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RESEARCH PAPER

On the ecology of lawn communities in the cities of the Republic of Bashkortostan, Russia

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ABSTRACT

This article provides information on the ecology of lawn communities in the cities of the Urals of the Republic of Bashkortostan (Ufa, Sterlitamak, Salavat, Ishimbay, Meleuz, Birsk, Neftekamsk, Yanaul). On the basis of 195 relevés, the ecological regimes of lawn communities and their species were determined using the ecological scales of Landolt. DCA ordination of the relevés confirmed their floristic differentiation into 4 associations, 2 subassociations, and 5 facies assigned to the alliance *Cynosurion cristati* of the class *Molinio–Arrhenatheretea*. The main contribution to the differentiation of communities is made by the thermoclimatic factor, soil moisture and nutrient regimes. The ranges of values of environmental factors of the lawn communities are determined. When conditions deteriorate, there is a succession of lawn communities from subass. *typicum* of the ass. *Leontodono–Poetum pratensis* via the subass. *cichorietosum intybi* of the same association to the ass. *Poo pratensis–Plantaginetum majoris*. At the same time, species diversity first increases due to the invasion of synanthropic species, and then decreases. Lawns considered to belong to synanthropized vegetation when the number of synanthropic species reaches 56–63 %. Along with traditional herbal mixtures with *Poa pratensis*, herbal mixtures with *Festuca rubra* and *Lolium perenne* are recommended, the combination of which better corresponds to a fairly wide range of environmental conditions of the Urals. Regular maintenance, watering and mowing are also necessary, which extend the life of the lawns.

Keywords: Republic of Bashkortostan, cities, lawns communities, ecological scales, successional processes

РЕЗЮМЕ

Голованов Я.М., Абрамова Л.М., Анищенко И.Е., Жигунов О.Ю. К экологии сообществ газонов городов Республики Башкортостан. В статье приводятся сведения по экологии сообществ газонов в городах Предуралья Республики Башкортостан (Уфа, Стерлитамак, Салават, Ишимбай, Мелеуз, Бирск, Нефтекамск, Янаул). На основе 195 геоботанических описаний по оптимумным экологическим шкалам Ландольта определяли экологические режимы газонных сообществ и их видов. DCA ординация описаний подтвердила флористическую дифференциацию 4 ассоциаций, 2 субассоциаций и 5 фаций, отнесенных к союзу *Cynosurion cristati* класса *Molinio–Arrhenatheretea*. Основной вклад в дифференциацию сообществ вносят термоклиматический фактор, увлажнение и богатство почвы элементами минерального питания. Определены диапазоны значений экологических факторов сообществ газонов. При ухудшении условий происходит сукцессионная смена сообществ газонов от субасс. *typicum* асс. *Leontodono–Poetum pratensis* через субасс. *cichorietosum intybi* той же ассоциации к асс. *Poo pratensis–Plantaginetum majoris*. При этом флористическое разнообразие сначала возрастает за счет внедрения синантропных видов, а затем снижается. По уровню синантропизации газоны относятся к синантропизированной растительности с участием синантропных видов 56–63 %. Наряду с традиционными травосмесями с *Poa pratensis*, рекомендуются травосмеси с *Festuca rubra* и *Lolium perenne*, сочетание которых лучше соответствует достаточно широкому диапазону экологических условий Предуралья. Необходим также регулярный уход, полив и скашивание, которые продлевают срок жизни газонов.

Ключевые слова: Республика Башкортостан, города, сообщества газонов, экологические шкалы, сукцессионные процессы

Lawns are a significant element of landscaping objects, the basis of spatial architectural and planning organization of all types of urban landscapes (Grechushkina-Sukhorukova 2019a). The functionality of lawns, and, above all, their ecological role in urban ecosystems, depends on their condition and territorial location (Larionov et al. 2018). Lawns, as the ecological framework of urban areas, play an important role in the ecosystems of cities: they are designed to ensure the stability and optimization of the human habitat, contribute to increasing its sanitary and hygienic comfort. Lawns improve the microclimate, increase air humidity and stabilize the temperature in the lowest stratum of the atmosphere; increase the production of oxygen and phytoncides; absorb and neutralize man-made pollution; prevent water and wind erosion (Laptev 1983, Glebova et al. 2000, Grechushkina-Sukhorukova 2019b).

