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The XXI International Grassland Congress / VIII 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

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Presenter Information

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Short term variations in the leaf area index ,tiller density and botanical composition of the grassland in Inner Mongolia as affected by light to very heavy grazing intensities

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Key words : Leaf area index ,tiller density ,botanical composition ,grazing

Introduction The process of vegetation degradation induced by overgrazing is an important issue to determine grassland sustainable utilization and optimum grazing intensity .Leaf area index (LAI) ,tiller density and botanical composition are hypothesized to be susceptible to grazing intensity and helpful to understand the vegetation degradation dynamics .Therefore the field observation of these 3 measurements was started from the beginning of the grazing experiment established in 2005 .Here we present the results from the first two years (2005&2006) .

Materials and methods The field experiment is located in the Xilin-River Basin ,Inner-Mongolia Autonomous Region ,China (116°42' E 43°38' N) .An area of about 160 ha was fenced and divided into 56 small paddocks to carry out our grazing experimental design since 2005 .It includes two grazing systems (traditional and mixed) ,two block replicates (flat and slope) ,7 intensities (0 ,1 .5 ,3 .0 ,4 .5 ,6 .0 ,7 .5 ,9 .0 sheep/ha) .Community level LAI (LAIc ,i .e .total one-sided projected leaf area divided by the corresponding ground area) ,tiller density (TD) were measured monthly at 4 grazing intensities (0 ,1 .5 ,4 .5 ,7 .5 sheep/ha) of both mixed and traditional grazing system .The botanical composition (BC) was investigated once in July in all grazing intensities with the transect method (0 .25×2 m²) by cutting ,drying and weighting species separately .

Results and discussion

LAIc was strongly affected by sampling periods (date) and grazing intensities ,the system effects was statistically significant only in 2005 (Table 1) ,and no interactions between system and intensity was detected .LAIc was significantly higher in traditional system in 2005 .The highest value of LAIc over the growth season was detected in July .The lowest value of LAIc was found in the highest grazing intensity ,compared to the control plot (0 sheep/ha) .It decreased to 48 .7% and 31 .8% in 2005 and 2006 respectively ,whereas LAIc of low grazing intensity (1 .5 sheep/ha) showed a trend of increasing in both years (Table 1) .**TD** was not significantly different between the systems ,whereas it was notably changed over the growth season .TD had a decreasing trend from light to heavy grazing intensities .This result shows the opposite trend compared to previous TD studies from European grassland ,which showed that TD will increase with increasing cut frequencies or grazing intensity up to a certain point ,because light was the primary limited factor in that area ,whereas this is not the case for Inner Mongolia grassland ,in which water is the primary limited factor .**BC** did not show any significant differences along the grazing intensities (data not shown) .

Table 1 Effects of Grazing on community level leaf area index (LAIc) and tiller density (TD) .

Factors	LSM	LAIc		TD (tillers/m ²)	
		2005	2006	2005	2006
System	M	0 .26 ^b	0 .45	2757	2068
	T	0 .34 ^a	0 .48	2616	2132
	SE	0 .02	0 .02	217	74
Date	Jul .	0 .39 ^a	0 .54 ^a	2581 ^b	2563 ^a
	Aug .	0 .27 ^b	0 .44 ^b	3108 ^a	1948 ^b
	Sep .	0 .24 ^b	0 .41 ^b	2370 ^b	1788 ^b
	SE	0 .02	0 .03	168	97
Intensity	0	0 .39 ^a	0 .66 ^a	3644	2474
	1 .5	0 .40 ^a	0 .69 ^a	2293	2081
	4 .5	0 .22 ^b	0 .30 ^b	2465	1941
	7 .5	0 .19 ^b	0 .21 ^b	2344	1903
	SE	0 .03	0 .03	307	135

(Means with the different letter are significantly different ,Mixed Model ,Bonferroni t-test for pairwise comparisons ,Bonferroni Holm Test for probabilities adjustment $\alpha=0 .05$)

Conclusions After two years of observation and experiment establishment we found that both LAIc and TD were strongly affected by grazing intensity and markedly decreased in higher grazing intensity ,whereas the BC were relative stable compared to the former two indexes .There were no significant changes detected after two years running of the grazing experiment .