Obtaining the Soil Nutrients’ Spatial Patterns Under a Gradient Grazing Disturbance by Using Geo-statistics in the Songnen Meadow Steppes, Northeastern China

Liangjun HU, Weiwei WANG

Key Laboratory of Vegetation Ecology, Ministry of Education, Northeast Normal University, 5268 Renmin Street, Changchun, Jilin 130024, China; hulj068@nenu.edu.cn

Keywords: soil nutrients, spatial pattern, grazing disturbance, Geo-statistics, semi-variograph, Songnen Meadow Steppes.

SUMMARY

Soil is a natural continuum coupled by anthropogenic impacts with high spatio-temporal heterogeneities that are defined to be soil patterns. These patterns, shown by soil physical, chemical and biological attributes, will determine the emergence and growth of plants and other living organisms above and beneath the soil. Grazing is a crucial disturbance to cause the formation of a spatial pattern of steppe soils (Bauer et al., 1987). Although relations between soil properties and grazing disturbance were long discussed, soil spatial patterns under and their responses to grazing disturbance are still poorly understood. By applying a Geo-statistic analyzes, we carried out a field survey to pursue the soil nutrients’ patterns and grazing disturbance relationships in the Songnen steppes. The aim of this research is: (1) to establish the dynamics of soil nutrients’ spatial patterns of under gradient grazing disturbance; and (2) to further understand the relations between grazing disturbance and soil nutrients’ spatial patterns, in a steppe ecosystem. We conducted the field survey in July, 2005 at the Changling Steppe Reserve in the Songnen Meadow Steppes, northeast China. Through laboratory analysis, main soil nutrients’ contents, their spatial variations of under and associations with gradient grazing pressures, were examined by use of the Geo-statistic method - the semi-variance method and Kriging algorithm. Herein, the grazing disturbance were settled by four levels as ungrazed, lightly, moderately, and heavily grazed, respectively. The selected major soil nutrient indices were SOM, soil total and available nitrogen, total and available phosphorus, and available potassium. As a result, we concluded that: (1) the semi-variographs of SOM, soil total phosphorus and available phosphorus can be best described by exponential model; (2) semi-variographs of soil total nitrogen, available nitrogen and available potassium will be best described by spherical model; (3) SOM, total nitrogen and total phosphorus showed a moderately spatial dependence (C/C0+C=50.5%, 65.8%, 72.9%), however, available nitrogen, available phosphorus and available potassium, indicated a weak spatial dependence (C/C0+C=76.5%, 83.6%, 99.9%).

REFERENCES