Ecological studies of lawns and their constituent grass mixtures in the Russian Federation and abroad are not numerous. They focus mainly on the flora and vegetation of lawn communities (Thompson et al. 2004, Stavretović & Jovanović 2005, Anishchenko 2005, Pal et al. 2013, Ishbirdina et al. 2019, Anishchenko et al. 2019, 2020, Novaković et al. 2020), the stability of lawn grass mixtures and their composition (Dübbern de Souza et al. 2020, Wolski et al. 2020), the impact of various environmental and anthropogenic factors (light, irrigation, trampling, soil conditions, etc.) on the durability of lawn carpets, as well as various issues of management and the role of lawns in urban ecosystems (Laptev 1983, Tyuldyukov et al. 2002, Petrova 2007, Anishchenko et al. 2011, Vizirskaya et al. 2013, Lukinykh 2013, Gladkov et al. 2016, Chollet et al. 2018, Watson et al. 2019, Foti et al. 2020, Parra et al. 2020, Unruh et al. 2020). The experience of lawn science accumulated shows that the problem of creating lawn grass stands can be successfully solved only on the basis of a deep knowledge of the bioecological features of the species used in the creation of lawns in specific ecological and geographical conditions of urban ecosystems. In a number of studies on predicting the success of growing, optimizing the range of lawn grasses, the study of the impact on their growth and development of the environmental conditions of specific places of their cultivation becomes particularly relevant. In urban conditions, lawn carpets experience various distructive impacts due to direct mechanical damage by vehicles, during construction work and during systematic trampling, as well as toxic effects of industrial and transport emissions and the use of deicing mixtures and salts. (Grechushkina-Sukhorukova 2010).

In the southern steppe and forest-steppe regions of the Russian Federation, which also includes the Republic of Bashkortostan (RB), periodic droughts are an additional stress, which, in the conditions of natural low moisture supply, in the absence of irrigation, lead to the suppression of the growth of lawn grasses, loss of decorative effect and even complete die-off of lawns in the case of long dry periods. In the conditions of the Southern Urals (RB), the urgency of the problem of creating highly decorative and sustainable lawns is compounded by the fact that the lawn management in settlements, the atmosphere of which is often polluted by industrial or agricultural enterprises, is often unsatisfactory (Anishchenko et al. 2011). This is especially true for slopes and roadsides, as well as in-house areas that are subject to increased anthropogenic load. The aim of this study is to assess the ecological regimes and patterns of ecological differentiation of lawn communities, as well as the main types of grasses that form them, in the conditions of urban ecosystems of the Pre-Urals of the Republic of Bashkortostan.

MATERIAL AND METHODS

The study is based on 195 relevés of lawn vegetation made in the cities of the Urals of the Republic of Bashkortostan (Ufa, Sterlitamak, Salavat, Ishimbay, Meleuz, Birsk, Neftekamsk, and Yanaul). Some of the relevés were previously published in open sources (Golovanov et al. 2017, Anishchenko et al. 2019), dissertations (Golovanov 2011), as well as in the database of anthropogenic vegetation of the Urals and adjacent territories (http://www.givd.info/ID/00-RU-008). The syntaxonomic scheme of lawn vegetation was provided by Anishchenko et al. (2019). The classification was carried out by the Brown-Blanquet approach (Braun-Blanquet 1964, Westhoff & Maarel 1978). The synoptic table was constructed with an aid of JUICE software (Tichý 2002).

The ecological regimes of the communities were determined using weighted averages based on the Landolt's optimal ecological scales (Landolt 1977) using the IBIS software (Zverev 2007). The weighted average values are calculated on the following scales: moisture content (F), acidity (R), richness of the soil with elements of mineral nutrition (N), humus content (H), mechanical composition and structure of the soil (D), illumination (L), thermoclimatic scale (T), continentality (K).

To identify the patterns of ecological differentiation of lawn communities and their main types, the DCA-ordination was used (CANOCO 4.5 software package, Ter Braak & Šmilauer 2002). The ranges of environmental factors were calculated in the PAST 2.17 package and visualized using the boxplot tool (Hammer et al. 2001).

