Research on the Relationship between Climate and Plant Community in North Grassland of China

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Introduction Farming-pastoral transitional zone is an important region in Northern China , whatever from its productivity or ecological function . For several decades , overgrazing have made the significant changes of vegetation . The land is being continuous degradation . Although there is lack of historical vegetation cover data , long-term meteorological data has been collected for the past 40-50 years . To explore the dynamic of vegetation which is effect by climate , large area survey , and historical data analysis are used .

Methods Located in agro-pastoral ecotone (41°06′ and 44°08′ Nlatitude , 111°27′ and 118°48′ East longitude , two sites were selected to analyze the phenology from 1985 to 2005 , and 7 sites was used to do investigation of grassland biodiversity in two years .

Plant species include *Xanthium mongolicum* , *Plantago asiatica* , *Iris ensata* , *Taraxacum officinale* in Wuchuan County of Inner Mongolia ,and *Leymus chinensis* , *Stipa baicalensis* , *Artemisia frigida* and *Heteropappus altaicus* in Xilinhot of Inner Mongolia . A general linear model (GLM) was used to evaluate the grass phenology . Grassland survey was conducted in plant flower season to measure the number of individual plant species and the dry matter , then to calculate the biodiversity .

Results The result showed that the grass phenology , the stages of germination and flowering trended to come early for *Xanthium mongolicum* , *Plantago asiatica* . , *Iris ensata* . , *Taraxacum officinale* during 1982 to 2005 and growth season was lengthened , because annual mean temperature and winter temperature increased in Wuchuan County of Inner Mongolia . The length of grass growth season is related to accumulative maximum temperature , accumulative mean temperature and annual precipitation . In Xilinhot , the anthesis of *Leymus chinensis* were appeared from the last ten-day of April to the last ten-day of July , but there were only 4 years to appeared anthesis during 20 years . The *Stipa baicalensis* had stronger adaptability , so its anthesis were usually in the middle ten days of August , sometime it appeared early in the last ten-day of July and late in the last ten-day of September . *Artemisia frigida* was of strongest adaptability and the growth stage was not lengthening because of harsh environment . *Heteropappus altaicus* developed normally .

It is important to work on the law of grass growth , development , the temporal and special variance of plant biodiversity on grassland community for adapting to climate change . Based on the observation of grass growth and development and sampling method of field survey , the variation of herbaceous phenology , biomass and biodiversity were analyzed with Marglef richness index (MRI) and Simpson biodiversity index (SBI) . These methods can be used to reflect the species richness .

A model of grasses phenology and growth were developed . Grassland sampling and surveying from Middle East to Midwest of Inner Mongolia were taken in July to August of 2006 and 2007 separately . The results showed that biodiversity and biomass of sampling plots were very different between sampling places . Because climate is different , the biomass was higher when precipitation was more or temperature was lower in Inner Mongolia grassland , and the Margalef 's biodiversity index decreased when drought index increased .

Conclusions and discussions Phenology period are ahead of time due to the temperature increase , especially the minimum temperature during winter season . The annual growing season has lengthened by 4 .5 days over the past 20 years . Grasses development stages are influenced by climate fluctuation . Climate also effect on the biodiversity which increase with more precipitation , and decrease with lower precipitation .

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