

URBAN FLORA OF THE AKTAU AND ITS BIOINDICATION ROLE

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Abstract. We have done the analysis of ecological districts outlined by the complex of technogenic and other ecological factors. By the results of urban flora species structure, its bioindicative role by species structure. Appropriateness of direct depending of urban flora species structure on pollution degree was revealed. Species structure of strongly polluted first district is three times less than species structure of sixth clean district. As pollution increases so urban flora, species structure decreases. Dependence of species structure abundance on the pollution degree indicates on its bioindicative role, that confirmed by flora analysis and statistic data.

Keywords: urban flora, bioindicative role, ecological factors

INTRODUCTION

The global human population has increased approximately ten-fold in the last century. Urban areas currently occupy ca. 4% of the total earth surface, which considerably increases the importance of conserving biological communities in urban ecosystems. Green urban areas have significant potential to aid biodiversity conservation, provide diverse advantages to human populations, contribute to the environmental quality of cities, and act as refuges for rich plant communities. The pace of urbanization in the modern world is increasing rapidly, which is one of the most important factors in the transformation of the natural environment [1].

Anthropogenic influence leads to the transformation of all components of the landscape and the formation of specific ecosystems characterized by low indicators of biodiversity and biological productivity. Plants are an integral part of ecosystems, so the study of urban flora and their formation features is one of the most relevant areas of modern Floristics [1]. Although studies of diversity patterns based on composition and natural occurrence are quite useful, functional diversity has been shown to be a promising approach for understanding ecological issues in anthropogenic habitats. The characteristics of a species, rather than its identity, will determine its contribution to ecosystem functioning [2]. The quantification and understanding of plant community characteristics and functions will allow more appropriate conservation and management decisions. Some researchers have investigated plant ecological attributes in urban ecosystems [3].

Materials on the current state of urban flora and the forecast of its possible changes are necessary for a comprehensive study of the nature of the region, assessment of the environmental situation and organization of monitoring in the study area, as well as optimization of the urban environment [4]. The study of urban flora is also very important for understanding modern florogenesis, since cities are the main centers of concentration of new adventitious plants capable of naturalization. However, the flora of many large and small cities in Kazakhstan has not been studied enough [5].

The flora of Aktau city, located in the South-West of Kazakhstan, the regional center of Mangystau region, is the object of research. Mangystau region occupies a vast territory in the South-West of Kazakhstan, between the Caspian and Aral seas. The territory is characterized by a significant dry climate with high heat supply. In geological and morphological terms, the region is an elevated arid-denudational plain on limestone with the participation of elevated plains (along the outskirts of the Karatau ridge). An important latitudinal climate boundary is the border between the Northern and southern deserts.

Under the influence of urbanization processes in cities, the ecosystem is radically changing [6]. The components of ecosystems are also changing soil, water, air, flora, fauna, etc. In General, the ecological balance characteristic of the natural zone where a particular city is located is disturbed. Therefore, the study of urban flora, as one of the important components of an urbanized ecosystem, is a subject of environmental science and remains an unexplored problem in Kazakhstan to date [7]. If we consider that Kazakhstan is an arid country in most of its territory, the study of urban flora becomes particularly relevant

The purpose of this work is a comprehensive analysis of Aktau urban flora and determination of its bioindicative role.

To achieve this goal the following tasks were set:

- To conduct taxonomic analysis of urbanology.
- General analysis of urban flora.
- Give a characteristic of introduced plants.

METHODS OF RESEARCH

The object of research is higher plants on the territory of Aktau. In the course of the work, the trends of changes in the species composition and environmental characteristics of urban flora depending on the degree of anthropogenic pressure - technogenic pollution in different regions of Aktau were determined.