The names of the species are given in accordance with the data of the electronic resource Euro+Med Plant Base (2021). The levels of synanthropization and adventization were calculated according to the methods used previously by Abramova et al. (2000), Abramova (2002), Golovanov & Abramova (2016).

RESULTS

To date, the prodromus of lawn vegetation in the cities of the Republic of Bashkortostan as a whole includes 4 associations assigned to the alliance *Cynosurion cristati* Tx. 1947 of the class *Molinio–Arrhenatheretea* Tx. 1937 (Anishchenko et al. 2019).

The most common syntaxon of vegetation of lawns of the RB in all cities of the Pre-Urals is acc. *Poo pratensis–Plantaginetum majoris* Ishbirdin et al. 1988. The association includes mesophytic and nitrophytic communities of trampled habitats, old-growth lawns near residential buildings. The wide spread of such communities is associated with poor lawn care, especially in small towns of the republic. This fact also contributes to a fairly wide occurrence of the ass. *Inulo britannici–Trifolietum repentis* Solomeshch in Ishbirdin et al. 1988. Many ruderal plant species are represented in these two associations. The subass. *Leontodono–Poetum pratensis typicum* Anishchenko et Ishbirdina in Ishbirdina et al. 1989 ex Anishchenko et al. 2019 combines the youngest and well-groomed lawns, the subass. *Leontodono–Poetum pratensis cichorietosum intybi* Anishchenko et Ishbirdina in Ishbirdina et al. 1989 ex Anishchenko et al. 2019 – transitional communities to the ruderalized lawns of the previous two associations. Facies represent lawns dominated by different lawn grasses (grass mixtures). The ass. *Lolietum perennis* Gams 1927, new to the RB, appeared as a result of the use of the European species *Lolium perenne* in grass mixtures, which has successfully naturalized on the lawns of large cities of the RB. The largest phytocoenotic diversity of lawn vegetation occurs in

the capital of the RB the Ufa City, where the entire spectrum of the lown communities is represented.

Ordination analysis (Fig. 1) confirmed the floral differentiation of syntaxa. The communities of the ass. *Poo pratensis–Plantaginetum majoris* are located at the bottom of the diagram. They combine the old-growth, disturbed urban lawns, with moist (F = 2.5–3.0), nitrogen-rich (N = 3.2–4.0) soils. In the left part of the diagram, communities of the ass. *Lolietum perennis* are concentrated. Lawns with a predominance of ryegrass are found in drier (F = 2.2–2.9) illuminated (L = 3.4–4.1) habitats with nitrogen-poorer soils. Another characteristic feature of these communities is their high values of the thermoclimatic scale (T =3.3–3.9). The common cloud in the center of the diagram was formed by communities of the ass. *Leontodono–Poetum pratensis* and *Inulo britannici–Trifolietum repentis*, which combines species rich lawns growing in fairly close ecological habitats. Slightly more shady habitats are occupied by lawns with a predominance of *Festuca rubra*.

Table 1 shows the values of the correlation coefficient of the calculated values of the ecological-coenotic status of communities with scores of 2 axes of DCA-ordination. The analysis of the values of the correlation coefficient of various environmental factors along the first axis (the abscissa axis) showed the following patterns. High values of the correlation coefficient (r > 0.4) were noted for the thermoclimatic scale and humidity. These two factors are divergent. On the second axis, a high correlation is observed for the thermoclimatic scale, moisture content, mechanical composition and structure of the soil, and the richness of the soil with elements of mineral nutrition. The highest values are noted for the latter two factors, both have a different direction in the ordination diagram.

