УДК 582.751.2:581.55+581.524.34(517.3)

The natural and human impacts on coenopopulation structure of *Geranium pratense* L. in meadow community of Mongolia

Влияние природных и антропогенных факторов на сруктуру ценопопуляций *Geranium pratense* L. в луговых сообществах Монголии

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Summary. Age structure in plant populations is determined by plant age state group and this is the age classification for plants displaying different time stages of from seedling to senile. A study on age structure change provides further research motivations on determination of plant adaptation to environment change. Because of that, plant biological process is developed by not only its morphology.

The geobotany comparison research on grass-forb meadow community was conducted in pastureland with continuous and over grazing and fence out areas of the pasture with 1 hectare area.

Increased number of total individuals *Geranium pratense* L. of meadow community in fence out areas of the pasture displayed the results on limitation of grazing. However, the decreased number of total individuals, in particular the young and juvenile individuals between the years could be depended on climate. Because of that, the average air temperature was dropped by from 1.0 to 1.2 ˚C in the years of 2009 and 2014, and precipitation was increased by 70 mm compared to long term average. Based on our research results, we concluded that the air temperature plays an important role for plant development in the forest steppe region compared to precipitation.

Реферат. Исследование проводилось с 2009 по 2014 г. в злаково-разнотравных луговых сообществах Монголии, находящихся под влиянием интенсивного выпаса. Для того чтобы предотвратить дальнейшую деградацию луговых пастбищ, необходимо изучить структуру ценопопуляции некоторых доминантных луговых видов.

В этом случае мы привели результаты исследования ценопопуляции *Geranium pratense* L. Для изучения влияния выпаса на луговые сообщества мы огораживали от выпаса участок в один гектар, в котором изучали процесс изменения сообщества вне выпаса, и под выпасом, где пасутся почти круглогодично, кроме зимы, изучали процесс его природного восстановления. В этих же сравнительныч участках изучалась структура ценопопуляции *Geranium pratense* L., одного из доминантных видов. Результаты исследования показали, что общее число особей *Geranium pratense* вне огороженных участков, где интенсивный выпас, сокращается, уменьшаются ювенильные молодые особи (p-j-im) и преобладют средневозрастные вегетативные (V) особи. Тогда как в огороженном от выпаса участке не только общее число особей, но и числа молодых и генеративных особей увеличиваются. Был сделан вывод о том, что с предотвращением выпаса сообщество восстанавливается и происходит хорошее возобновление растений за счёт прекращения постоянного поедания и вытаптывания скотом (Narantuya, 1997). В связи с этим, растению удаётся проходить полную стадию своего развития. Сравнивая по годам исследований, мы пришли к выводу, что уменьшение общего количества особей и числа молодых особей в огороженных участках связано с изменением климата в данные годы. В последние годы исследований температура воздуха уменьшалась почти на 1,2 °С, а осадков выпало больше на 70 мм, по сравнению с многолетними средними данными (Gomboluudev et al., 2010) и с начальным годом исследований. Следовательно, в лесостепных поясах Монголии для развития растительности ведущим фактором является не осадки, а а температура воздуха (Narantuya, 1997).

Introduction

Study background: One of the leading factors indicating the plant development and its dynamic is plant coenopopulation. Coenopopulation study covers three main studies of plant individual number and its changes, plant age structure and plant vitality (Plant coenopopulation, 1976).

Age structure in plant populations is determined by age state group and this is the age classification for plants displaying different time stages of from seedling to senile (Khantemerova, 1997).

A study on age structure change provides further research motivations on determination of plant adaptation to environment change. Because of that, plant biological process is developed by not only its morphology.

In addition, plant vitality, plant survival, and capacity to reproduce can be determined as well. Therefore, a study on coenopopulation structure of dominant meadow community is essential in order to identify how plant communities are changing under the pressures of climate change, and human impacts as overgrazing. Results from this study can be scientific basis for preventing and conserving the meadow plant against degradation.

Study purpose: To determine the natural and human impacts on coenopopulation structure of *Geranium pratense* L. as dominant of the meadow community.

