

Potential for using ornamental bushes for greening the city of Novosibirsk: in case of the genus *Syringa* L.

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Abstract. Species composition, quantity participation and spreading of ornamental bushes in current system of Novosibirsk green areas are determined. Upper zone (“Verkhnyaya zona”) of Academgorodok is not taken into research as far as it is a cultural heritage site and a significant site of landscape architecture of the 20th century. Special attention is given to participation of lilac species and cultivars (*Syringa vulgaris* L., *Syringa amurensis* Rupr., *Syringa josikaea* J. Jacq. ex Rchb.). It is pointed out that 62 species of bushes are used in the city, including 3 species of lilac, however their quantity participation is not enough and does not satisfy regulatory limits. Twenty six cultivars from the collection *Syringa vulgaris* L. of the Central Siberian Botanical Garden SB RAS are recommended additionally. Three cultivars, ‘Nadezhda’, ‘Pamyat’ o S. M. Kirove’ and ‘Olimpiada Kolesnikova’, successfully tested in urban environment are highly recommended. Besides, it is recommended to use wider *Syringa amurensis* Rupr., and to introduce late-flowering Preston hybrids (*Syringa* × *prestoniae* Mc. Kelvey (*S. reflexa* × *S. villosa*)), currently absent in green urban areas, in urban greening in Siberia.

1 Introduction

The city of Novosibirsk is the third biggest city in the Russian Federation and it can be described as one of the most provided with greenery [1]. The most part of the greened territory is located along river net of the city as well as in the outskirts where natural ecosystems (city forests) are being kept in big forest areas called “green wedge”. According to Novosibirsk city General plan’s update of 2020 only 6% of all territories of recreation zone (the land area is 14 747 hectare or 29.3% of the whole city area) are landscaped and planted areas (boulevards, miniparks and parks), located in historical central part of the city. Plantation there is quite old (planted more than 50 years ago) and most of them are close park forests forming closed landscapes (e.g. Central Recreation and Leisure Park, Pervomayskiy minipark etc.). Consequently, current configuration of urban greenery does not give big enough territories and suitable terms to use ornamental bushes. Open

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landscapes shortage leads to absence of park-scaled landscape compositions of ornamental bushes and disbalance of recommended life-forms in green space.

Determining species composition, quantity participation and spreading of ornamental bushes in current system of Novosibirsk green areas will support development of necessary recommendations on using this life-form for urban greening.

2 Materials and methods

Thirty two most popular green areas in Novosibirsk, i.e. the entire city’s main parks and mini parks were investigated by the authors in the period from 2015 to 2019. Reserve territories of vegetation and city forests used by citizens as recreation areas are not taken into consideration. Results of inventory of urban greenery are presented in the Concept of city’s green areas development “Green Novosibirsk” [2]. Species composition and ornamental bushes participation in landscape compositions forming were discovered in the process of inventory.

3 Results and discussion

According to results of urban greenery inventory 62 species of ornamental bushes are used in 32 investigated green areas. It is necessary to notice that recommended correlation of trees and bushes in green public areas for our soil-climate zone is 1:7, and density of planting is 1850 items for 1 hectare [3]. Now correlation of trees and bushes is not more than 1:2. This leads to impoverishment of landscape composition space structure and contravention of “garden diversity” principle. Calculated rate of number of lilac bushes necessary for the city reserve green areas can be about 500 000 items. The city has necessity of using released, low-maintenance, frost-resistant and gas-resistant species and cultivars.

Currently all recorded species of ornamental bushes can be divided into four groups according to their occurrence in green urban areas: rare (occur in 17-1% of green areas), occurring (30-17%), ordinary (50-30%) and permanently found (more than 50%). Species of lilac used in the city are spreading in these groups as follows. The most dispersed species is *Syringa josikaea* J. Jacq. ex Rchb. It occurs on the half of investigated areas and is second to only indigenous species *Sorbus aucuparia* L. and *Crataegus sanguinea* Pall. Common lilac occurs in 30% of green areas along with *Rosa majalis* Herrm. и *Physocarpus opulifolius* (L.) Maxim., *Syringa amurensis* Rupr. occurs only in 2 green areas. It is as rare as *Rhododendron dahuricum* L., *Corylus heterophylla* Fisch. ex Bess. (Table 1)

Table 1. Spreading of lilac species in the groups of bushes occurrence in city green areas

Group of ornamental bushes occurrence (occurrence, %)	Quantity of species of native flora	Quantity of species of cultivated flora	Presence of lilac species
Rare (17-1%)	5	21	<i>Syringa amurensis</i> Rupr.
Occurring (30-17%)	4	18	Species of genus <i>Syringa</i> are absent
Ordinary (50-30%)	4	11	<i>Syringa vulgaris</i> L.
Permanently found (more than 50%)	2	1	<i>Syringa josikaea</i> J. Jacq. ex Rchb.

