vegetation pattern](#); [multivariate statistical analysis](#)

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