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Classification of herbaceous communities in the subalpine meadow on Mt . Xiaowutai

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Introduction Sub-alpine meadows of Xiaowutai Mountain ($39^{\circ}\sim 40^{\circ}\text{N}$, $114^{\circ}\sim 115^{\circ}\text{E}$) dominated by *Kobresia myosuroides* are important summer feed resources for grazing cattle and horses (Dong *et al.* , 1994) . However , very limited information about the vegetation compositions of the meadows are available . This study was conducted to classify the herbaceous communities of the meadows , so as to provide basic information for their management .

Materials and methods The sampling site was 9.6 km^2 in size and located on upper Xiaowutai Mountain . $1\text{ m} \times 1\text{ m}$ plots were randomly placed along an altitudinal gradient from 2200 to 2800 m a.s.l . at 50 m ($\pm 20\text{ m}$) intervals , Totally 8 transects with 76 plots were set at last . Plant species composition , average height and plant cover of each species in each site were recorded . Species importance value ($IV = (\text{relative height} + \text{relative cover})/2$) was calculated . Data sets were subjected to Two-way Indicator Species Analysis (TWINSpan) (Hill , 1979) for the classification of plant communities .

Results Overall , 97 taxa including grass , herb , fern species were recorded from 76 survey plots . 5 vegetation associations were distinguished according to TWINSpan cluster analysis (Figure 1) . (1) Ass . *Saussurea chinensis* + *Saussurea iodostegia* + *Ligusticum tachiroei* (cluster 1 , 2 plots) occupied the steep , sunny rocky slopes near the summit , and most species living here were cold-resistant , sun plants . *S. chinensis* was the dominant species and *S. iodostegia* and *L. tachiroei* were subdominant species . (2) Ass . *Kobresia myosuroides* + *Potentilla nivea* + *Hedysarum inundatum* (cluster 2 , 37 plots) were found just below the Asso . 1 , where *K. myosuroides* , *S. iodostegia* , *P. nivea* and *H. inundatum* , the typical species of subalpine meadows were the dominant species , and *Carex coriophora* , *Poa sibirica* , *Anaphalis sinica* , *L. tachiroei* , *Koeleria cristata* and *Trisetum sibiricum* were in the position of subdominant species . (3) Ass . *Kobresia myosuroides* + *Hedysarum inundatum* (cluster 3 , 12 plots) distributed at shady slopes , where the dominate species are *H. inundatum* , *K. myosuroides* , *S. iodostegia* , *Libanotis condensata* and *C. coriophora* , accompanied by those species favor humid environment and are shade-tolerant and cold-resistant , such as *Rumex acetosa* , *Myosotis sylvatica* , *Aster alpinus* , *Ranunculus japonicus* , etc . (4) Ass . *Kobresia myosuroides* + *Polygonum viviparum* + *Carex duriuscula* (cluster 4 , 7 plots) existed at the low altitudinal sites , where *Carex duriuscula* and *Taraxacum platyepidum* were more important , followed by other trample-standing species like *Plantago depressa* and *Ligusticum jeholense* . (5) Ass . *Kobresia myosuroides* + *Scabiosa tschiliensis* (cluster 5 , 18 plots) located in sunny slopes near valley , and was dominated by light-favoring and dry-standing species , such as *Scabiosa tschiliensis* , *Sanguisorba officinalis* , and *S. iodostegia* , *P. nivea* , *K. myosuroides* .

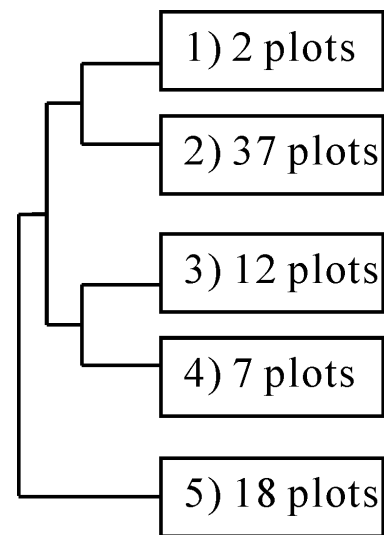


Figure 1 End-groups of floristic classification (TWINSpan) for the 76 vegetation samples .

Conclusions Five herbaceous associations classified by TWINSpan shows that the vegetation compositions of the sub-alpine meadows on Xiaowutai Mountain vary with the geographic location and micro-environment . Therefore , the appropriate management strategies should be applied according to their diversity .

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