Objectives:

To compare the studies on coenopopulation structure of *Geranium pratense* in pastureland and fence out areas of the pasture.

To determine age structure spectrum of *Geranium pratense*.

Study area and methods

The geobotany comparison research on grass-forb meadow community was conducted in pastureland with continuous and over grazing and fence out areas of the pasture with 1 hectare area.

The study was carried out in the Baidlag Bag, Mungunmorit Soum, Tuv Province and the research site was located in the floodplain area of the Baruun Burkh River (N48°18'622" E108°44'681", 1431 a. s. l). Approximately 60 percent of livestock in the Mungunmorit Soum belong to the Baidlag Bag.

Material and Methods

The research materials on coenopopulation study were collected in the meadow community dominated area with 80 to 90 percent of vegetation cover during the peak vegetation period of July to August. The geobotanical descriptions were filled at the transection area of 50 x 50 cm with a frequency of 15 times at each transection area. According to the age structure the individuals of *Geranium pratense* at each transection area were counted in pastureland and fence out areas of the pasture. For instance: seedlings (p), juvenile (j), immature (im), virginile (v), young (g1), mature (g2) old (g3) reproductive, subsenile (ss), senile (s). The Uranov (1975) classification was used for the determination of age structure.

The age structure spectrum of *Geranium pratense* was calculated using the following equation:

Bc=(Xi/Xj)*100 % Bc-plant age structure spectrum,%;
Xi-number of individuals in all age state group of species;
Xj-number of individuals in one age state group of species.

Study results. Canopy cover of *Geranium pratense* was 2.4 % within the area of 50 x 50 cm in the pastureland with continuous and over grazing and its average height was 11.4 cm. However, *Geranium pratense* had a 6 % canopy cover with an average height of 20 cm in fence out areas of the pasture. During the research years (2009–2014), a total individual number of *Geranium pratense* was 243 in 2009 and of them, 90 individuals in pastureland and 153 individuals in fence out areas of the pasture were counted. About 60 percent of individuals (90) of meadow community in fence out areas of the pasture belonged to the age structure of virginile (v) and the age groups of seedlings (p), juvenile (j), and immature (im) were distributed with a significant low percentage indicating that there was nearly no chance for community development. In 2014, a total individual number of *Geranium pratense* was 88 and of them, 23 individuals in pastureland and 65 individuals in fence out areas of the pasture were counted. A comparison of the results from 2009 and 2014, the number of individuals was decreased 2.7 times in 2014. According to the age structure, the young and juvenile individuals (age groups of p, j and im) occurred with 19 % and virginile group (V) was distributed by 70.4 percent at selected research sites in pastureland. In fence out areas of the pasture, the young and juvenile individuals (age groups of p, j and im) occurred with 64.5 % and virginile group (V) was distributed by 21.2 percent. The young to old reproductive age groups (g1-g3) were distributed by 18.3 percent (Narantuya et al., 2015).

Discussion

Increased number of total individuals of meadow community in fence out areas of the pasture displayed the results on limitation of grazing. However, the decreased number of total individuals, in particular the young and juvenile individuals between the years could be depended on climate. Because of that, the average air temperature

was dropped by from 1.0 ˚C to 1.2 °C in the years of 2009 and 2014, and precipitation was increased on 70 mm compared to long term average. Based on our research results, we concluded that the air temperature plays an important role for plant development in the forest steppe region compared to precipitation (Narantuya et al., 2015).

Conclusion

The results on decreased number of young and juvenile individuals and increased individual number of virginile group indicated over grazing impacts. In particular, the young and juvenile groups lost their adaptive capacity and cannot pass through their development groups.

Results of fence out areas of the pasture, growth development of meadow community improved and natural rehabilitation was considerably acceptable. Fencing can be suitable approaches for natural rehabilitation in order to prevent from overgrazing.

Plant coenopopulation study can be scientific basis for sustainable use of pastureland with plant biological development of meadow community.

Air temperature played an important role for plant development in the forest steppe region of Mongolia compared to precipitation.

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