Population Dynamics of Soil Microorganisms in Deteriorate Grassland in West Region of China

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Population dynamics of soil microorganisms in deteriorate grassland in West Region of China

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Introduction Animal husbandry is the most important sector of West Region of Chinese economy , and it accounts , for example , 45 .36% and 50 .06% of total agricultural output value in Inner Mongolia and Sichuan province respectively (CAYEB , 2006) . In recent years , sustained overgrazing and rodent s destruction are responsible for more than 50 % degradation of grassland in western China , which causes serious social and economical problems in the region . To prevent deteriorate , intensive multidisciplinary researches have been performed . However , there is little documented information on microorganisms population changes in the region though it is well known that soil microorganisms play an important and vital role in grassland ecosystem . The objectives of present study focused on enumerating and detecting different groups of microorganisms population dynamics in the region .

Materials and methods The study was carried out at Tianzhu alpine grassland experiment station (37°11'-37°13' N , 102°29'-102°33'E) of Gansu agriculture university , northeastern of Tibet plateau in China . Soil samples were collected (0-40cm in depth) and treated as described by Xu and Zhang (1986) at three sites (Table 1) in June , August and October in 2003 and 2004 respectively . The number of soil microorganisms (fungi , actinomycete and bacteria) and nitrogen bacteria group (ammonifying bacteria , nitrobacteria , diazotroph and denitrobacteria) were enumerated by plate colony count or MPN method (Xu and Zhang , 1986) .

Table 1 *Basic condition of sample sites .*

Sample site	Vegetation	Soil					
	Main species	CO	HE	pH	WC	OM	TN	TP
Rodent hill	*Microula sikkimensis* , *Elsholtzia ciliate* , *Polygonum viviparum* , *Oxytropis* spp . , *Potentilla chinensis*	37	33	8 .0	19 .80	10 .91	0 .50	0 .043
Unfenced grassland	*Kobresia bellardi* , *Carex* spp . , *Iris chinensis* , *P . viviparum* , *O .* spp . , *Stellera chamaejasme* , *P . chinensis*	41	22	8 .0	18 .41	10 .83	0 .45	0 .042
Fenced grassland	*K . bellardii* , *C .* spp . , *O .* spp . , *Stipa capillata* , *P . viviparum* , *P . fruticosa* , *P . chinensis* , *Cyperus* spp .	82	41	7 .8	24 .42	12 .22	0 .64	0 .058

CO : coverage (%) ; HE : height (cm) ; WC , OM , TN and TP means percentage of water content , organic matter , total N and total P respectively . Rodent hill : original vegetation damaged ; Unfenced grassland : nearby animal road , tight soil .

Results and discussion The number of soil microorganisms and nitrogen bacteria group in serious degradation grassland (unfenced grassland and Rodent hill) were much less than those in slight degradation ones (Fenced grassland) (Table 2) , and their distribution tendency with temporal change showed " Low (June)-high (Aug .)-lower (Oct .)" pattern except fungi showing " high (June)-Low (Aug .)-lower (Oct .)" pattern in plant growth period (Figure not shown) . Moreover , predominant species of fungi , *Aspergillus* , *Rhizopus* , *Penicillium* and *Mucor* , were similar while their numbers varied with habitat (fenced grassland was higher than the other two habitats , data not shown) . This was due to vegetation and soil condition significant difference in three habitats (Table 1) . The number of microorganisms in this study was distinctly low compared to those obtained by Zhao (Zhao *et al* , 1984 , the same method and sites) because of grassland deteriorated . The results clearly illustrated the important decline of soil microbial population associated with the deterioration of grassland . Therefore , it is very important to take soil microorganisms into account when utilization and management grassland .

Table 2 *The number of soil microorganisms and nitrogen bacteria group in different habitats* $\times 10^4$ */g dry soil .*

Habitat	Fungi	Actino-mycetes	Bacteria	Ammonifying bacteria	Nitrobacteria	Diazotroph	Denitro-bacteria
Rodent hill	0 .30^a	170^b	807^b	804^b	0 .18^b	5 .03^b	1 .02^b
Unfenced grassland	0 .22^b	155^b	580^c	518^c	0 .11^b	4 .12^c	0 .97^b
Fenced grassland	0 .32^a	255^a	1302^a	1170^a	0 .53^a	6 .16^a	2 .13^a

The data in the table is an average of 2003 and 2004 ; Letters different mean significant level ($P<0.05$)

Conclusion The number , as well as distribution , of soil microorganisms and nitrogen bacteria group varied greatly with habitat , it was much higher in slight degradation grassland and summer than in serious degradation grassland , autumn and spring .