

## Method of Reintroduction as a Measure of Active Preservation of Species of Genus *Stipa* L.

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### **Бандурко В. В., Сафонов А. І. Метод реінтродукції як захід активного збереження видів роду *Stipa* L.**

Актуальність еколого-ботанічних досліджень степових угруповань зумовлена і потребами науки (еколого-ценотичні ніші, потенціали; стійкість та динамізм; діагностика та контроль стану збалансованості екосистем), і практики землекористування та ресурсозбереження. У результаті інвентаризаційних робіт на території РЛП «Клебан-Бик» було визначено 13 видів ковил. Більшість видів роду *Stipa* L., які зростають на території РЛП «Клебан-Бик», мали регресивні популяції або тенденцію до регресивності й знижений рівень відновлення особин. Коли антропогенний вплив призводить до зникнення зі складу рослинних угруповань цих видів, виникає потреба їх реінтродукції, найбільшу успішність упровадження якої доведено для *S. dasyphylla* і *S. capillata*.

**Ключові слова:** *Stipa*, стан популяцій, антропогенний вплив, реінтродукція.

### **Бандурко В. В., Сафонов А. І. Метод реінтродукции как мера активного сохранения видов рода *Stipa* L.**

Актуальность эколого-ботанических исследований степных сообществ обусловлена как потребностями науки (эколого-ценотические ниши, потенциалы; устойчивость и динамизм; диагностика и контроль состояния сбалансированности экосистем), так и практики землепользования и ресурсозбережения. В результате инвентаризационных работ на территории РЛП «Клебан-Бык» было определено 13 видов рода *Stipa* L. Большинство видов рода *Stipa* L., произрастающих на РЛП «Клебан-Бык» имели регрессивные популяции или тенденцию к регрессивности, и низкий уровень возобновления особей. Когда антропогенное влияние приводит к исчезновению из состава растительных сообществ этих видов, возникает необходимость их реинтродукции, наибольшую успешность введения которой доказано для *S. dasyphylla* и *S. capillata*.

**Ключевые слова:** *Stipa*, состояние популяций, антропогенное воздействие, реинтродукцию.

### **Bandurko V. V., Safonov A. I. Method of Reintroduction as a Measure of Active Preservation of Species of Genus *Stipa* L.**

Donetsk National University – Topicality of ecological and botanical research of steppe associations is conditioned both by scientific requirements (ecological and cenotic niches, potentials; steadiness and dynamism; diagnostics and control of the state of ecosystems balance) and practice of land tenure and resource preservation. As a result of the inventory on the territory of the RLP «Kleban-Byk» 13 species of *Stipa* were identified. In the course of the research it was stated that the age state of the populations is not satisfactory and demands reintroduction measures. In cases when anthropogenic impact leads to disappearance of these species from the complex of vegetable groups, there is need of their reintroduction, its successfulness having been proved for *S. dasyphylla* and *S. capillata*.

**Key words:** *Stipa*, state of the populations, anthropogenic impact, reintroduction.

**Formulation of research problem and its significance.** Modern economic activity of man leaves its mark on quantitative and qualitative state of biological diversity. The ecosystems with steppe types of vegetation are considerably vulnerable. Their steady exploitation led to radical changes in biotic structure that couldn't but affected their diversity.

**Analysis of recent research on this issue.** Steppe type of vegetation in our country is regarded as priority protected units as it recovers very slowly when superficial layer of soil is disturbed and it quickly reduces its territories under anthropogenic pressure [4; 5].

Topicality of ecological and botanical research of steppe associations is conditioned both by scientific requirements (ecological and cenotic niches, potentials; steadiness and dynamism [1; 6]; diagnostics and control of the state of ecosystems balance) and practice of land tenure and resource preservation. That is why all the aspects of ecology and botany must find and keep their place in general movement for rational land tenure.