Field research was carried out using the route method. The method of A. K. Skvortsov was used to collect the herbarium [8]. A comparative morphological geographical method was used to determine taxa. "Flora of the USSR" (1933-1954), " Flora of Kazakhstan "(1956-1966)," Plant Identifier of Central Asia "(1968-1993)," Illustrated plant identifier of Kazakhstan "(1969-1972)," Vascular plants of the USSR", "State plant Cadastre of South Kazakhstan region" . Book one. "Summary of species of higher vascular plants", State Cadaster of plants of South Kazakhstan region. Red book. Wild rare and endangered plant species».

When classifying the urban flora of Aktau, the system of A. Engler was used [9-10].

Based on the works of E. P. Korovin, R. V. Kamelin, N. H. Karmysheva, M. S. Baitenov and I. O. Baitulin, the floral composition and classification of plants were carried out.

The species composition of isolated plants and the influence of anthropogenic factors on urban flora was studied using the Sukachev method [11-12]. This information was used to compare and determine the species composition and degree of contamination of areas.

In the course of research route and field work, herbarium materials collected by the authors were used, as well as herbarium materials of the Mangyshlak experimental Botanical garden

Results of the study

In the urban environment, the species composition of introduced and acclimatised plants is of great importance. In this regard, we conducted an inventory of introduced species and identified their promising species.

Based on the materials of a detailed survey of the green devices of city and localities in the Mangystau region developed assortment of the most perspective taxa the composition of collection plantings, effective use of the collection fund of the MEBG in garden and park construction was assessed.

During the 45-year period of introduction research, the Botanical garden has created a unique collection of plant gene pool for arid conditions in Kazakhstan, including 1270 taxa from 250 genera from 88 families, including: - coniferous-53 taxa; - deciduous-309; – climbing – 60; - fruit and berry-127; – natural flora – 95 taxa;–flower and decorative – 487; – roses – 146 varieties. The assortment that is promising for the implementation of green construction and phytomelioration includes 382 of the most decorative and biologically stable taxa, including 281 tree-shrub and 101 flower introducers.

Total of 98 species, varieties and forms of ornamental plants were identified in the surveyed green devices, including 11 – coniferous, 59 – non – district – deciduous, 1 – climbing, 7 – varietal roses and 15-flower-decorative (Table 4).

The most common in single, linear and group plantings among coniferous introducers are Eastern biota (*Platycladus orientalis* (L.) Franco) – 11.6% of the total and juniper virginiana (*Juniperus virginiana* L.) – 7.7%; among deciduous trees - dwarf elm (*Ulmus pumila* L.) - 28.1% and tree of heaven (*Ailanthus altissima* (Mill.) 16.9 per cent, among the deciduous shrubs – the Thunberg barberry (*Berberis thunbergii* DC.)- 2.3% and common privet (*Ligustrum vulgare* L.) - 1.1%. The latter species is also noticeably dominant in green hedges, gaining together with the dwarf elm more than 80% of their quantitative composition (53.7 and 29.5%, respectively).

Table 4 - Evaluation of the effective use of the MEBG collection fund in landscape gardening.

Section, section, morphological and systematic group	Part of the collection of gene pool of MEBG	Composition of the perspective assortment	Implemented in the practice of green construction	in percentage	
				from the gene pool	from the recommended range
CONIFEROUS WOODY PLANTS:					
- trees	34	12	9	26,5	75,0
- shrubs	11	4	2	18,2	50,0
TOTAL:	45	16	11	24,4	68,8
DECIDUOUS PLANT (DENDROIDAL):					
- trees	127	74	32	25,2	43,2
- shrubs	194	130	27	13,9	20,8
TOTAL:	321	204	59	18,4	28,9
Including green fences:	28	12	5	17,9	41,7
CLIMBING WOODY PLANTS (WOOD LIANAS)					
Lianas	48	23	1	2,1	4,3
TOTAL:	48	23	1	2,1	4,3
ROSARIUM					
Varietal roses	134	38	7	5,2	18,4
TOTAL:	134	38	7	5,2	18,4
FLOWER AND ORNAMENTAL PLANTS					
- annual plant	117	51	10	8,5	19,6
- perennial plant	114	44	3	2,6	6,8
- biennial plant	15	2	0	0,0	0,0
- tuberous	27	4	2	7,4	50,0
TOTAL:	273	101	15	5,5	14,9
LAWN PLANTS					
Variety mixes			5		
TOTAL:			5		
IN TOTAL:	821	382	98	11,3	24,3

