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Carbon and Nitrogen Losses from Soil Depend on Degradation of Tibetan Kobresia Pastures

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Abstract

Copyright © 2016 John Wiley & Sons, Ltd. Degradation of *Kobresia pygmaea* pastures has strongly increased on the Tibetan Plateau over the last few decades and contributed to a high loss of soil organic carbon and nutrients. The pathways of carbon (C) and nitrogen (N) losses from degraded *K. pygmaea* pastures are still unclear, but this is a prerequisite to assess the recovery of Tibetan grasslands. We investigated the response of day- and nighttime CO₂ efflux and leaching of dissolved organic C and N, NH₄⁺ and NO₃⁻ from *K. pygmaea* root mats in three degradation stages: living root mat, dying root mat and dead root mat. Dying root mat had the highest C loss as CO₂ and as leached dissolved organic carbon. This indicates *K. pygmaea* pastures shift from a C sink to a C source following plant death. In contrast, living root mat had the lowest daytime CO₂ efflux ($0.38 \pm 0.1 \mu\text{g C g}^{-1} \text{h}^{-1}$) because CO₂ was assimilated via photosynthesis. Nighttime CO₂ efflux positively correlated with soil moisture for living and dead root mats. It indicates that increasing precipitation might accelerate C losses due to enhanced soil organic carbon decomposition. Furthermore, dead root mat had the highest average NO₃⁻ loss ($23 \pm 2.6 \text{ mg N L}^{-1}$) from leaching compared with other root mats. Consequently, leaching increases the negative impacts of pasture degradation on N availability in these often N limited ecosystems and thus impedes the recovery of *K. pygmaea* pastures following degradation. Copyright © 2016 John Wiley & Sons, Ltd.

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Keywords

CO₂ efflux, dissolved organic carbon, grassland degradation, *Kobresia pygmaea* pasture, NO₃⁻ leaching

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