One of the necessary conditions of protection of biodiversity of plants genetic fund is introduction *ex situ* rare and disappearing species of plants for their further reintroduction in disturbed natural ecosystems. Steppe plants became disappearing quite recently, but the areas of their natural growing reduced quickly enough under the impact of anthropogenic factors. That's why preservation and reproduction of these plants in artificial conditions is gaining immediate significance [2].

Reintroduction of plants nowadays is a contemporary method of preservation *ex situ* that enables to preserve genetic fund of natural flora and to renew natural plants cover [7].

Scientific knowledge of functioning of *Stipa* L. steppes of Donbass (the most ecologically tense and urbanized region of Europe), that are characterized by floristic, biomorphological, ecological and phytocenotic richness, is significant provided there is an overall analysis based on botanic and ecological complex approach. On the steppe territories of Donbass there are 112 rare species of plants. Among them 14 are listed in The Red Book of Ukraine, 6 are on The European Red List, 23 are protected according to resolutions of regional Councils, 24 are rare species of the Donetsk basin. *Stipa* steppes number 395 species prospective for economy. Among them 288 species are decorative, 155 – are fodder crops, 123 species are officinal, 104 – are phyto-land-improvement species, and also eatables, that is why it is very important to preserve phytocenofund of the territory under analysis [7; 8].

The species of genus *Stipa* are edipicators, often being dominants and indicators of steppe ecosystems, systems of disturbed vegetable cover and evaluation of anthropogenic pressure level onto natural systems. They play an integral role in normal functioning of the unique fertile steppes of Donbass, so study and preservation of different species of genus *Stipa* are of great scientific and practical importance [5].

**Purpose:** to realize the complex of current measures on analysis and renewal of steppe *Stipa* areas on the basis of botanical and ecological research.

Tasks:

- to determine floristic representativeness of the locality;
- to investigate the state of the age structure of the model populations of the rare species of plants in natural habitat;
- to elaborate and apply the project on preservation and renewal of the steppe plots of the RLP «Kleban-Byk»;
- to ascertain the effectiveness of reintroduction activities.

**Materials and Methods.** The research was conducted on the territory of the RLP «Kleban-Byk» (Kostyantynivskyi district of the Donetsk region in Ukraine).

Methods of research: field geobotanic (reconnaissance and itinerary, detail and itinerary and stationary), populational, ecological and morphological, introduction methods and methods of statistical processing of results [3].

To evaluate the state of *Stipa* on the territory of steppe areas of the RLP «Kleban-Byk» we conducted the following research: determining projecting cover of plants, abundance evaluation by O. Drude's scale, determining age structure of populations. Type of populations is given according to T. A. Rabotnov's classification supplemented by L. P. Rysina and T. M. Kazantseva [1]. Individuals' vitality was determined according to the stage of development of overground and underground parts of plants, and of population – by complex characteristic.

To conduct the research in the RLP «Kleban-Byk» the generally accepted method was used [9] that had been approved for some species of rare flora fraction in the Donetsk Botanical Garden of the National Academy of Sciences of Ukraine.

As the species of genus *Stipa* L. are in The Red Book of Ukraine, the research was conducted at the same areas with minimal removal of individuals from the population. The overall territory of the experimental areas made 273 m<sup>2</sup>.

It is the complex of such methods that enables to assess the state of populations of species of genus *Stipa* L. and to implement activities on renewal of steppe ecosystems of the RLP «Kleban-Byk».

**Results and discussion.** As the result of the research aiming at investigation of the list of species of *Stipa* populations, we identified 13 species of *Stipa* L. in the central area of the RLP: *Stipa capillata* L., *Stipa anomala* P. Smirn. ex Roshev, *Stipa dasyphylla* Trautv, *Stipa pennata* L., *Stipa pulcherrima* C. Koch, *Stipa disjuncta* Klokov, *Stipa borysthenica* Klokov, *Stipa ucrainica* P. Smirn., *Stipa lessingiana* Trin. et Rupt., *Stipa asperella* Klokov et Ossycznjuk, *Stipa tirsia* Steven, *Stipa maotica* Klokov et Ossycznjuk, *Stipa zaleskii* Wilensky.

