

Changes in the species composition of plants under the influence of human activities in the shrub-grassland belt, Zailiysky Alatau

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Introduction

Nature of Zailiysky Alatau is unique and inimitable. It was first investigated by P.P. Semenov-Tien Shan in 1867, and the most complete description of the vegetation was later done by the following academicians, N.V. Pavlov in 1940 and 1948 (Pavlov 1948), M.G. Popov in 1940, N.I. Rubtsov in 1950, and B.A. Bykov in 1950 (Bykov 1980). Due to urbanization, the once lush and rich vegetation of Zailiysky Alatau has been inexorably decreasing in recent decades (Arystanbekova *et al.* 1975). The impact of human activities on the change in the floristic composition of plant shrub-forb zone of Zailiysky Alatau at the height of 1,300 m above sea level was conducted during the period of 2000 - 2010 together with the Horticulture Department of Kazakh State Agrarian University. The aim of our observations was to assess a variation in the species composition of plants as a result of human activities.

Material and Methods

Four field plots were selected:

1. In the first station, plowing is not carried out after one single fall. There are no further economic activities. In addition, the plot is not touched by man.
2. In the second section, plowing is conducted annually after autumn (mowing).
3. In the third section, followed by the annual hay-mowing, the disposable seeding of Transcaucasian sainfoin (*Onobrychis transcaucasica* Grossh.) is carried out.
4. The fourth section is with the meadow and herbs landed shelterbelt consisting of elm pinatoramosa (*Ulmus pinntoramosa*). The annual mowing is also undertaken.

5. The fifth site was chosen very carefully. It was a natural piece of land previously not subjected to too large human activities, just to a frequent gathering of herbs and flowers by tourists. This site was blocked and in this way isolated from the influence of anthropogenic factors during the entire study period.

In the second, third and fourth sections, grass mowing was annually conducted once, within the last week of June, the flowering period of the main types of herbs. As to sowing, the third section used the Transcaucasian sainfoin (*Onobrychis transcaucasica* Grossh.). In April, sowing was performed manually at the pre-prepared soil based on 1ha/6-7 kg scheme per 7 * 20cm.

Results

The result of the long-term observation of experimental plots showed the following.

In the first station after plowing, there was the first year in a mass form without any human intervention, thistle serrulate (*Cirsium serrulatum*), alatavsky spurge (*Euphorbia alatavica*), and partly bluegrass (*Poacea*) have grown. Then, in the second and subsequent years, the entire area began to gain bluegrass (*Poacea*): alatavskaya fescue (*Festuca alatavica*), bluegrass ordinary (*Poa trivialis* L.), meadow foxtail (*Alopecurus pratensis*), cocksfoot (*Dactylis glomerata*), calamagrostis dioecious (*Calamagrostis dioica*), and others, together with the following weeds: nettle (*Urtica dioica*), dandelion ordinary (*Taraxacum officinale*), sagebrush near Belen (*Artemisia albida*). In the fourth year, butterflies (*Poacea*) completely conquered this site. In the period of 5-7 years, the following were already beginning to appear: the single plant succession tripartite (*Bidens tripartita*), oregano (*Origanum vulgare*) and elecampane rough (*Lnula aspora*).

In the second site, during the first year the following also grew plentifully: thistle serrulate (*Cirsium serrulatum*), spurge alatavsky (*Euphorbia alatavica*), and rarely bluegrass. In the second year, thistle serrulate appeared as isolated individuals, but bluegrass (*Poacea*) and weeds such as yellow lucerne (*Medicago falcata* L), agrimony Asian (*Agbimania asiatica*), red clover (*Trifolium pratense*), and dandelion ordinary (*Taraxacum officinale*) were gaining their strength.

Years	The species composition of plants		
	the Transcaucasian sainfoin	bluegrass	other thistle denticulate
2000	94.5	3.3	2.2
2001	92.7	4.6	2.7
2002	90.4	6.8	2.8
2003	84.2	12.1	3.7
2004	50.1	34.4	15.5
2005	30.8	51.4	17.8
2006	15.6	62.0	22.4
2007	3.8	73.0	23.2
2008	2.2	74.6	23.2
2009	1.1	75.4	23.5
2010	0.5	76.2	23.3

Table 1. Changes in the number of basic species data (in% by weight).

In consequence, the years brought here common chicory (*Cichorium intybus*), echium vulgare (*Echium vulgare*), melissa officinalis (*Melissa officinalis*), horse sorrel (*Rumex confertus*), or mallow forest (*Malva silvestris* L.), red clover (*Trifolium pratense*), mother and stepmother (*Tussilago farfara*). The data which we obtained in the third section are displayed in Table 1. Results of the fourth embodiment shows that in the first four years the species composition remained almost unchanged, consisting mainly of bluegrass (*Poacea*). On the site of the fifth embodiment, in the initial period of the dominant vegetation, typical for the area, and only in the first 9-10 years, there were species that had not been there before: a series of tripartite (*Bidens tripartita*), oregano (*Origanum vulgare*), St. John's wort (*Hypericum perforatum*), meadow geranium (*Geranium pratense*), and iris Sogdian (*Iris sogdiana*).

Conclusion

According to the results of the study:

1. The natural self-regulation is observed even after a single human intervention, i.e. autumn plowing. After the annual mowing the species composition is depleted as there is no seed

reproduction, and what remains are only species breeding rhizomes and root suckers.

2. Without the reinforcements of seeding valuable fodder crops - esparcet Transcaucasian (*Onobrychis transcaucasica* Grossh, it is displaced. There are mostly bluegrass (*Poacea*) and other low value forage species, in low-light mode, and the accompanying annual mowing observed the displacement of bluegrass (*Poacea*) shade tolerant, toxic: not eaten by cattle.
3. For the natural replenishment of rare and endangered species, there is a need for such a reserve site that would serve as a kind of a genetic fund of plants. In the distance of every 3-5 km, such sites should be fenced, strictly prohibited to any human activity, to be able to restore the natural plant species. This should facilitate the efficient use of land, preservation and multiplication of plant resources, and the environmental improvement.

References

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