The results of the DCA ordination of lawn communities are well complemented by the ordination of species (Fig. 2), the diagram shows species with a weight of more than 3 %. The species widely distributed in disturbed nitrogen-rich habitats (*Capsella bursa-pastoris*, *Polygonum aviculare*, *Plantago major*) are found at the bottom of the graph. They all differentiate the ass. *Poo pratensis–Plantaginetum majoris*. The species more demanding on moisture of the substrate (*Trifolium repens*, *Inula britannica*, *Leontodon autumnalis*, *Plantago major*, *Poa pratensis*) are in the right part of the diagram. In the left part of the diagram, the synanthropic species characteristic of drier habitats (*Artemisia absinthium*, *Carduus acanthoides*, *Cichorium inthybus*, *Lactuca seriolla*, *Tripleurospermum inodorum*), as well as the thermophilic European grass *Lolium perenne*, are concentrated. In the upper right part of the diagram, some

Table 1. Values of correlation coefficient (r) of calculated values of ecological factors of lawn communities of the Republic of Bashkortostan with axes of DCA-ordination

Ecological factor	Axis 1	Axis 2
Moisture (F)	**0.054**	**-0.435**
Acidity (R)	-0.109	0.336
Humus content (H)	0.355	-0.313
Soil structure (D)	0.325	**-0.486**
Illumination (L)	-0.313	-0.238
Thermoclimatics (T)	**-0.436**	**0.561**
Continentality (K)	0.344	0.177
Soil nutrients (N)	-0.136	**-0.657**

Values of factors above 0.4 are bolded

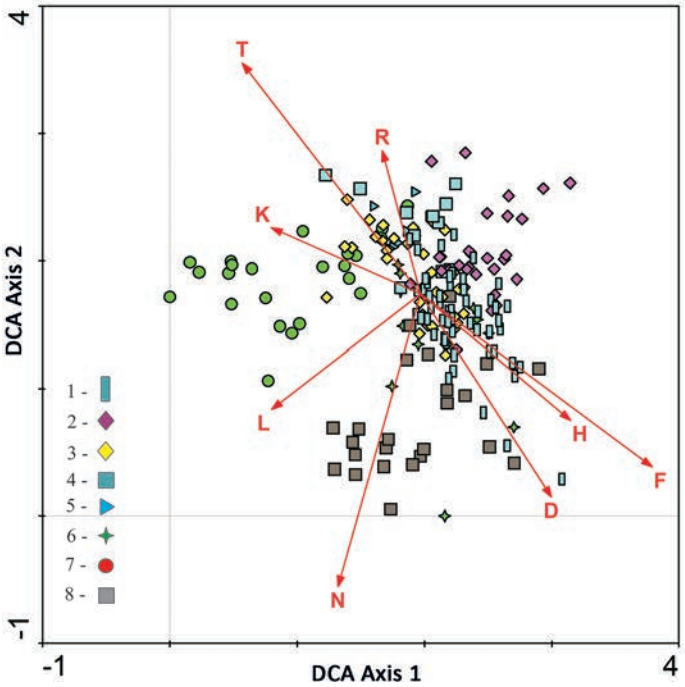

Figure 1 DCA-ordination of lawn communities of cities of the Republic of Bashkortostan. The syntaxa numbers in figure. 1 – subass. *Leontodono–Poetum pratensis typicum*, facies *typica*; 2 – subass. *Leontodono–Poetum pratensis typicum*, facies *Festuca rubra*, 3 – subass. *Leontodono–Poetum pratensis cichorietosum intybi*, facies *typica*; 4 – subass. *Leontodono–Poetum pratensis cichorietosum intybi*, facies *Festuca rubra*, 5 – subass. *Leontodono–Poetum pratensis cichorietosum intybi*, facies *Festuca pratensis*, 6 – ass. *Inulo britannici–Trifolietum repentis*, 7 – ass. *Lolietum perennis*, 8 — ass. *Poo pratensis–Plantaginetum majoris*.
Eigenvalues: Axis 1: 0.300; Axis 2: 0.273

