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Presenter Information

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Effects of grazing and rainfall variation on root and shoot decomposition in steppe ecosystem

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Introduction Overgrazing affects large areas of Inner Mongolia semi-arid grassland . Grazing effects on above-and belowground decomposition as a key process of ecosystem carbon and nitrogen cycling are still unclear .

Materials and methods We studied the effects of grazing on shoot and root decomposition using the litter bag method in a long-term grazing exclosure , a moderately winter grazed site and a long-term heavily grazed site at Xilingole steppe (43°38′N , 116°42′E) . Decomposition of control and site-specific root and shoot biomass were analysed to distinguish effects of local environmental factors and litter quality as altered by grazing . Growing seasons of average (2004) and very low precipitation (2005) allowed to study effects of inter-annual rainfall variation on decay dynamics .

Results Grazing impact on local environment (Figure 1) and litter quality parameters had no effect on decay rates of shoot and root dry mass . In contrast to expected grazing effects , we found pronounced impact of rainfall variability on decay rates (Table 1) . In the year of average precipitation (2004) root decomposition was faster than shoot decay , while under dry conditions (2005) the opposite was observed . Not shown : fitting a simple exponential decay function , we found soil moisture storage the best parameter explaining root decomposition dynamics . Contrarily , shoot decay rates were almost constant and unaffected by annual rainfall variance . Initial N content had no effect on N release dynamics and net N immobilization was not observed during decay process of shoot and root (see Parton et al . 2007) .

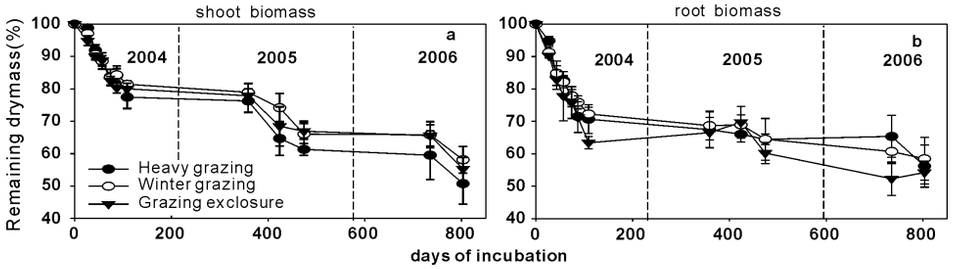

Figure 1 *Test for local environment effects on decay dynamics of shoot and root biomass among three grazing intensities from 2004-2006 .*

Table 1 *K-values of shoot and root biomass incubated in 2004 (325 mm rain) and 2005 (166 mm rain) at different grazing intensities . K-values calculated as-LN (X/X₀)=kt (Olson 1963) .*

	k-value shoot		*k*-value root	
Site	2004	2005	2004	2005
Heavy grazing	0 .28	0 .36	0 .40	0 .20
Winter grazing	0 .24	0 .26	0 .38	0 .23
Grazing exclosure	0 .26	0 .29	0 .41	0 .17

Discussion When root decay is limited in dry periods , shoot decomposition becomes relatively more important for plant nutrient supply . Photodegradation (UV-B radiation) might explain balanced aboveground decay dynamics (Austin et al . 2006) . Consequently , separate analysis of shoot and root decomposition is crucial to describe carbon and nitrogen cycling in semi-arid environments . Under average rainfall conditions grazing effects on nutrient supply through decomposition are less pronounced because of more active belowground processes . The grazing impact on C and N fluxes through decomposition of plant biomass , thus , likely exhibits a strong interaction with seasonal rainfall patterns .

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