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Influence of growing season rainfall amount and clipping intensity on aboveground net primary productivity in *leymus chinensis* steppe

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Key words : rainfall variability , clipping times , transparent rainfall manipulation shelters , soil moisture , biomass

Introduction Aboveground net primary productivity (ANPP) is the foundation to assess structure and function of grassland ecosystem . The amount of rainfall is dominant climatic driver and clipping times (or grazing intensity) is important external perturbation to the variability of ANPP in the *leymus chinensis* steppe of China , However there're many different opinions on the relationship (Cai et al . , 2005 ; Bai et al . , 2004) . The objective of this study was to evaluate the adaptable clipping intensity under potential changes in rainfall .

Materials and methods This study was conducted in the Ba Shang steppe of Hebei , China (41°45′N , 115°39′E) . The main vegetation of productive , perennial rhizomes grass *L .chinensis* , perennial C_4 grass *Cleistogenes squarrosa* and *Artemisia eriopoda* . Mean growing season(may through September) rainfall totals 275 mm , annual mean temperature is 1 .4℃ . The experiment was implemented in 2005 , there is 6 combined-treatments including 3 rainfall gradient * 2 clipping intensity , each with three replicates . Rainfall gradient including R_1-using the Transparent Rainfall Manipulation Shelter (Figure 1) decreased 50% rainfall , R_2- ambient , R_3-increased 50% rainfall each time rainfall event occurred , extra 50% percent water was applied immediately . Clipping gradient including C_1-clipping during 20-25 august each year , C_2-clipping at the each beginning of growing month (Jun . to Sep .) each year . ANPP was estimated annually by accumulate each clipping aboveground biomass from two 0 .5 m^2 samples per plots . Samples were sorted into dominant species (*L .chinensis* , *C . squarrosa* and *A . eriopoda*) and others , dried at 65℃for at least 48 h prior to weighing . statistical analyses using SPSS 13 .

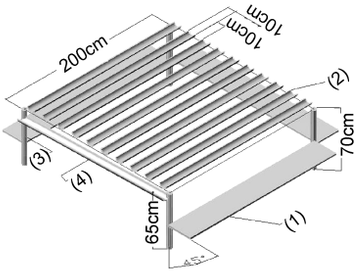

Figure 1 *Transparent Rainfall Manipulation Shelter Note :(1) side shelter (made of transparent plastic film) , length 200cm ,width 30cm , keep angle 45° with brace ; (2) above shelter (made of polyvinyl chloride (PVC) tube) , length 200cm , width 10cm , depth 4 .8cm , distance 10cm , fixed on removable woody shelf ; (3) there are 4 braces , one side two aboveground 70cm hight , the other side two high 65cm , form an inclined plane ; (4) side water guide tube (made of PVC tube) , fixed on the two brace which high 65cm , one point fixed on 60cm place aboveground , one fixed on 55cm place , form an inclined tube .*

Results

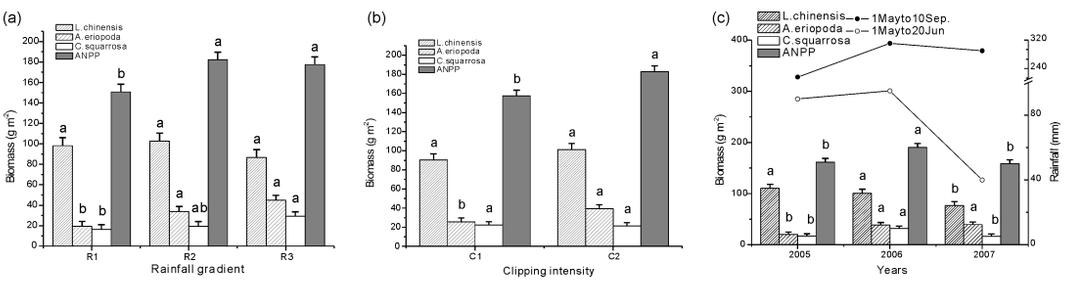

Figure 2 *Variability of ANPP and biomass of* L .chinensis , C . squarrosa *and* A . eriopoda *in (a) rainfall gradient ,(b) clipping gradient and (c) each years with rainfall patterns .*

Conclusions ANPP of R_1 significantly decreased due to direct effects of biomass of *C . squarrosa* and *A . eriopoda* , not *L . chinensis* . The increased ANPP of C_2 came from *A . eriopoda* . To compare with *C . squarrosa* and *A . eriopoda* , *L .chinensis* was more important status for ecosystem's stability , however it is vulnerable when drought happens at the beginning of growing season . Both the amount and patterns of growing season rainfall are important factor for ANPP .

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