



University of Kentucky
UKnowledge

International Grassland Congress Proceedings

21st International Grassland Congress / 8th
International Rangeland Congress

Carbon and Nitrogen Characteristic in Plants and Soils of the Degraded Alpine *Kobresia pygmaea* Meadow in the Tibetan Plateau

Qiji Wang

Chinese Academy of Science, China

Shixiong Li

Chinese Academy of Science, China

Zenchun Jing

Chinese Academy of Science, China

Wenyong Wang

Qinghai Normal University, China

Follow this and additional works at: <https://uknowledge.uky.edu/igc>



Part of the [Plant Sciences Commons](#), and the [Soil Science Commons](#)

This document is available at <https://uknowledge.uky.edu/igc/21/2-2/42>

The 21st International Grassland Congress / 8th International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

This Event is brought to you for free and open access by the Plant and Soil Sciences at UKnowledge. It has been accepted for inclusion in International Grassland Congress Proceedings by an authorized administrator of UKnowledge. For more information, please contact UKnowledge@lsv.uky.edu.

Carbon and nitrogen characteristic in plants and soils of the degraded alpine *Kobresia pygmaea* meadow in the Tibetan Plateau

Qiji Wang¹ Shixiong Li¹ Zenchun Jing¹ Wenyong Wang²

¹ Northwest Plateau Institute of Biology, The Chinese Academy of Science, Xining, 810001, E-mail: WQJ@nwipb.ac.cn
China ² College of Life Science, Qinghai Normal University, Xining, 810008, China

Key words : Alpine *Kobresia pygmaea* meadow ; Carbon and nitrogen status ; Degradation ; Plants and Soil ; Tibetan Plateau

Introduction Grassland in the Tibetan Plateau occupies an area of about 1.5 million km², or two thirds of the total plateau area (Sun & Zheng 1998). For a long time, grasslands were thought to be inexhaustible, but overgrazing has resulted in serious degradation. Cryoturbation and climate change have also accelerated the deterioration of alpine meadow. Ecosystem alterations cause changes in C and N cycling by altering plant production, rates of soil organic matter accumulation and decomposition, and subsequent C storage in the soils. The objective of the study was to evaluate the influence of land degradation on plant and soil C and N content in degraded alpine meadow.

Materials and methods This work was conducted on alpine meadow in Gande county, Qinghai Province (34°08'N, 100°11'E) located 4060 m asl. Three plots (200m×200m) for each lightly degraded meadow (LD) and severely degraded meadow (SD) were chosen for study. Total vegetation ground cover, and aboveground biomass for grasses, sedges and forbs were evaluated. Total organic carbon and total nitrogen for aboveground plant tissue, the root tissues and soil in the 0~20 cm and 20~40 cm depths were analyzed by dry combustion in a VarioEL[®] elemental analyzer. Tests for significant differences between treatments were conducted using analysis of variance with least significant difference.

Results The biomasses of grasses, forbs and the root biomasses in the 0~20 cm, 20~40cm and in 0~40m depths in LD were significantly higher than those in SD, respectively, except the biomass of sedges. The total aboveground plant tissue C and root C and N contents were higher for LD than SD, although, there were no significant difference for plant N and soil C and N between LD and SD.

Discussion With grassland degradation, vegetation cover and plant productivity decreased, which resulted in soil degradation, even loss of economical and ecological function. In the degraded succession of alpine meadow, sedges and grasses with dense-short rootstalk were replaced by dicotyledons with taproots, and the belowground biomasses were changed. The change of the community structure and functional groups resulted in the loss of plant tissue and soil C and N (Wang et al 2005). Compared with the lightly degraded meadow, C content is lower in the severely degraded meadow. The decline was primarily attributed to decline in vegetative cover and productivity. In addition, since the carbon dioxide which was removed by photosynthesis from the atmosphere was reduced, there may be a decrease of organic matter input into the soil.

Table 1 The biomass (\pm standard error) of plant groups and root in different degraded land.

	LD	SD
Grasses (g m ⁻²)	73.24 (13.32) a	7.91 (3.59) b
Forbs (g m ⁻²)	76.03 (10.92) a	137.02 (16.19) b
Sedges (g m ⁻²)	18.42 (4.47) b	3.90 (2.09) a
Total	167.69 (24.27) a	148.88 (21.54) a
Root 0-20 cm (g m ⁻²)	2266.81 (187.41) a	942.02 (168.70) b
Root 20-40 cm (g m ⁻²)	284.89 (116.18) a	28.34 (5.85) b
Root 0-40 cm (g m ⁻²)	2551.69 (204.53) a	970.39 (172.35) b

Mean with the same letter are not significantly different at 5% level.

Table 2 Mean (\pm standard error) content of C, N for plant, root and soil in 0-40cm in different degraded land.

	LD	SD
Plant C (g m ⁻²)	70.67 (10.23) a	57.79 (8.49) b
Plant N (g m ⁻²)	3.30 (0.33) a	2.04 (0.29) a
Root C (g m ⁻²)	905.67 (78.14) a	358.10 (62.32) b
Root N	15.33 (2.04) a	6.57 (1.88) b
Soil C	13692.7 (1211.4) a	13131.9 (1032.3) a
Soil N	3633.4 (160.0) a	3772.3 (210.0) a

Mean with the same letter are not significantly different at 5% level.