

Dynamics of seedling emerging and survival rates of *Stipa baicalensis* steppe community under two utilizing regimes

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Introduction The emergence and survival of seedlings are the bases of grassland innovation. Seedlings were produced from seed rains, or soil seed bank. Only when seeds germinate in soil, then become seedlings, grow into juvenile plants, and finally develop into mature plants that could affect the characteristics of community. The seedling emerging and survival were affected by many factors like management (Brys, 2004). *Stipa baicalensis* steppe was utilized through grazing and hay-making. Both regimes had different effects on producing and survival of seedlings.

Materials and methods The study was undertaken in a *S. baicalensis* steppe near Wulagai River in the eastern Inner Mongolia meadow steppe. The steppe was divided into two paddocks by the fence-one grazing paddock (GP) that was grazed by sheep and cattle yearly for many years and one hay-making paddock (HP) where the plants were mowed for hay in each autumn for three years and was grazed shortly in winter. In each paddock a 2500 m² study site was selected and thirty five 1/4 m² quadrats were randomized fixed inside of the site respectively. Same perennial plant species were observed in HP and GP site, and no annuals were found. The observation was carried out for two growing years. Six observations were done in First year (rainfall 486 mm), and three in Second year (rainfall 190 mm). On each observation all new seedlings were labeled by different colourful metal points one by one and mortality seedlings were recorded.

Results In the First year most seedlings emerged after middle of June because concentrated rainfall kept the soil moisture suitable. The numbers of new seedlings between any two observations and accumulated new seedlings, as well as survival seedlings in HP site were significant higher than in GP site ($p < 0.01$) (Table 1). Also HP site had higher seedling survival rate. In spring of the Second year the wintering rates of total seedlings in HP and GP were 36.0% and 17.7% respectively. Based on total seedling numbers on Sep. 10 before winter the survival rates were 17.9% and 8.6% for Aug. 10 observation, and 14.5% and 4.6% for Sep. 10 respectively, showed significant difference ($p < 0.01$). Because of the dry weather in Second year the total new seedlings in both HP and GP were only 90.3/m² and 74.7/m².

Table 1 New emerged, accumulated, survival and accumulated survival seedlings (no./m²) and their survival rate.

Seedlings	May 30		Jun 15		Jul 1		Jul 15		Aug 25		Sep 10	
	HP	GP	HP	GP	HP	GP	HP	GP	HP	GP	HP	GP
New emerged s.	1.2	0	0.4	0	56.8	30.8	90.8	33.2	63.6	32.4	97.2	47.6
Accumulated s.	1.2	0	1.6	0	58.4	30.8	149.2	64.0	213.2	96.4	310.0	144.0
Survival s.	0	0	0	0	48.8	23.2	84.4	23.2	61.6	28.8	97.2	47.6
Survival rate(%)					85.9	75.3	93.0	69.9	96.9	88.9		
Accumulated survival s.			1.2	0	50.0	23.2	134.4	46.4	196.0	75.2	293.2	122.8
Accumul. survival(%)			75.0		85.6	75.3	90.1	72.5	91.9	78.0	94.6	85.3

Conclusions Different regimes had different effects on steppe seedling emerging and survival. The total survival rates in both HP and GP were very low. Steppe for hay-making was considerably better to keep seedling quantity than for Grazing. So it is necessary to practice both regimes rotationally in one steppe in some regular years.

Reference

Brys, R., Jacquemyn, H., Endels, P., Blust, G. de, Hermy, M., (2004). The effects of grassland management on plant performance and demography in the perennial herb *Primula veris*. *Journal of Applied Ecology* 41 (6) :1091.