Geophysical Research Abstracts
Vol. 16, EGU2014-13337, 2014
EGU General Assembly 2014

Clipping and shading alter NH4+ uptake by plants in grazed and ungrazed Tibetan alpine grasslands

Yue Sun (1), Per Schleuss (2), Qianru Li (1), Baijie Yang (1), Xingliang Xu (1), Yakov Kuzyakov (1,2)

(1) Institute of Geographic Sciences and Natural Resources, Chinese Academy of Sciences,Beijing,China (syxixisy@gmail.com), (2) Soil Science of Temperate Ecosystems Büsgen-Institute,Georg August University of Göttingen Büsgenweg 2 37077 Göttingen Germany

The Kobresia pastures are the most common and most important vegetation type on the Tibetan Plateau as it occupies more than 35% the plateau area. These pastures have been remained stable for about one million years, but have been strongly changed by increased grazing in the recent decades which led to serious grassland degradation. Previous studies on the N cycling in alpine grasslands showed that plant growth was limited by low N availability due to low N mineralization caused by low temperature. However, the effect of grazing on N turnover processes and plant N uptake remains unclear. To clarify the grazing effect for a better understanding N mineralization and plant N uptake in these alpine grasslands, we conducted a 15N experiment in grazed and ungraded plots in these alpine grasslands. Because ammonium was a dominant N form, we used 15N-labeled ammonium so that we can also measure gross N mineralization. To explore the effect of root exudates on 15NH4+ uptake by plants and gross N mineralization, three treatments such as clipping, shading and control were used. Initially, all treatments were labeled by 15NH4+, with blank treatments no 15N tracer addition. Plant and soil samples were collected 7, 14 and 28 days after the labelling. 15NH4+ uptake by alpine plants almost did not change after clipping in the grazed plots, but its uptake was lower under the clipping treatment than under the control treatment in the ungrazed plots. 15N recovery in plants under the shading treatment remained the lowest level in grazed and ungrazed plots. Although clipping removed a part of aboveground biomass, subsequent stimulation of plant growth increased N uptake by plants. Likely, moderate grazing removed a part of aboveground biomass, but 15N recovery in plants was still compared to that in the ungrazed plots, indicating moderate grazing stimulate N uptake by plants through compensatory growth. Gross N mineralization under the shading treatment was higher than under the clipping treatment (shading vs clipping: 0.42 vs 0.34 mg N kg-1 h-1) in the grazed plot. In contrast, gross N mineralization was lower for shading treatment than for clipping treatment (shading vs clipping 0.47 vs 0.63 mg N kg-1 h-1) in the ungrazed plot. Gross N mineralization in the ungrazed soil was higher than in the grazed soil, suggesting that grazing greatly reduced the potential to provide available nitrogen for plants and microorganisms. Therefore, we concluded that low photosynthesis caused by shading, clipping and grazing can affect N transformation and therefore affect the format of soil organic matter.