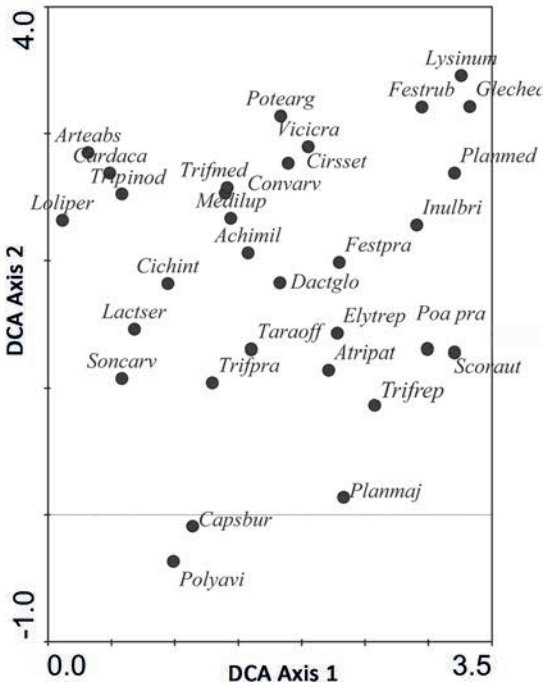

Figure 2 DCA-ordination of species of lawn communities the Republic of Bashkortostan (species with a weight of more than 3 % are shown). First four characters abreviate the genus name and 3 following character – species name

shade-tolerant meadow and fringe species (*Glechoma hederacea*, *Festuca rubra*, *Lysimachia nummularia*) are found. The middle part is occupied by a combination of meadow and synanthropic plant species, including grasses of the lawn grass mixtures: *Dactylus glomerata*, *Festuca pratensis*.

Figure 3, along with the ordination diagram, enables us to estimate the ecological amplitude of various communities of lawns in the RB. Below, we consider environmental factors only with a high correlation with the ordination axes. It was revealed that the communities of the ass. *Lolietum perennis* (F = 2.3–2.8) have the widest amplitude in terms of soil moisture regime. The communities of the subass. *Leontodono–Poetum pratensis cichorietosum intybi*, facies typica having the largest moisture amplitude between the lowest–highest values. Moreover, for the above-mentioned facies, differences within the interquartile range are not significant.

For the thermoclimatic scale, the communities of the ass. *Inulo britannici–Trifolietum repentis* (F = 3.2–3.5) and the ass. *Lolietum perennis* (F = 3.4–3.7) have the widest amplitude, and according to the lowest–highest values – communities of the subass. *Leontodono–Poetum pratensis typicum*, facia *typica*. The narrowest amplitude is found in the coenoses of the subass. *Leontodono-Poetum pratensis cichorietosum intybi*, facies *Festuca rubra* and *Festuca pratensis*.

Analysis of the factor of mechanical composition and structure of the soil showed that the most widespread coenoses of the subass. *Leontodono–Poetum pratensis cichorietosum intybi*, facia *typica* (D = 3.75-4.2) are found on various substrates (transitional from gravel or sandy soils to fine sand) and according to the lowest–highest values – coenoses of the subass. *Leontodono–Poetum pratensis typicum*, facia *typica*.

For the factor of the richness of the soil with elements of mineral nutrition, the largest ecological range is shown for a number of syntaxa: the ass. *Poo pratensis–Plantaginetum majoris* (N = 3.5–3.9), *Inulo britannici–Trifolietum repentis* (N = 3.3–3.7). These are usually old-growth and heavily disturbed lawns. According to the lowest–highest values – cenoses of the subass. *Leontodono–Poetum pratensis typicum*, facia *typica*, however, within the interquartile range, the differences are not obvious.

DISCUSSION

The vegetation of the lawns of the Republic of Bashkortostan has a relatively large syntaxonomic diversity. The beta diversity of lawn vegetation is comparable to such territories as Krasnodar (4 associations, 1 variant) (Postarnak 2019), Kiev (9 associations, 2 subassociations, 2 variants) (Chokha 2007).

The main association of both seeded and rolled lawns in the RB is *Leontodono–Poetum pratensis*. The subassociations included in both above-mentioned association reflect the disturbance regime of lawns by trampling. These lawns are characterized by a large number of synanthropic species

