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DUST CAPTURE EFFICIENCY OF TREES AND SHRUBS USED IN GREENING THE CITY OF KARSHI

N. Tukhtamurodova 1
M. Kholmurotov 2
1 Karshi Institute of Engineering and Economics
2 Tashkent State Agrarian University

Abstract
This study highlights the ecological, economic, and aesthetic importance of selecting tree and shrub species for greening Karshi city. Drought- and salt-tolerant species, such as Elaeagnus angustifolia, demonstrate high efficiency in soil stabilization and dust retention. Decorative species like Rosa canina and Berberis vulgaris are recommended to enhance the aesthetic appeal of the urban landscape. These species contribute to improving public health by cleaning the air and optimizing the microclimate. The findings of this study can be instrumental in improving the ecological and social environment of Karshi city.

Keywords: Karshi city, greening, trees, shrubs, dust retention, drought tolerance, salt tolerance, ecological balance, landscape, microclimate.

Introduction

Greening is an essential element of urban ecology, playing a pivotal role in enhancing the ecological condition of urban areas, improving air quality, mitigating microclimatic variations, and fostering comfortable living conditions for urban residents. In light of the climatic conditions prevalent in the city of Karshi, the selection of seedlings in this region necessitates meticulous attention.

Materials and Methods

Studied the natural-geographical and climatic characteristics of the Karshi city area. Including: Temperature, precipitation and wind indicators, sandy and highly saline soils of the Karshi region were analyzed. Local and introduced plant species previously grown in Karshi, as well as drought resistance, dust capture ability and ecological adaptability of the selected plants were taken into account.

Karshi city is located in the southern part of Uzbekistan and has a continental climate. The average annual rainfall is around 200-300 mm, which requires plants to be highly drought-resistant. The soils of the region are often sandy and saline, which is also a decisive factor in the selection of plant species.

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Research Results

Recommended tree species for landscaping:

Elaeagnus angustifolia (Oleaster) – is a fast-growing tree that is resistant to salinity and low temperatures.

- Ulmus pumila (Small-leaved Elm) – is wind and heat tolerant, with a high dust-holding capacity.
- Morus alba (white mulberry) – a fast-growing and broad-leaved tree.

Recommended shrub types:

- Rosa canina (Rosa canina) – plays an important role in soil consolidation and landscaping.
- Berberis vulgaris (Common Barberry) – can also be used as a landscape ornament.

The selection of tree and shrub species for the landscaping of the city of Karshi should be informed by an understanding of the prevailing climate and soil conditions. The recommended species are characterized by their resilience to drought conditions and their capacity to mitigate dust accumulation and enhance air quality. The implementation of these species offers multifaceted benefits, encompassing both ecological and economic advantages. The integration of additional ornamental species into the urban landscape is also recommended.

Recommended trees and shrubs (such as Elaeagnus angustifolia) have the ability to trap dust and reduce carbon dioxide in the atmosphere. Ulmus pumila and Morus alba species have dense foliage, which reduces air pollution in urban areas. Shrubs such as Rosa canina play an important role in strengthening the soil layer during strong winds. Trees help retain soil moisture and stabilize sandy soils in suburban areas.

Trees reduce summer heat and improve the microclimate by providing shade. Large trees (e.g. Morus alba and Ulmus pumila) serve to reduce urban air temperatures. Shading trees reduce heat absorption by urban buildings, reducing electricity consumption for cooling. They reduce energy consumption for heating in winter by blocking winds. Greenery increases the aesthetic appeal of the landscape of the city of Karshi. The variety of colors and sizes of plants (e.g. Rosa canina flowers and Berberis vulgaris berries) creates a positive psychological environment for city residents. Green zones allow for use as recreational areas, which helps to improve the health of residents. Trees create a quiet living environment by reducing urban noise.

