



University of Kentucky  
UKnowledge

---

International Grassland Congress Proceedings

21st International Grassland Congress / 8th  
International Rangeland Congress

---

## Response of Plant Species Diversity to Simulated Climate Change Nitrogen Supply in Desert Steppe

Zhen Wang

*Inner Mongolia Agricultural University, China*

Guodong Han

*Inner Mongolia Agricultural University, China*

Menli Zhao

*Inner Mongolia Agricultural University, China*

Dan San

*Inner Mongolia Agricultural University, China*

Xiong Han

*Inner Mongolia Agricultural University, China*

*See next page for additional authors*

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/21/1-3/39>

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](mailto:UKnowledge@lsv.uky.edu).

---

**Presenter Information**

Zhen Wang, Guodong Han, Menli Zhao, Dan San, Xiong Han, and Fuguang Gao

## Response of plant species diversity to simulated climate change nitrogen supply in desert steppe

Wang Zhen , Han Guodong\* , Zhao Menli , San dan , Han Xiong , Gao Fuguang  
College of Ecol. and Env. Sci. , Inner Mongolia Agric. Univ. , Huhhot , Inner Mongolia 010019  
P.R. CHINA . E-mail nmghangd@hotmail.com

**Key words :** species diversity , diversity index , desert steppe , warming , nitrogen supply

**Introduction** Species diversity plays an essential role in sustaining earth system processes and providing basic goods and services to human society . Stresses from human activities , however , are having a profound effect on the earth system , including loss of species diversity , which is proceeding at unprecedented rates . Such stress is climate alteration and deposition . We investigated the independent and combined effects of experimental warming and nitrogen supply on plant species diversity in Sizhiwang County , a located in Inner Mongolia , China .

**Materials and methods** The experiment used a paired , nested design with warming as the primary factor and nitrogen supply as the secondary factor . There were six paired of 3×4-m plots , one plot in each pair was assigned as the warming treatment and the other as the control . Each warming and control plot were divided into two subplots (2×3-m) . The subplots were randomly assigned to the nitrogen supply treatment . Nitrogen supply in the subplot is 10g/m<sup>2</sup> . The warmed plots have been heated continuously since May 2006 using 165×15-cm MSR-2420 infrared radiators (Kalgo Electronics , Bethlehem , PA , USA) suspended 2.25 m above the ground . In the unwarmed control plot , one dummy' heater with the same shape and size as the infrared radiator was suspended 2.25 m high to simulate the shading effects of the heater . Thus , there were six replicates for each treatment (control , warming , nitrogen supply , warming plus nitrogen supply) . In each of 24 subplots , we laid out a 1×1-matrix . We investigated species diversity , cover and height . Margalef (Ma) , Shannon-Winner (H) , Simpson (D) and Pielou (JP) diversity indexes were analyzed using SAS 9.0 .

**Results** In the study , the main effect of warming plots for H , D , JP was larger than in the control plots both 2006 and 2007 , but Ma was decreased . Comparing 2006 and 2007 in warming and control plots , D index was similar , H and JP were both increasing , respectively 4.1% and 4.6% , but Ma decreased 1.5% . Both 2006 and 2007 , D , H and JP's value in warming×nitrogen supply subplots is higher than other three kinds treatment plots (control , warming , nitrogen supply) . In the same year , these diversity indexes were no significant difference (P>0.05) . The reason could be attributable to warming time . If warming experimental was continuously done in the following year , the diversity index difference would be significant . These diversity indexes did not vary in nitrogen-supplied subplots . A similar result has been reported from the Tibetan Plateau (Klein et al , 2004) .

**Table 1** Diversity index (W : warming , N : nitrogen supply , C : control) .

Treatment	Margalef		Shannon-Winner		Simpson		Pielou	
	2006	2007	2006	2007	2006	2007	2006	2007
W×N	1.576a+0.21	1.453a+0.14	1.491a+0.2	1.586a+0.2	0.695a+0.07	0.736a+0.07	0.717a+0.07	0.772a+0.1
W	1.544a+0.31	1.437a+0.14	1.425a+0.21	1.613a+0.16	0.642a+0.09	0.756a+0.05	0.693a+0.07	0.784a+0.06
N	1.536a+0.23	1.477a+0.24	1.44a+0.25	1.524a+0.26	0.653a+0.11	0.749a+0.05	0.689a+0.12	0.716a+0.08
C	1.625a+0.3	1.495a+0.22	1.438a+0.37	1.511a+0.26	0.642a+0.16	0.701a+0.1	0.674a+0.14	0.716a+0.13

**Conclusions** The study , which is the first to explicitly examine the independent and combined effects of experimental warming and nitrogen supply on the desert grassland , suggests that the future species in this region will depend on both climate change and nitrogen supply .

### References

Shuli Niu , Mingyu Wu , Yi Han , Linghao Li and Shiqiang Wan , (2007) . Water-mediated responses of ecosystem carbon fluxes to climatic change in a temperate steppe , *New Phytologist* , Journal compilation . <http://www.newphytologist.org> . 1-11 .  
Tilman , D . , Downing , J . A . , (1994) . Biodiversity and stability in grasslands . *Nature* , 367 : 363-365 .