

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°C . 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 : $IV = (\text{Relative coverage} + \text{Relative frequency} + \text{Relative height}) / 300$. 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

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