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The 21st International Grassland Congress / 8th International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

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## Quantitative classification of subalpine grassland under degenerate succession in northwest Sichuan

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**Key words :** subalpine grassland , degenerate succession , TWINSpan , association , north-west Sichuan

**Introduction** The northwestern Sichuan is located at eastern margin of Qinghai-Tibet Plateau , in which the vegetation is typical subalpine meadow . Two-way Indicator Species Analysis ( TWINSpan ) , which was adopted to conduct the multi-analysis of the florae , was used to study the distribution patterns of subalpine grassland communities under degenerate succession in the region .

**Materials and methods** The pathway expedition on subalpine grassland in Hong-Yuan County was carried out for three years from 2005 to 2007 . The marsh , shade slope , flat and sunny slope were chosen to set up research sites . On base of those terrain , 45 sampling plots were investigated in non-degraded , lightly degraded , moderately degraded and severely degraded subalpine grassland . Using Importance Value as the measuring index , the 45×71 matrix was formed . Then through analyzing with the software PC-ORD , Two-way Ordered Table was obtained .

**Results** 45 sampling plots were divided into 13 groups by TWINSpan . And in combination with the ecological characteristics , they were classified into 12 associations ( Figure 1 ) : ( I ) *Poa annua* + *Plantago asiatica* + *Thlaspi areven* , ( II ) *Carum carvi* + *Elymus dahuricus* , ( III ) *Carex alofusca* + *Plantago asiatica* + *Ranunculus tanguticus* , ( IV ) *Kobresia pygmaea* + *Anemone rivularis* , ( V ) *Kobresia setchwanensis* + *Polygonum vivparum* + *Stellera chamaejasme* , ( VI ) *Kobresia setchwanensis* + *Potentilla discolor* , ( VII ) *Kobresia setchwanensis* + *Saussure japonica* + *Geranium pylzowianum* , ( VIII ) *Festuca rubra* + *Aster alpinus* + *Deschampsia caespitosa* , ( IX ) *Elymus nutans* + *Deschampsia caespitosa* , ( X ) *Carex muliensis* + *Kobresia setchwanensis* , ( XI ) *Kobresia setchwanensis* + *Carex muliensis* + *Sanguisorba parviflora* , ( XII ) *Caltha scaposa* + *Blysmus sinocompressus* + *Deschampsia caespitosa* .

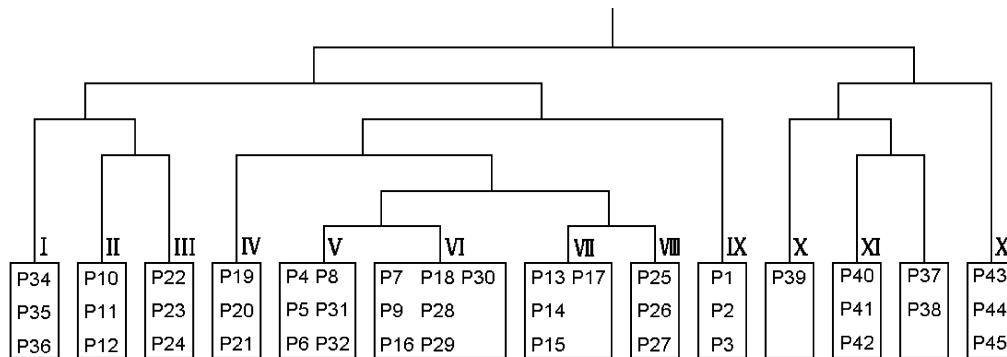


Figure 1 Dendrogram of TWINSpan classification .

**Conclusions** The TWINSpan results showed that distribution pattern of associations were mainly affected by the leading ecology factor of humidity and the gradient in degeneration of subalpine grassland . Community composition diverged distinct different groups between non-degraded and severely degraded subalpine grassland . While moderately degraded shade slope and lightly degraded sunny slope , or lightly degraded flat , shade slope and moderately degraded sunny slope had the similar composition characteristics of community .

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