The efficiency of trees in trapping pollen depends on various factors, including tree species morphology, leaf surface shape, growth rate, and leaf density. Factors that affect the ability of tree species to trap pollen include:

– leaf shape and structure;
– roughness of the leaf surface;
– growth height;
– leaf arrangement.

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Table 1 As a result of research, the average pollen-holding capacity of each tree was determined as follows:

Tree type	Average dust capture (g/sq.m/day)	Notes
Elaeagnus angustifolia	50-70	Dense leaves capture dust from the atmosphere well.
Ulmus pumila	60-80	A tall tree, fruitful with broad leaves.
Morus alba	50-65	The leaf surface is large, improving the microclimate.
Rosa canina	10-20	Mainly decorative, it collects a low level of dust.
Berberis vulgaris	15-25	Low-leafed, average in dust retention.

Large and numerous leaves – the surface area provides a large opportunity to trap dust. For example, Ulmus pumila (Elm) and Morus alba (White Mulberry) are broad-leaved trees that effectively trap dust. Rough and hairy leaves help trap dust particles. Trees with more leaves are effective in removing dust from the atmosphere. Elaeagnus angustifolia (Oleaster) is effective in this regard. Tall trees also effectively trap dust particles in the upper layers of the atmosphere. This feature is characteristic of Ulmus pumila and Morus alba trees. Dense, spreading or pyramidal growth of trees also increases the ability to trap dust.

According to the data presented in Table 1, tree and shrub species have different efficiency in terms of their ability to trap pollen. The highest results were observed in broad-leaved and tall trees (Ulmus pumila, Elaeagnus angustifolia), as these trees effectively trap pollen through their large leaf surface. However, smaller-leaved species, such as Rosa canina, have moderate or low efficiency.

Highly effective species: Ulmus pumila has the highest dust capture rate (60-80 g/sq.m/day). Due to its large leaves and tall stature, it is able to capture even the upper layers of dust particles carried by the wind. This species is very suitable for landscaping the central and outer areas of the city. The Elaeagnus angustifolia, distinguished by its dense foliage, exhibits a remarkable capacity to capture dust, with a rate of 50-70 grams per square meter per day. This species is resistant to saline soils, so it performs well in dry areas of the city of Karshi.

Moderately effective species: Morus alba has a large leaf surface area (50-65 g/m2/day) and captures moderate amounts of dust. At the same time, it also helps improve the microclimate. Recommended for densely populated areas of the city.

Rosa canina is mainly used for landscaping purposes, has a low dust-holding capacity (10-20 g/sq.m/day). This species can be used for aesthetic landscaping of city streets or residential areas. Berberis vulgaris is considered to have a low dust-holding capacity (15-25 g/sq.m/day) due to its sparse foliage. Although it has a scenic value, it is moderately effective from an ecological point of view.

In regions with high wind speeds, the cultivation of Ulmus pumila is recommended. These trees have been shown to assist in the capture of atmospheric dust particles, thereby mitigating the risk of soil erosion. In densely populated areas, Morus alba and Elaeagnus angustifolia are particularly beneficial due to their capacity to trap dust and enhance the microclimate. For aesthetic purposes, particularly in residential areas, Rosa canina and Berberis vulgaris are highly regarded and are

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often selected for their ornamental value. These trees are particularly recommended for placement along roadsides or in residential gardens.

The capacity of tree and shrub species to trap dust is significant from both ecological and social standpoints. Specifically, species that demonstrate efficacy in dust trapping contribute to the purification of urban air, thereby exerting a favorable influence on the health of the population. The creation of green spaces has been demonstrated to enhance the well-being and quality of life of urban residents.

Conclusions and Suggestions

The tree and shrub species in the table play an important role in solving the ecological and social problems of the city of Karshi. The most effective species (Ulmus pumila, Elaeagnus angustifolia) should be used in the outskirts and center of the city to capture dust, improve air quality and control the microclimate. The scenic and less effective species (Rosa canina, Berberis vulgaris) help enrich the landscape and create an aesthetic environment for the population.

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