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Presenter Information

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Slope aspect has effects on belowground biomass and root length of semi-arid hilly steppe

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Key words : Slope aspect, belowground biomass, root length density, soil water content

Introduction Hilly steppe is an important landform, which constitutes approximately 40% of total Xilin River Basin. Slope aspect as the main topographic factor may influence the plant productivity, but existing data are rare.

Materials and methods Study sites were located in a hilly region (N43°26', E116°40') of Xilin River Basin of Inner Mongolia, China. Mean temperature and precipitation during the growing season were 15.0 ± 0.8 °C and 294 ± 62 mm. The predominant soil types are Calcic Chernozems. Five slope positions of one hill including the base of the southern (BS) and northern (BN) slopes, at the middle of the southern (MS) and northern (MN) slopes, and at the top of the hill (TP) were sampled in 2004 and 2005. Plant aboveground biomass and root samples were taken at the beginning of Sep. in 2004 and 2005. Root samples of 0-20cm depth were sampled by taking soil cores using a metal ring with a diameter of 25 cm. Line intersect method (Tennant, 1975) was used to determine the root length density.

Table 1 Plant aboveground green biomass (AGB, g m⁻²), belowground biomass (BGB, g m⁻²), and root length density (RLD, cm cm⁻³) of five slope positions. Small letters indicate differences among slope positions at $p < 0.01$ level, ^{ns} indicate no significant difference.

	AGB		BGB		RLD	
	2004	2005	2004	2005	2004	2005
BS	77 b	23 ^{ns}	1179 b	1357 b	3.0 b	5.1a
MS	50 c	19 ^{ns}	1089 b	697 c	2.0 b	2.3b
TP	48 c	25 ^{ns}	1507 ab	1253 b	3.4 b	3.2b
MN	108 a	27 ^{ns}	2017 a	1944 a	5.7 a	5.2a
BN	116 a	18 ^{ns}	1859 a	1804 a	6.0 a	5.7a

Results Comparing both, middle and base positions, significantly more AGB was found in northern slope positions than at the southern slope in 2004 (Table 1). In 2005 no differences were found, which can be explained by the very low rainfall. North-oriented slope showed higher BGB and higher RLD than the southern slope at all sampling dates. Significant correlation between soil water content and BGB was detected in samples of Aug. and Sep. 2004 (Figure 1); whereas this trend was not observed in 2005, due to the less rainfall and consistently low soil water content.

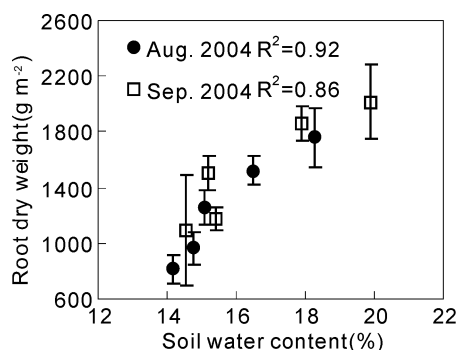


Figure 1 Correlation between root dry weight and soil water content, $n=5$.

Conclusions In a year with average rainfall, the slope aspect affected above and below ground biomass production: Northern slopes exhibited higher AGB, BGB and RLD compared to southern slopes. As supported by the correlation between soil water content and BGB, soil water availability is seen as the primary limiting factor for plant belowground productivity.

Reference

Tennant, D., 1975. A test of a modified line intersect method of estimating root length. *Journal of Ecology* 63, 995-1001.