Ramet recruitment from different bud types along a grassland degradation gradient in Inner Mongolia, China

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INTRODUCTION

Grassland degradation caused by overgrazing has been recognized as a major threat to ecosystem services and functioning, especially in arid and semi-arid regions (Mainguet 1994, Bai et al. 2007, Ford et al. 2012, Wiesmeier et al. 2012). The area of degraded grassland in China has reached approximately 1.35×10⁶ ha. It accounts for one third of the available grassland area, and it increases at a speed of 2.0×10⁶ ha yr⁻¹ (Zhou and Wang 2002, Jia et al. 2006). Grassland degradation is usually accompanied by changes in plant community composition, then leading to changes in the vegetation succession process (Jauffret and Lavorel 2003, Wang et al. 2006). Since population regeneration plays important roles in determining plant community dynamics (Grubb 1977), understanding the dynamics of changes in population recruitment is essential to reveal the mechanisms of vegetation succession, and predict community dynamics.

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ABSTRACT

Since the contribution of total belowground bud bank and different bud types to community regeneration has rarely been explored, the vegetative offspring recruited from different belowground bud types was investigated in four plant communities along a grassland degradation gradient in northeastern China (Inner Mongolia). This gradient, between 1000 and 1500 m a.s.l., has been caused by overgrazing. It is a Leymus chinensis steppe which occupies about 3.0×10⁵ ha. Recruitment from tiller buds was dominant (>80%) in determining the total vegetative offspring density along the whole grassland degradation gradient. However, the proportional contribution of tiller-ramets to total ramet recruitment was significantly greater (P <0.05) during earlier than later stages of grassland degradation, while that of rhizome-ramets showed an opposite pattern. While the percentage contribution and density of root-derived ramets to total ramet density increased significantly (P <0.05) during the late stages of grassland degradation, those of bulb-ramets kept relatively constant along the whole grassland degradation gradient. The relative contribution of hemicryptophytes [i.e., Achnatherum sibiricum, Cleistogenes squarrosa, Festuca ovina, Koeleria cristata, Poa annua, Stipa grandis] to total plant species richness decreased, while that of geophytes [i.e., Agropyron cristatum, Carex korshinskyi, Leymus chinensis, Allium anisopodium, A. bidentatum, A. tenuissimum, Astragalus galactites, Cymbalaria dahuurica, Iris tenuifolin, Potentilla acaulis, P. bifurca, Pulsatilla turczanzinovii, Serratula chinensis, Thalictrum aquilegifolium] increased with the increases of grassland degradation. Our results showed that as grassland degradation increased, changes in the proportion of tiller-, rhizome- and root-derived ramets with respect to total ramet density determined in turn changes in the proportion of hemicryptophytes and geophytes in the study plant communities.

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