# Root System Ecology of Shrubs in Qilian Mountains Alpine *Rhododendron* Shrubland

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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

# Root system ecology of shrubs in Qilian Mountains alpine *rhododendron* shrubland

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**Key words :** root system ecology , 16 shrub species , alpine *rhododendron* shrubland , disturbance , climate warming ,Qilian mountains

**Introduction** The Qilian Mountains National Nature Reserve located in the northeastern edge of Qinghai-Tibet Plateau is the key areas for global climatic change research . The alpine *Rhododendron*-shrubland survived above 3 ,000m in protection area has been attracting the attention for its important ecological services function , and is also the summer-pasture for rare white yak and other herbivores . Under global warming background , what or how the impact caused on the shrubland ecosystem by increasing human disturbance are the main reasons of this study . From root system ecology to understand belowground ecological characteristics and response of ecological process to disturbance could provide belowground ecological data and theoretical support for scientific utilization and conservation , however , alpine shrub root system studies were seldom found . The root system architecture and spatial distribution of 16 shrub species existing in alpine *Rhododendron* shrubland were studied , and the relationship with environment were discussed .

**Methods** The study area was the north slope of the Eastern Qilian Mountains , about 5 km from research station of GSAU . The shrub species existing in alpine *Rhododendron* shrubland were investigated including *Rhododendron thymifolium (R .t) ,R . capitatum(R .c) ,R . anthopogonoides (R .a) ,R . przewalskii (R .p) ,Salix oritrepha (S .o) ,S . rehderiana (S .r) ,S . sclerophylla(S .s) ,Lonicera hispida(L .h) ,L . rupicola(L .r) ,L . ferdinadii(L .f) ,Potentilla fruticosa(P .f) ,Spriaea alpina(Sp .a) ,Caragana jubata(C .j) ,Aretous ruber(A .r) ,Rubus irritans(R .i) and Hippophae tibetica(H .t)* . Coarse root length and distribution were studied by using traditional skeleton method to expose root systems ,and fine root length and distribution were studied by soil core sampling method and wet-sieving method(Mou P . , 1995 ; Robert ,2001) .

**Results** The root system of shrubs spread mainly in the 0-30 cm soil layer (Figure 1) . The shallow root dominant species *(R .t ; R .c ; R .p ; S .o)* and subdominant species *(S .r ; S .s ; R .a ; L .f)* form the constructive synusia of the community ; deep-rooted shrubs ( *Sp .a ; P .f ; C .j*) are only companion species form the middle synusia ; *L . h ; A . r* compose the low synusia ,other species are rare species in community .

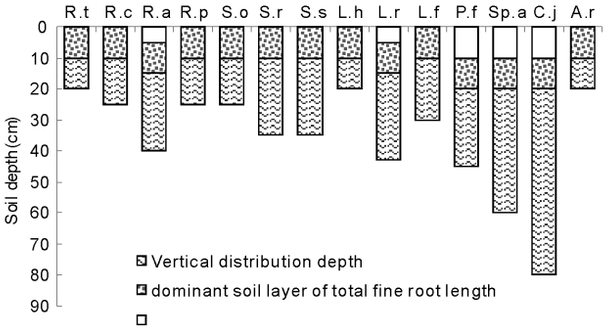


**Figure 1** *Overlapping and separation of niche of different shrub roots in soil layer .*

**Discussion** By using niche overlapping and separating theory , the role of 16 shrubs species in the community and the relationship with environment can be explained . The dominant species and subdominant species adapt to the alpine freezing and humid environment with shallow and dense root distribution , but deep-rooted shrubs only can survived occasionally in community . Global climate warming and human activity disturbance may lead that the deep-root style shrubs replace the current shallow-roots type's constructive species in succession . The hypothesis is consistent with the status of serious damaged Rhododendron shrubland and transitional zone .

**References**

Mou P . R . H . Jones R . J . *et al .*, (1995) . Spatial distribution of roots in sweetgum and loblolly pine monocultures and relations with aboveground biomass and soil nutrients . *Functional Ecology* , 9 , 689-699 .

Robert P . Gibbens *et al .*,(2001) . Root systems of some Chihuahuan Desert plants . *Journal of Arid Environments* , 49 , 221-263 .