Therefore, *Syringa josikaea* and *Syringa vulgaris* can be relegated to basic assortment in the process of greening Novosibirsk while *Syringa amurensis* is a part of limited use assortment.

Common lilac is an ordinary ornamental bush for the city and is found in one third of investigated public spaces, in the following landscape compositions: landscape groups of many different species, line plantings of many different species (boulevards), alleys (very rarely), 3-5 instance landscape groups of one species, single planting.

Considering specific features of green areas the cultivars of compact and dime-size and decorative forms are in high demand. Nowadays Novosibirsk for-profit nursery gardens offer 24 cultivars of common lilac, but it is important to make a point that planting material is brought mostly from European Russia. It is necessary to use lilac cultivars which are resistant to Novosibirsk climate.

The Central Siberian Botanical Garden SB RAS, its laboratory of dendrology has been working with common lilac cultivars since 1986 to create the collection and then to select the most promising cultivars for severely continental climate of forest-steppe zone of West Siberia. One hundred twenty six cultivars of foreign and domestic selection have been tested for the period of working with *Syringa vulgaris*. Currently the collection of *Syringa vulgaris* has 26 cultivars recommended for greening Siberian cities [4]. These cultivars are defined by remarkable winter hardness and can be recommended for using widely in greening the cities in colder climate zones of Russia, as well as in Northern Europe and Northern America. Experience in using CSBC cultivars in Northern Europe is available. Within collaborative project of the Central Siberian Botanical Garden SB RAS and Natural Resources Institute Finland (Luke) 10 cultivars of lilac (*Syringa vulgaris*) from the collection of CSBG laboratory of dendrology were brought in Helsinki (Finland) in 2012 with a purpose of studying their winter hardness. The lilac bushes of Russian selection were successfully introduced, and they are being monitored [5].

In 2003 within scientific experiment the staff members of the Central Siberian Botanical Garden Elena M. Lyakh and Ludmila N. Chindyaeva planted 17 bushes in the minipark near the Memorial of Military Honor. Three most resistant cultivars of common lilac from the collection of CSBG SB RAS ‘Nadezhda’, ‘Pamyat’ o S.M. Kirove’ and ‘Olimpiada Kolesnikova’ [6] by celebrated Russian plant breeder L.A. Kolesnikov are found in three landscape groups (Fig. 1a, b, c).



Fig.1. a ‘Nadezhda’, b ‘Pamyat’ o S. M. Kirove’, c ‘Olimpiada Kolesnikova’

The annual monitoring of these cultivars has confirmed their resistance to urban conditions. They are recommended for use in forming of plantation for public spaces being designed and constructed.

To improve contact availability of lilac for Novosibirsk dwellers it is necessary to make new spaces using up to date landscape compositions, such as lilac single parks – siringariums, lilac alleys and lilac hedges. There is a significant amount of interest in creating bush compositions of prolonged flowering (“fruticetum”). They are bush landscape groups which can be made with not only cultivars of common lilac, but with late-

flowering lilac species (*Syringa josikaea* J. Jacq. ex Rehb., *Syringa amurensis* Rupr., *Syringa* × *prestoniae* Mc. Kelvey (*S. reflexa* × *S. villosa*)), and with the other beautifully flowering bushes as well. It must be noted that *Syringa amurensis* and Preston hybrids are hardly used in green plantations despite their remarkable freeze resistance. Expanding the number of ornamental bushes will enrich garden diversity of green areas in Novosibirsk and prolong flowering period for more than 1 month.

4 Conclusions

Species composition and quantity participation of ornamental bushes, specifically common lilac in urban plantation of Novosibirsk have been analyzed. Plantation of common lilac cultivars introduced in CSBG SB RAS has been recommended. In purpose of creating optimal space structure and esthetically attractive scene of public green spaces the authors have recommended to broaden the assortment of lilacs with late-flowering ornamental species and hybrids (*Syringa amurensis* Rupr., *Syringa* × *prestoniae* Mc. Kelvey (*S. reflexa* × *S. villosa*)), resistant to climate characteristics of Novosibirsk.

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