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

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Abstract

© 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±0·1μgCg-1h-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±2·6mgNL-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. pastures following degradation.

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Keywords

CO efflux 2, Dissolved organic carbon, Grassland degradation, Kobresia pygmaea pasture, NO leaching 3 -