The Change of Soil Temperature to Stocking Rate on the *Stipa breviflora* Desert Steppe

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Introduction Stocking rates are one of the most important factors in grazing management ,and are a key determinant in the grazing intensity of grasslands . In recent years ,it has become widely accepted that over grazing can lead to grassland degradation . Many studies have shown that over grazing leads to significant reductions in plant communities height ,density and ground coverage . The changes in these grassland plant features can lead to changes in the grassland uptake of solar radiation energy and sun reflection ,consequently effecting the change in soil temperature and atmospheric temperature in grassland ecosystems . Further it affects the nutrient cycle and energy flow of the whole grassland ecosystem . All these changes may lead to unpredictable changes on the whole climate system . As such ,this experiment studied the effect of different stocking rates on soil temperature in the *Stipa breviflora* Desert Steppe ,and in doing so tried to provide some scientific insights into grassland degradation and global warming .

Materials and methods This study was conducted on the Inner Mongolian Plateau (41°47′17″N ,111°53′46″E ,average annual precipitation= 280 mm ,elevation = 1450 m ,perennial mean temperature = 3 .4℃ ,the months of highest monthly mean temperature are June ,July and August ,with a yearly mean temperatures of 21 .5 ,24 .0 and 23 .5℃ ,respectively ,≥10℃ accumulate temperature is 2200—2500℃ ,soil= Light Chestnut) .The experiment used three random blocks ,each block with four treatments including three different stocking rates and one site with no grazing . The stocking rates were 0 .93 (LG) 1 .82 (MG)2 .71(HG) and 0(CK) sheep/ha^2/half year ,respectively . Grazing occurred throughout summer ,commencing from June 2004 ,until November every year . In May 2005 ,each treatment set probes into the soil to record soil temperature at 7 .5cm , 15cm ,30cm and 50cm . The soil and probe data was collected every two hours from September 3rd to September 4th between 7 :00am to 7 :00pm ,with sunrise at 6 :30 am and sunset at 7 :00 pm .

Results After continuous grazing for four years during the summer ,the features of grassland plants changed significantly . The soil temperatures under the grazed treatments were significantly different from that recorded under the no grazing treatment (Table 1) . The highest soil temperature ccurred at the 7 .5cm soil layer with a temperature of 1. 46℃ . The change in temperature at the 7 .5cm soil layer was different from the other three layers . This may be related to the lag effect in temperature change at different soil depths . (Figure 1) .

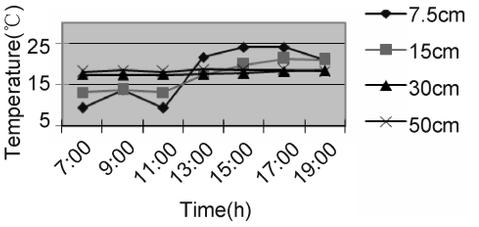

Figure 1 *The daily change of Soil temperature at different depth*

Table 1 *Soil temperature at different soil depth of different stocking rates .*

Treatment	7 .5cm	15cm	30cm	50cm
CK	19 .78^{a}	17 .92^{a}	18 .04^{a}	18 .60^{a}
LG	18 .54^{bc}	17 .15^{c}	17 .51^{c}	18 .24^{c}
MG	18 .82^{b}	17 .33^{b}	17 .65^{b}	18 .48^{b}
HG	18 .32^{c}	17 .16^{c}	17 .56^{bc}	18 .41^{b}

$^{a-c}$ Means in a column having a common letter are not different (P>0 .05)

Conclusions A majority of researchers believe that environmental pollution was brought on by the Industrial Revolution ,and continues to be the major factor in global warming at present . There is little study on the affect of grassland degradation on solar radiation and sun reflection in land ecosystems ,especially in the arid and semi-arid areas . In our preliminary study ,it has been shown that grassland degeneration significantly affected soil temperature . China has 400 million ha of grassland of various different types ,and over 90% of this is degraded to at least some degree (L I Feng-xia ,2005) ,this means that the whole grassland ecosystem affect global warming cannot be estimated . Therefore ,the study on grassland degradation and its affect on solar radiation ,sun reflection and global warming warrants further investigation .

Reference

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