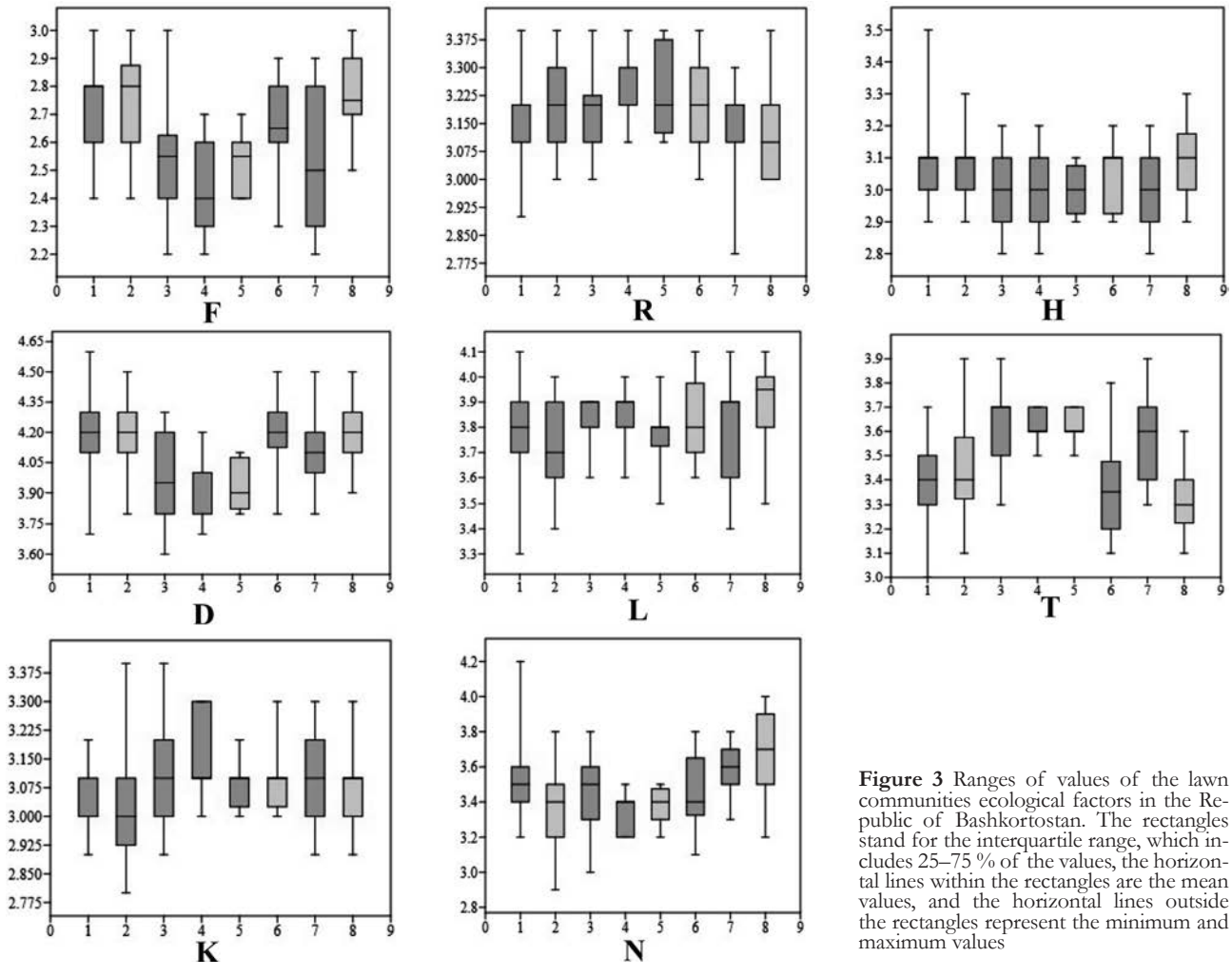

Figure 3 Ranges of values of the lawn communities ecological factors in the Republic of Bashkortostan. The rectangles stand for the interquartile range, which includes 25–75 % of the values, the horizontal lines within the rectangles are the mean values, and the horizontal lines outside the rectangles represent the minimum and maximum values

in the subass. *Leontodono–Poetum pratensis cichorietosum intybi* and smaller in subass. *Leontodono–Poetum pratensis typicum*. The facies reflect the dominance of certain grasses in lawn grass mixtures (Anishchenko et al. 2019). In the ordination diagram, the relevés belonging to this association occupied a central area and formed an almost homogeneous cloud. They are indicated primarily by *Dactylus glomerata*, *Festuca pratensis*, *Poa pratensis* from commercial grass mixtures, as well as by species characteristic of secondary meadows of the class *Molinio-Arrhenatheretea*: *Achillea millefolium*, *Inula britannica*, *Leontodon autumnalis*, *Taraxacum officinale*. They differ from the general pool of relevés of seeded lawns dominated by *Festuca rubra*, which are characterized by the presence of shade-tolerant species: *Glechoma hederacea* and *Lysimachia nummularia*. The ecological amplitude of the association's communities is narrow, therefore they can be stable only in conditions of proper care (watering, mowing, etc.) of lawns.