According to table 4, the overall degree of implementation of the collection gene pool of the Botanical garden in the practice of green construction in Aktau is only 11.3%. This indicator is not objective enough to confirm the success of the MEBG's introduction activities, since the number of taxa actually used in landscaping should be compared with the range of recommended ones as the most tolerant to the harsh conditions of the desert zone. In this case, the use of

decorative plants in green construction increases to 24.3, more than twice. The highest percentage of implementation is observed for coniferous plants (68.8), deciduous trees (43.2) and deciduous shrubs used for creating green fences (41.7).

It is necessary to activate the implementation of the assortment of wood lianas (4.3%), varietal roses (18.4%) and flower and ornamental plants (14.9%) in the coming years. It is also necessary to resume work on the introduction testing of various varieties of lawn grass mixtures.

According to the degree of anthropogenic pressure, the territory of Aktau is heterogeneous. Based on the results of accounting for the species composition of urbanflora according to the classical method of V. N. Sukachev, the bioindicative role of its species composition was revealed. There was some regularity in direct proportion to the species composition of urbanology of the degree of contamination. As pollution increases, the species composition of the city's flora decreases. The dependence of the richness of the species composition of urbanflora on the degree of pollution indicates its high bioindicative role, which is confirmed by the analysis of the flora

CONCLUSIONS

Analyzed systematic, ecological, biological structure of urban flora. It was found that the share of representatives of anthropophytes (introduced, cultivated plants, weed-ruderal species) – 11.6 %. The species composition of urban flora is 10-15% poorer than the regional natural one. An inventory of introduced species was carried out, and their promising species were identified. The direct dependence of the species composition of urban flora on the degree of environmental pollution was revealed. Marked high bioindicative role of flora of urban.

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АҚТАУ УРБАНОФЛОРАСЫ ЖӘНЕ ОНЫҢ БИОИНДИКАЦИЯЛЫҚ РӨЛІ

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Аңдатпа. Техногендік және басқа да экологиялық факторлар кешені бойынша экологиялық аудандарға талдау жүргізілді. Урбанофлораның түрлік құрамын есепке алу нәтижелері бойынша оның түрлік құрамы бойынша биоиндикациялық рөл анықталды. Урбанофлораның түрлік құрамының ластану дәрежесіне тікелей тәуелділік заңдылықтары анықталды. Ластанудың ұлғаюына қарай урбанофлораның түр құрамы азаяды. Урбанофлораның түрлік құрамы байлығының ластану дәрежесіне тәуелділігі оның жоғары биоиндикациялық рөлін көрсетеді, бұл флора анализімен және статистикалық деректермен расталады.

Түйінді сөздер: урбанофлора, биоиндикациялық рөл, экологиялық факторлар

УРБАНОФЛОРА АҚТАУ И ЕЕ БИОИНДИКАЦИОННАЯ РОЛЬ

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Аннотация. Проведен анализ экологических районов по комплексу техногенных и др. экологических факторов. По результатам учета видового состава урбанофлоры выявлена биоиндикационная роль по ее видовому составу. Установлена закономерность прямой зависимости видового состава урбанофлоры от степени загрязнения. По мере увеличения загрязнения уменьшается видовой состав урбанофлоры. Зависимость богатства видового состава урбанофлоры от степени загрязнения указывает на ее высокую биоиндикационную роль, что подтверждено анализом флоры и статистическими данными.

Ключевые слова: урбанофлора, биоиндикационная роль, экологические факторы.