Distribution of Vegetation Types in Bayinbuluk Alpine Grassland

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Introduction In order to better understand and manage grassland ecosystems , it is important to study the relationship between environmental factors and plant (Jafari , 2004) . Effects of environmental factors on plant communities have been the subject of many ecological studies in recent years (Campagne , 2006) . One of the main components of grassland is vegetation , the absence and presence of which is controlled by environmental variables . Much of the research on species-environment relationships has been carried out in semiarid regions of North America , Australia , and other regions . Our knowledge about interactions of vegetation distribution and environmental factors in arid regions of China is rather poor (He , 2004) . The aim of this paper was to discuss how does environmental factors impact on plant distribution and composition in Bayinbuluk grassland , northwest china .

Materials and methods Bayinbuluk grassland is an typical alpine cold grassland (82°27′-86°17′ E ,42°18′-43°34′ N) and located in the southern slope of the Tianshan mountain region in Xinjiang province . The mean altitude is 2400m .The annual mean temperature is-4 .2℃ . The mean annual precipitation is 263 .6mm . In 2006 , fifteen sites (10m × 10m) were founded from typical vegetation types . In each site , seven 1m × 1m quadrats were sampled for grass species in late July . Grassland vegetation frequency , height and cover percentage were recorded . Three soil samples were collected in each site , every soil sample was taken from 0-10 , 10-20 , 20-30 , 30-40 to 40-50 cm layers . Samples were pooled to form one composite sample . Measured soil factors included organic matter , pH value , soluble calcium , soluble bicarbonate , soil water content . In vegetation growing season(from early May to late September) , fifteen HOBO Pro RH/TEMP Data Loggers were installed to acquire data of relative humidity and air temperature . Soil compaction were determined by soil compaction meter . The species importance values were calculated using the formula : IV = (Relative coverage + Relative frequency + Relative height) /300 . Vegetation and related environmental factors were analysed using canonical correspondence analysis (CCA) . Vegetation types were classified by two-way indicator species analysis (TWINSPAN) .

Results A total of 50 indigenous species were identified during this study , belonging to 43 genera and 21 families . fifteen sites of study area were classified into six groups . Group I was dominated by *Stipa purpurea* + *Festuca ovina* and *S . purpurea* + *F . ovina* community types , contained the less soil water content and relative humidity values , but the air temperature value was highest . Group II was dominated by *Kobresia capillifolia* + *Carex stenocarpa* + *S . purpurea* and *C . stenocarpa* + *K . capillifolia* + *F . ovina* community types , soil water content and relative humidity values were relative lower . Group III was dominated by *C . stenocarpa* + *K . capillifolia* + *Polygonum viviparum* and *C . stenocarpa* + *K . capillifolia* + *P . viviparum* . Available potassium , air temperature , organic matter and soil compaction values were relative lower . Group IV was dominated by *C . stenocarpa* + *P .viviparum* , *P .viviparum* + *C . stenocarpa* and *K . capillifolia* + *P .viviparum* . Fertile soil were indicated by relative higher available nitrogen , available potassium and organic matter values . Group IV was dominated by *C . stenocarpa* + *K . capillifolia* + *P .viviparum* , *K . capillifolia* + *C . stenocarpa* + *P .viviparum* and *K . capillifolia* + *Carex melanantha* + *P .viviparum* , Soil water content , relative humidity values , organic matter and available nitrogen values were relative higher . Group VI was a sedge wetland community type dominated by *C . melanantha* + *Triglochin palustre* , relative humidity and soil water content values higher . The results of CCA ordination showed first axis (eigenvalue = 0 .915) accounted for 34 .2% variation in environmental factors data . Correlation between the first axis and species-environmental variables was 0 .996 . The second axis (Eigenvalue = 0 .632) explained 57 .8% variation in data set . Correlation between the second axis and species-environmental variables was 0 .95 . Axis 1 was correlated to air temperature , pH value , HCO_3^{2-} , soil water content . Axis 2 was correlated to soil compaction , Ca^{2+} , pH value , HCO_3^{2-} , air temperature , soil water content and relative humidity .

Conclusions According to the results of vegetation classification , quadrats were classified into six groups . Group 1 was an alpine cold steppe type , group 2 was an alpine cold grassland-meadow , group 3 ,4 ,5 was alpine cold meadows , group 6 was a sedge wetland type . CCA analysis showed that the distribution of vegetation types was most strongly correlated with air temperature , pH value , HCO_3^{2-} , soil water content in Bayinbuluk grassland .

Reference

He , M Z . , Zheng , J .G . , Li , X .R . , et al . (2007) . Environmental factors affecting vegetation composition in the Alxa Platean , China . *Journal of Arid Enviroments* 69 , 473-489 .