Testing Diversity Effects of Forage Biodiversity in the Karst Region of Southwestern China

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Introduction The relationship between biodiversity and productivity has received wide attention during the last decade . Most of studies have been performed in America and Europe , but rarely in China , especially in Karst region . We investigated the relationships between cultivated forage species diversity and productivity in the Karst region of southwestern China , and anticipated answering the following questions : firstly , how did biomass production respond to forage species richness in our experiment in the Karst region ? Secondly , what was the mechanism underlying diversity-productivity in our experiment ? Thirdly , did aboveground biomass per plant change with different levels of diversity ?

Materials and methods The experiment was carried out at the permanent field site of Huanjiang Experimental Station of Karst Agro-ecosystem of CAS , located in south-west of Guangxi in China (24° 44′N , 108°19′E , 302 m above sea level) . The mean temperature is about 20℃ , and mean annual precipitation is about 1389 mm . Six forage species selected , including White Clover , Red Clover , Alfalfa , Common Aeschynomene Herb , Green Bristlegrass Herb and Broadleaf Paspalum were included in this experiment . The communities of two , three , four and six species were combined by constrained random selection from the species pool , without any certain composition twice . The analysis was based on the data of aboveground forage biomass and species compositions after a full growing season of each plot . Diversity effect was calculated by the method of (Loreau & Hector , 2001) . The data were tested by SPSS 13 .0 software using one-way ANOVA procedures , followed by LSD multiple comparison tests to determine the differences among the yields of forage species in monocultures and the differences of RYT , net effect , selection effect and complementary effect among different levels of species-rich communities .

Results Forage species richness had a significant linear increased effect ($P<0.01$) on aboveground biomass . Net effect and RYT of mixture of two species was lower ($P<0.01$) than one , while the other three levels showed diverse trends . Selection effect showed general increase with diversity ($P<0.01$) , with the highest value occurring in the community of four species . Complementary effect showed an increasing trend with species richness without significant difference from zero .

Conclusions Our study indicated that biodiversity enhanced the aboveground biomass production in the Karst region because of the selection effect . Selection effect facilitated the growth of forage species with deep roots , and then compensated the growths of other forage species . In addition , our species-rich communities might be in an unstable status , with easilily suffered by disturbance . Increased effective aboveground space utilization might be caused by the increased species richness , and then leaded to the increased aboveground biomass production . The results implied that aboveground species interactions , such as light complementarity , might contribute to positive diversity-productivity . Further investigation should be conducted using empirical field data on light absorption . The presented study revealed production formation mechanism of initial cultivated grassland processes in the Karst region in southwestern China , and was helpful for the grassland building in this area .

Reference

Loreau M . , Hector A . (2001) . Partitioning selection and complementarity in biodiversity experiments . *Nature* 412 , 72-76 .