Researching age spectra of the species of genus *Stipa* we determined that populations of all the species of *Stipa* are incomplete according to their age structure and are characterized by domination of generative individuals. It is also determined that age spectra of all the populations with moderate pasture maximum of individuals are generative (over 50 %) that proves accumulation of individuals in these populations, which is related to high life duration of individuals in this period of ontogenesis. Populations with moderate pasture

also lack individuals of young part of spectrum. In the reintroduced populations of species of genus *Stipa* L. individuals of the young part of spectrum prevail.

50 % of researched populations of *Stipa pennata* turned out to be normal, 90 % of populations of *Stipa capillata* are normal, as well as those of *Stipa dasyphylla*. *Stipa anomala* and *Stipa pulcherrima* have more than 47% of regressive populations, while 94 % of populations of *Stipa lessingiana* and *Stipa maetica* are normal. All the researched populations of *Stipa tirsia* had tendency to regression. We determined that regressiveness of the majority of populations of genus *Stipa* L are related to turfy soil.

Level of abundance of the majority of the species of genus *Stipa*, according to O. Drude's scale, was determined by the score cop1. Usually the role of such plants in forming an areas appearance is not really significant, but the species of genus *Stipa* can influence the look of vegetation considerably, especially during fruiting.

We have stated that in the conditions of anthropogenic pressure considerable territories contain groups that are at different stages of degradation, where the experimental species of *Stipa* are being excluded by those of little value or disappear. In the cases when anthropogenic impact causes disappearance of these species from vegetable groups, there is a necessity of their reintroduction.

The overwhelming majority of the researched species are presented by not numerous isolated populations that take small areas (compared to potentially possible). Generative reproduction plays an important role in self-support of these species populations. The majority of the populations are characterized by incompleteness of age spectra. Such populations lack separate age groups, more often pre- and post generative individuals.

Incompleteness of separate populations are related mostly to anthropogenic factors. State of separate natural populations of certain species (*S. borystenica*, *S. ucrainica*, *S. tirsia*, *S. pulcherrima*, *S. anomala*) was improved with the help of reintroduction method.

One of the conditions of choosing the place for the research work was availability of territories with thin vegetable cover at the moment of plants transplantation, which would ensure a further possibility of their seed reproduction.

In order to receive the initial material for the outlined research of the species of genus *Stipa* artificial vegetative reproduction by division and seed reproduction are defined as the most effective. We formed an experimental seed-plot of all the mentioned species of *Stipa* on the area of steppe type on the territories adjacent to the RLP. It is stated that in natural conditions it is better to propagate *Stipa* with seeds and at the 2<sup>nd</sup>-3<sup>d</sup> year of vegetation split the bush into three clonal parts and to practice reintroduction directly. In this case it is planting out individuals to places in the RLP where *Stipa* has already disappeared from phytocenosis. The four-year introduction period allows us to single out the species that are characterized by the greatest introduction success (*S. capillata*, *S. ucrainica*) and the species whose preservation requires additional activities. The principal among them is artificial correction of growing conditions for overcoming phytocenotic barriers that are mostly limiting factors for young individuals (*S. asperella*, *S. grafiana*).

By the results of active and passive monitoring of the state of populations we have made up a working scheme-project of activities as for preservation and renewal of steppe areas of the RLP. The stated stages are unified, their duration is species-specific and can be corrected. For example, for *S. dasyphylla* the period of success evaluation of these activities is no less than 3 years, and for *S. capillata* 2 years will do.

**Conclusions.** As a result of the inventory on the territory of the RLP «Kleban-Byk» 13 species of *Stipa* were identified. In the course of the research it was stated that the age state of the populations is not satisfactory and demands reintroduction measures. In cases when anthropogenic impact leads to disappearance of these species from the complex of vegetable groups, there is need of their reintroduction, its successfulness having been proved for *S. dasyphylla* and *S. capillata*.

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