Land Degradation and Development 2017 vol.28 N1, pages 166-174

Fate of Organic and Inorganic Nitrogen in Crusted and Non-Crusted Kobresia Grasslands

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Abstract

Copyright © 2016 John Wiley & Sons, Ltd. A widespread pattern of the Tibetan plateau is mosaics of grasslands of Cyperaceae and grasses with forbs, interspersed with patches covered by lichen crusts induced by overgrazing. However, the fate of inorganic and organic N in non-crusted and crusted patches in Kobresia grasslands remains unknown. We reported on a field 15 N-labeling experiment in two contrasting patches to compare retention of organic and inorganic N over a period of 29 days. 15 N as KNO 3 , (NH 4) 2 SO 4 or glycine was sprayed onto soil surface. Crusted patches decreased plant and soil N stocks. More 15 N from three N forms was recovered in soil than plants in both patches 29 days after the labeling. In non-crusted patches, 15 N recovery by the living roots was about two times higher than in crusted ones, mainly because of higher root biomass. Microorganisms in non-crusted patches were N-limited because of more living roots and competed strongly for N with roots. Inorganic N input to non-crusted patches could alleviate N limitation to plants and microorganisms, and leads to higher total 15 N recovery (plant + soil) for inorganic N forms. Compared to non-crusted patches, microorganisms in crusted patches were more C-limited because of depletion of available C caused by less root exudation. Added glycine could activate microorganisms, together with the hydrophobicity of glycine and crusts, leading to higher 15 N-glycine than inorganic N. We conclude that overgrazing-induced crusts in Kobresia grasslands changed the fate of inorganic and organic N, and lead to lower total recovery from inorganic N but higher from organic N. Copyright © 2016 John Wiley & Sons, Ltd.

http://dx.doi.org/10.1002/ldr.2582

Keywords

15 N pulse labeling, crusted patches, Kobresia grasslands, pasture degradation, Tibetan grasslands

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