

Changes of persistent soil seed bank in degraded *Seriphidium transillense* desert grassland

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Introduction *Seriphidium* desert is generally the dominant native grassland type and is extensively distributed in central Asia, especially on the northern slopes of the Tianshan Mountains. It playing an important role in stockbreeding and ecosystem. Persistent soil seed bank plays a key role in vegetation restoration after disturbance, but research about *Seriphidium transillense* desert seed bank is relatively few. In this paper we address the following two questions: (1) what changes happen under different degradation degree about soil seed bank? (2) why the changes happened?

Materials and methods The study area is the spring - autumn pastures of Ashili village (N43°49'~43°56', E87°02'~87°05'), is open flat alluvial plain and located on the northern side of the Tianshan Mountains, in Xinjiang, China. The dominant flora on the study sites is *Seriphidium transillense*, the companion species are *Petrosimonia sibirica*, *Tulipa iliensis*, *Trigonella arcuata* and *Ceratocarpus arenarius*. We divided grassland into four types according degradation gradients, non-degradation (ND), media-degradation (MD), heavy-degradation (HD) and over-degradation (OD). Samples of soil seed bank were collected on April 17, 2006, sample's area is 38.5 cm², and soil depth are 0~5, 5~10 and 10~15 cm respectively, and every degradation stages set four repetitions. Use Germination Method to identify the seeds in greenhouse.

Results and discussions Composition of soil seed bank: ND has 6 species, *Seriphidium transillense*, *Tetradlea quadricornis*, *Eragrostis pilosa*, *Chenopodium album*, *Amaranthus retroflexus*, and *Malcolmia africana*, MD has 8 species, *Seriphidium transillense*, *Petrosimonia sibirica*, *Eragrostis pilosa*, *Tetradlea quadricornis*, *Chenopodium album*, *Amaranthus retroflexus*, *Trigonella arcuata*, and *Ferula ferulaeoides*, HD has 7 species, *Eragrostis pilosa*, *Tetradlea quadricornis*, *Chenopodium album*, *Amaranthus retroflexus*, *Trigonella arcuata*, *Peganum harmala*, and *Amaranthus mangostanus*, and OD has 8 species, *Kochia prostrata*, *Petrosimonia sibirica*, *Salsola brachytricha*, *Eragrostis pilosa*, *Tetradlea quadricornis*, *Malcolmia africana*, *Trigonella arcuata*, and *Peganum harmala*. We use Mehinick Richness Index (MRI), Alatalo Evenness Index (AEI), Gini Diversity Index (GDI) to study species diversity of the persistent soil seed bank. The three indexes have the same change tendency, and least in ND, increase from ND to MD and then decrease little from MD to OD. In the course of degradation, invasive species occupy the niche of dominant species, so the species diversity of soil seed bank increased. But it will decrease as the degradation enhanced. The seed number are 683, 455, 374, and 611 seeds/m² respectively in four degradation stages. In ND, the rate of constructive species seeds, *Seriphidium transillense*, is 50%, but 5% in MD, 0% in HD and OD. Constructive species can not complete its life history under higher grazing stress, so seed number decrease. But in OD, invasive species replaced constructive species gradually, and their reproductive strategy made seed number increase. To the three vertical layers, the distribution rate of seeds is respectively 62%, 14%, 24% in ND, 72%, 14%, 14% in MD, 44%, 35%, 21% in HD, 83%, 6%, 11% in OD. The total seeds number decrease gradually with soil depth, and 66% of total seeds distribute in 0~5 cm soil depth. Grazing stress made soil compaction increase, so it is difficult for seeds to sedimentate, and most of total seeds exist in surface layer of soil.

The soil seeds of suffrutex artemisia and ephemeral/ephemeroid species are both more than the number of their overground plant seedlings, but result of annual species is reversed. Grazing stress made the two types of species suffer much more, they have no chance to produce seeds, so convert to agamogenesis strategy, furthermore most of seeds remain dormant in soil, so give annual community an opportunity to grow and propagate.

Conclusions As the grazing stress enhanced, (1) Richness, evenness, and diversity of vegetation all increase more or less, and species invade severely in MD. (2) Seed number decrease from ND to HD, but increase much in OD. And most of seeds exist in surface layer of soil. (3) Seeds of suffrutex artemisia and ephemeral/ephemeroid species, select temporary dormancy strategy to evade adversity, but these stimulate the seeds of annual species to burgeon and propagate.

References

LIU Hong-lai, ZHU Jin-zhong, JIN Gui-li, et al., (2007). Division on degraded successional series of *Seriphidium transillense* desert grassland. *Xinjiang Agricultural Sciences*, 44 (2), 137-142.