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Effects of Salt-Alkali Stress and Clipping on *Stipa baicalensis*

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Abstract

Stipa baicalensis is one of the dominant species in Songnen grassland, where soil salinisation-alkalisation is serious problem. In addition, overgrazing is other major cause contributing to grassland degradation. Due to above mentioned stresses, the population size of *S. baicalensis* in the grassland dramatically decreased during the last four decades. However the response of *S. baicalensis* to salt-alkali stress and overgrazing has not been well understood.

A two factorial experiment was conducted in the natural field with the addition of mixed salt-alkali solution ($\text{NaCl}:\text{NaHCO}_3:\text{Na}_2\text{CO}_3 = 1:1:1$) and clipping (removal 60% of aboveground biomass). The aboveground biomass (AB), plant density and height, proline and soluble sugar content were measured. The results showed there is no significant interaction between salt stress and clipping on AB. Clipping significantly reduced AB regardless of salt stress, whereas salt stress has no significant effect on AB. Overall, clipping has no significant effect on plant density and height, while salt stress significantly increased plant density and height. The content of proline and soluble sugar was significantly reduced by clipping and salt-alkali stress in shoot, but not in stem-base. As to root, salt-alkali stress and clipping have no significant effect on proline content, while salt-alkali stress significantly reduced soluble sugar content.

In summary, overgrazing has more adverse effects on *Stipa baicalensis* community than salt stress. Since this species didn't show any morphological and physiological resistance to clipping, while it exhibits salt resistance by increasing plant density and height in spite of no physiological salt resistance ability. Further, our results suggest reducing stocking rate may be an effective way to restore *Stipa baicalensis* community, and the measurements could include rotational grazing, seasonal exclosure and even complete exclosure at the overgrazed sites.

Keywords: Aboveground biomass, clipping, salt stress, *Stipa baicalensis*