When conditions deteriorate, a succession of lawn communities occurs (Table 2). The most complete succession processes can be considered in relation to the most widespread and widely represented in all the cities studied the ass. *Leontodono–Poetum pratensis*. With the increase of anthropogenic impact, as well as in the absence of the necessary care, the communities of the typic subassociation move to the subass. *Leontodono–Poetum pratensis chorietosum intybi*. At the same time, weed species that are widely distributed in the surrounding disturbed habitats appear in the communities: *Artemisia absinthium*, *Carduus acanthoides*, *Cichorium intybus*, *Cirsium arvense*, *Convolvulus arvensis*, *Lactuca serriola*, *Vicia cracca*, etc. Due to the introduction of such plant species into the communities, the indicators of the richness of the subass. *Leontodono–Poetum pratensis chorietosum intybi* slightly increase. The occurrence and abundance of lawn grasses remain generally stable, with the exception of *Lolium perenne* and *Dactylis glomerata*. Even more severe degradation of communities, accompanied by constant disturbances of vegetation and soil cover, leads to the transformation of the subass. *Leontodono–Poetum pratensis chorietosum intybi* into the ass. *Poo pratensis–Plantaginetum majoris*. At the same time, there is a depletion of the species composition; lawn grasses reduce their abundance and constancy, with the exception of the more stable species *Poa pratensis*. The constancy of many tall and medium-sized weed species is also reduced. At the same time, the presence of species adapted to constant trampling (*Capsella bursa-pastoris*, *Plantago major*, *Poa annua*, *Polygonum aviculare*) is increasing. Strong anthropogenic impact leads to a decrease in the quality of lawns and worsens their appearance. The communities of the ass. *Poo pratensis–Plantaginetum majoris* occupy nitrophilic, sufficiently moist habitats and are characterized by a complete or almost complete absence of agrotechnical measures necessary for the proper maintenance of urban lawns.

According to the level of synanthropization, lawns can be attributed to synanthropized vegetation with a fairly high participation of synanthropic species (56–63 %). Indicators of synanthropization and adventization naturally increase in the direction of the ass. *Poo pratensis–Plantaginetum majoris*. As the anthropogenic load increases, the invasions into the communities also increases. In most disturbed communities of subass. *Leontodono–Poetum pratensis chorietosum intybi* and the ass. *Poo pratensis–Plantaginetum majoris*, we recorded such strong transformers as *Acer negundo* and *Hordeum jubatum*.

The communities of the ass. *Lolietum perennis* have a wide range of moisture. They are not widely spread yet in the cities of the Pre-Urals of the RB, but at the same time they have a significant potential in urban landscaping. They are indicated by both the thermophilic Western European grass *Lolium perrene*, which is a part of many modern lawn grass mixtures, and thermophilic synanthropic plant species: *Artemisia absinthium*, *Carduus acanthoides*, *Cichorium inthybus*, *Lactuca seriolla*, *Tripleurospermum inodorum*. The wide amplitude of the association for the thermoclimatic scale is noted that makes it possible to cultivate this type of

Table 2. Shortened synoptic table of the lawn vegetation syntaxa reflecting their successional changes

