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“Development on the margin”

Leymus chinensis Overcomes Salt Stress by Increasing Individual Ramet Growth

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Abstract

Songnen plain is a large natural grassland in Northern China, where most of parts are suffering from salinity and alkalinity. Overgrazing, an additional major threat, accelerates degradation processes in the grassland during the last four decades. *Leymus chinensis* is a dominant rhizome grass and resists to grazing as well as tolerates to salt. However, the adaptation mechanism of *L. chinensis* is largely unknown. A two factorial field experiment was carried out in the natural *L. chinensis* community, combining the addition of mixed salt-alkali solution (NaCl: NaHCO₃: Na₂CO₃ = 1:1:1) with clipping (removal 60% of aboveground biomass). Aboveground biomass (AB), plant ramet density, net photosynthesis rates and rhizome sugar content were measured.

Salt and clipping had an interactive effect on AB of *L. chinensis*. Salt addition significantly increased AB under no clipping treatment but under the clipping. The significant increase of AB is due to a high leaf area index and net photosynthesis rates of individual ramets under salt stress, although the total ramet density was significantly decreased. The clipping significantly decreased AB regardless of salt addition probably due to the decrease of rhizome sugar content.

Our results suggest *L. chinensis* can grow well under the salt stress through ramet compensation, which is the decrease of ramet density was compensated by the increase of individual ramet biomass. The dead ramets remove salts to lower soil salt concentration making the live ramets grow better. However, this is probably an unsustainable strategy of *L. chinensis* to cope with salt stress, a long-term field study is needed in the future research.

Keywords: Clipping, *Leymus chinensis*, photosynthesis, salt stress