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Jinhua Zhang  
*Sichuan Agricultural University, China*

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## Plant community and soil nutrient characteristics of trampling disturbance in a *Kobresia humilis* community along the road in Naqu, Tibet

Jinhua Zhang

Department of Grassland Science, Sichuan Agricultural University, Ya'an, China, E-mail: zhangjinhua990@msn.com

**Key words:** Plant community characteristics, soil nutrient, Alpine meadow, Tibet

**Introduction** Plant community characteristics and soil nutrients were investigated in trampling disturbance in a *Kobresia humilis* community along Qi-Zang road.

**Materials and methods** Eight sample sites in different successional stages were selected. These varied on time of reconstruction of the Qi-Zang road during 1973, 1984, 1991~1996 and 2004, and represent restoration stages 1, 2, 3 to 7, respectively. Grassland within animal pens was selected as a control or stage 8, which represented the climax community. The samples along the road were repeated for 4 times with an interval of 2~20 meters.

The investigation was conducted in August of 2003 and 2004 when the vegetation was most abundant. We determined the plant species, vegetation cover, number of tillers, and frequency (Tilman D & Downing JA., 1994). Soils from eight different sites were sampled at two depths (0~10cm and 10~20 cm). Each soil sample was a composite consisting of five sub-samples collected from each site. Soil OM, TN, AN, TP, AP, TK, AK, pH and CEC were measured.

### Results

**Quantitative characteristics of the community** The main quantitative characteristics of the community increased remarkably during the process of succession, all of them varied logistically except the height. The density increased from 336 ind/m<sup>2</sup> to 4,490 ind/m<sup>2</sup>. The height of the community increased from 0.58cm to 2.34cm ( $H = 27.2199 / (1 + e^{-(x-25.9249) / 6.4637})$ ,  $R = 0.7439$ ,  $n = 24$ ). The coverage of vegetation was increasing with succession ( $C = 109.5181 / (1 + e^{-(x-5.3859) / 1.3141})$ ,  $R = 0.9856$ ,  $n = 24$ ). The above-ground biomass was more than below-ground, but they all increased logistically ( $BM_{up} = 514.9035 / (1 + e^{-(x-8.6405) / 2.8705})$ ,  $R = 0.9454$ ,  $n = 24$ ,  $BM_{under} = 7511.652 / (1 + e^{-(x-7.0389) / 1.2766})$ ,  $R = 0.9515$ ,  $n = 24$ ).

**Plant diversity** The plant diversity ( $y$ ) varied logistically with the stages ( $t$ ), ( $y = a / (1 + e^{-(t-10) / b})$ ). The plant diversity was low during the early stage, higher during the climax stage, and highest during the intermediate stages.

**Soil nutrient** Serious erosion occurred after trampling disturbance, and the soil nutrient contents decreased. Along with vegetation recovery, soil nutrient condition improved, with an increase in each nutrient element. But the soil recovery process lagged behind vegetation recovery.

The dynamics of TN, TP and TK are very similar, and significantly interrelated with organic matter. With the biomass changing, pH value changed affecting the available phosphorus complex. The dynamics of available potassium is different compared with total potassium, total nitrogen and total phosphorus, it is high with trampling and stable in the other stages.

**Conclusion** The main quantitative characteristics of the community increased remarkably during the process of succession. Plant diversity varied logistically with the stages. Soil recovery process lagged behind vegetation recovery.

### Reference

Tilman D & Downing JA. Biodiversity and stability in grassland[J]. *Nature*, 1994, 367: 363~365.