Syntaxon number	**1**	**2**	**3**
Number of relevés	**83**	**45**	**24**
Average number of species	**12**	**18**	**11**
Index of synanthropization of cenoflora, %	**56**	**58**	**63**
Index of adventization of cenoflora, %	**20**	**19**	**27**
Cereals included in grass mixtures			
Poa pratensis	V^{+-5}	V^{+-5}	V^{1-4}
Festuca rubra	IV	IV	I
Lolium perenne	III	II	I
Dactylis glomerata	III	II	II
Festuca pratensis	I	I	II
Diagnostic species of the Cl. *Molinio-Arrhenatheretea*			
Taraxacum officinale	V^{r-5}	V^{r-3}	V^{+-2}
Trifolium repens	IV	IV	III
Achillea millefolium	III	III	I
Medicago lupulina	III	II	II
Vicia cracca	I	III	I
Scorzoneroides autumnalis	II	I	II
Plantago media	II	I	I
Trifolium pratense	I	I	II
Matricaria discoidea	I	.	II
Lotus corniculatus	I	II	.
Carum carvi	.	.	II
Diagnostic species of the Cl. *Trifolio-Geranietea sanguinei*			
Trifolium medium	I	II	I
Diagnostic species of the Cl. *Sisymbrietea*			
Convolvulus arvensis	III	IV	II
Cirsium arvense s.l.	I	IV	I
Lactuca serriola	I	III	II
Tripleurospermum inodorum	I	III	I
Capsella bursa-pastoris	I	I	III
Atriplex patula	I	II	I
Sonchus arvensis	I	II	I
S. oleraceus	I	.	II
Echinochloa crus-galli	I	II	.
Diagnostic species of the Cl. *Artemisietea vulgaris*			
Cichorium intybus	II	IV	III
Elytrigia repens	II	II	II
Carduus acanthoides	I	IV	I
Artemisia absinthium	I	III	I
Potentilla argentea	I	II	I
Pastinaca sativa	I	II	.
Berteroa incana	I	II	.
Diagnostic species of the Cl. *Polygono-Poetea annuae*			
Plantago major	IV	II	V^{+-4}
Polygonum aviculare	II	II	V^{r-3}
Poa annua	I	.	III
Diagnostic species of the Cl. *Epilobietea angustifolii*			
Glechoma hederacea	II	I	I

Syntaxa number. 1 – subass. *Leontodono–Poetum pratensis typicum*, 2 – subass. *Leontodono–Poetum pratensis cichorietosum intybi*, 3 – ass. *Poo pratensis–Plantaginetum majoris*. Abundance parameters are indicated for species with constancy V.

lawns in various vegetation zones of the republic. Similar communities were noted both in the north-west of the RB (Neftekamsk), and in the center (Ufa) and in the southern part of the republic (Salavat). For the ass. *Lolietum perennis*, it is not yet possible to assess the succession changes, since the cultivation of this type of lawns began only in recent years. Probably, with increased anthropogenic impact and without proper care, they will also form highly disturbed communities with a large phytocenotic role of species of the class *Polygono–Poetea annuae*.

A less common lawn association is *Inulo britannici-Trifolietum repentis*. Such communities are formed in conditions of a somewhat weaker trampling if compare with the ass. *Poo pratensis–Plantaginetum majoris*. Their anthropogenic succession is characterized by an increase in the abundance of the long-rooted perennial polycarpic *Trifolium repens*. This association also combines quite old, degraded lawns.

CONCLUSION

Creating lawns with high ecological and aesthetic functions is a complex task, which is solved by selecting the components of the lawn grass mixture that correspond to a complex of environmental (natural and anthropogenic) factors. Types and varieties of lawn grasses should also have a high intensity of shoot formation, high competitiveness in the phytocenosis, uniform distribution of shoots on the soil surface, high seed germination energy and the ability to quickly form a dense herb layer. It is necessary to select such types of grasses that most fully correspond to the complex of environmental conditions, and therefore require minimal energy costs in the form of irrigation, fertilizers, others to maintain lawns. The use of complex phytocoenological methods for studying lawn communities allows us to assess the ecological amplitude and the main environmental factors affecting the formation of certain lawn variants in urban conditions. In relation to the territory of the Pre-Urals of the Republic of Bashkortostan, it is promising, along with traditional grass mixtures with a predominance of *Poa pratensis* and *Festuca pratensis*, to use grass mixtures with the participation of *Festuca rubra* and *Lolium perenne*, the combination of which better corresponds to a fairly wide range of environmental conditions observed in urban ecosystems formed on, for example, shady habitats, compacted, nitrophilic or very dry soils.

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