URBAN GREEN INFRASTRUCTURE OF MAJOR CITIES IN AZERBAIJAN: SPECIES DIVERSITY AND MYCOBIOTA

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Abstract

Urban green spaces play a critical role in maintaining ecological stability and improving the quality of life in rapidly developing cities. This study explores the composition of woody plants used for urban landscaping in major Azerbaijani cities and examines the fungal communities associated with them. The findings highlight the diversity of urban vegetation and reveal the presence of fungi that can affect plant health and aesthetic value. Understanding these interactions provides essential insights for designing effective management and protection strategies, supporting the resilience, sustainability, and ecological functionality of urban green infrastructure.

Keywords: urban green spaces; woody plants; mycobiota; fungal pathogens; urban ecology;

Introduction.

The current rates of urbanization and projected growth have made improving the ecological conditions in cities one of the most critical tasks of modern times. Urban environments are often characterized by highly deformed natural processes and habitats, resulting from numerous negative anthropogenic factors that directly impact the quality of life for the population. Stabilizing and optimizing these urban environments is only possible by maintaining the high-level vital activity of plants, which serve as an organic part of the city both within and beyond built-up areas [1, 5, 7, 8, 9].

Green spaces act as a vital ecological framework, providing a buffer that optimizes the state of the environment in urbanized territories. The primary functions of urban landscaping include:

• Sanitary and hygienic benefits: Trees and shrubs clean the air by filtering dust, harmful gases, and industrial waste.

• Microclimate regulation: Greenery increases humidity, creates shade to cool the environment on hot days, and reduces noise pollution from transport and industry.

• Architectural value: Landscaping serves as a fundamental element of the artistic and architectural design of cities and towns [12, 13, 14, 15, 16, 17].

Effective urban greening requires a meticulous approach to selecting plant species. It is essential to consider their longevity, bio-ecological characteristics, and decorative features, as well as their resistance to local climatic conditions.

Furthermore, the choice of plants must account for their resistance to fungal diseases. Pathogenic fungi can significantly reduce the lifespan, vitality, and aesthetic value of trees, and in some cases, lead to their complete destruction. Consequently, it is necessary to possess comprehensive data on the eco-physiological state of woody plants to evaluate their functional contribution to improving environmental quality.

Recent studies emphasize that an integrated analysis of plant biometric parameters and their adaptive responses provides a reliable basis for assessing the stability of both natural and urbanized ecosystems. In this context, the primary goal of this work is to clarify the species composition of woody plants used for greening major cities in Azerbaijan - including Baku, Sumgait, Ganja, and to identify the various fungi inhabiting these plants. This research aims to provide the necessary data to enhance the sustainability and functional efficiency of urban green spaces across the republic.

Materials and Methods.

The study was conducted in major urban centers of Azerbaijan, including Baku, Sumgait, and Ganja, which differ in climatic conditions, degree of urbanization, and anthropogenic load. Sampling sites were selected within parks, roadside plantings, residential green zones, and public recreational areas, representing the main types of urban green infrastructure.

The species composition of woody plants used in urban greening was determined through route-based field surveys conducted in major cities of Azerbaijan (Baku, Sumgait, and Ganja) during the growing season. Plant species were identified in situ based on morphological characteristics, with verification using regional floristic and dendrological guides. To assess mycobiota, samples of leaves, shoots, and bark exhibiting disease symptoms were collected from selected plant species. Fungal isolation was carried out under laboratory conditions using standard culture methods on nutrient media. Identification of fungi was based on morphological and cultural characteristics of colonies and reproductive structures using specialized mycological keys. The resulting data were used to compile species lists of woody plants and associated fungal taxa [2, 3, 4, 10, 18, 20, 22, 23].

Fluctuating asymmetry was calculated based on bilateral leaf traits to serve as an indicator of environmental stress and developmental stability [2, 6, 11].

Results and discussion.

The survey of urban green spaces in major Azerbaijani cities, including Baku, Ganja, and Sumgait, revealed that over 100 species of trees and shrubs are currently used for landscaping. Among the most frequently planted species are *Sophora japonica* L., *Nerium oleander* L., *Platanus orientalis* L., *Tilia caucasica* Rupr., *Robinia pseudoacacia* L., *Quercus castaneifolia* C.A. Mey, *Quercus ilex* L. *Ficus carica* L., *Fraxinus excelsior* L., *Forsythia europaea* Deg., *Pinus eldarica* Medw., *Pinus silvestris* L., *Salix australior* Anderss., *Olea europaea* L., *Populus pyramidalis* Roz., *Populus niqra* L., *Populus tremula* L., *Morus alba* L., *Morus niqra* L., *Castenea sativa* Mill., *Syringa vulqaris* L., *Ligustrina vulgare* L. and others, while several species, such as *Lagerstremia indica* L., *Acer platanoides* L., *Laurocerasus officinalis* Roem., *Hippophae rhamnoides* L., *Spirea arquta* Zol., *Chaenomeles japonica* Lindl., *Rosa multiflora* Thunb., *Amorpha fruticosa* L., *Forsythia europaea* Deg., *Ligustrina sinense* Lour. and others occur more rarely. These species vary in their phenology, including both evergreen and deciduous types, and some possess medicinal or ornamental value. The distribution of species also differs among cities, reflecting local preferences, climatic conditions, and urban planning priorities

Micological analysis of these plants identified 163 fungal taxa associated with the surveyed species. The majority of fungi were anamorphic, while xylotrophic macromycetes accounted for 12.5% of the total mycobiota. Many of the detected fungi, including species from the genera *Alternaria, Fusarium, Botrytis, Fomes, and Septoria,* are known phytopathogens causing leaf spots, wilting, and various rots, which can reduce both aesthetic value and biological vitality of urban trees and shrubs. Additionally, several fungi were found to be opportunistically pathogenic, toxigenic, or allergenic, posing potential risks not only to plants but also to humans and urban wildlife.

These findings indicate that urban vegetation in Azerbaijani cities is highly diverse yet subject to substantial biotic stress, primarily from fungal pathogens. Understanding the composition of both plant species and their associated mycobiota provides a foundation for designing targeted protection and management strategies aimed at enhancing the sustainability, resilience, and ecological functionality of urban green spaces. Such measures are crucial for maintaining plant health, aesthetic quality, and the overall environmental stability of rapidly urbanizing areas.

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