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BIOECOLOGICAL CHARACTERISTICS OF RED MAPLE (ACER RUBRUM) IN UZBEKISTAN AND ITS PROSPECTS FOR USE IN GREENING

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Abstract: This article examines the biological and ecological characteristics of the Red Maple (Acer rubrum) and its adaptability to the soil and climatic conditions of Uzbekistan. The morphological structure, reproduction, distribution, and ecological significance of the tree are analyzed. The prospects of utilizing Red Maple in greening urban and rural areas, its role in moderating urban climates, its aesthetic and ecological importance, as well as its requirements for soil, moisture, and light are explored. The advantages and potential challenges of introducing this species in Uzbekistan are also discussed.

Keywords: Red Maple (Acer rubrum), greening, bioecological characteristics, climate, adaptation, soil, water resources, salinity, "Green Space" nationwide project, Maple family, landscape, ecosystem, pollination, nectar.

Introduction Green spaces play a vital role in improving living conditions in cities, providing recreational opportunities, enhancing sanitary-hygienic conditions, and fostering a healthier microclimate. With the accelerating pace of urbanization, greening and landscaping urban environments, as well as creating natural landscapes around cities, have become urgent tasks. Enriching the assortment of ornamental trees and shrubs, utilizing aesthetically appealing plants, and planning greening efforts based on the needs of the population are key considerations in this process. In Uzbekistan, within the framework of large-scale reforms, improving the quality of human life and the ecological situation is a priority. Based on the decrees of the President of the Republic of Uzbekistan dated October 30, 2019, on the "Concept of Environmental Protection of the Republic of Uzbekistan until 2030" and December 30, 2021, on "Measures to Accelerate Greening Activities and Enhance Effective Tree Protection in the Republic," the nationwide "Green Space" project is being implemented. The project aims to plant 200 million trees and shrubs annually, increasing green areas in cities from 8% to 30%. This contributes to reducing environmental stress, improving air quality, and enriching biodiversity. The Red Maple (Acer rubrum), with its decorative qualities, adaptability, and ecological benefits, holds significant potential for greening initiatives. Native to North America, its introduction and utilization in Uzbekistan's conditions are among the pressing issues. This article analyzes the bioecological characteristics of Red Maple and discusses its prospects for use in greening Uzbekistan's cities.

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Biological and Ecological Characteristics of Red Maple The Red Maple (Acer rubrum) belongs to the Maple family (Aceraceae) and is a medium to large deciduous tree, typically reaching heights of 12–20 meters, though it can grow up to 30 meters under favorable conditions. Its native range spans the eastern and central regions of North America, where it thrives in wet forests, swamps, riverbanks, and dry mountainous areas. The bark is smooth and gray in youth, becoming rougher and developing cracks with age. Its leaves are oppositely arranged, with three to five lobes, light green in spring and summer, and turning red, orange, or yellow in autumn. In spring, it produces red flowers, followed by double-winged seeds (samaras) that are dispersed by wind. Red Maple is a dioecious plant, with some trees bearing only male or female flowers. Pollination occurs primarily via wind, and seeds germinate quickly when they fall on moist soil in spring. The tree's root system is not deep but spreads widely, aiding in soil stabilization. It grows in acidic (pH 4.5–7.5), neutral, and slightly alkaline soils, though its growth may be limited in areas with high salinity. While the tree prefers full sunlight, it can also develop in partial shade and is moderately drought-tolerant.The growth rate of Red Maple is relatively high, with annual growth reaching up to 60 cm under favorable conditions. Its flowers provide nectar for bees and other pollinators, while its seeds serve as food for birds and small mammals. Fallen leaves enrich the soil with organic matter, supporting microorganism development. The tree is also efficient in absorbing CO_2, improving urban air quality and filtering pollutants.

Adaptability of Red Maple to Uzbekistan's Conditions Uzbekistan's climate is sharply continental, with summer temperatures exceeding 40°C and cold winters. While Red Maple is moderately cold-tolerant, adapting to Uzbekistan's scorching summers and arid conditions requires additional measures. The tree prefers moist, well-drained soils, making it suitable for planting in areas with established irrigation systems, such as urban parks, streets, and recreational zones. The diverse soil types in Uzbekistan (sandy, saline, clayey) impact its growth differently. While it thrives in slightly acidic and sandy loam soils, high salinity in desert regions can pose challenges. In cities like Tashkent and Samarkand, concrete and asphalt surfaces absorb heat, exacerbating urban heat islands. Red Maple, with its broad canopy, helps lower temperatures and enhances the aesthetic appeal of urban landscapes. Its vibrant autumn foliage adds unique color diversity to the local flora. However, due to water scarcity, regular irrigation is essential, particularly in the early years of growth. Drip irrigation or the use of treated wastewater can provide effective solutions.

The Role of Red-leaved Maple in Greening Red Maple offers several advantages for greening in Uzbekistan. First, its decorative qualities—especially its autumn foliage in shades of red, yellow, and orange—add aesthetic appeal to urban and rural landscapes. Second, its wide canopy helps mitigate urban heat islands. Third, it efficiently absorbs atmospheric carbon dioxide (CO_2), reducing air pollution and contributing to ecological balance. The tree also plays a key role in preventing soil erosion, enhancing biodiversity, and managing rainwater. Its flowers serve as a nectar source for pollinators, while its seeds provide food for birds and animals. When planted in urban parks, streets, and recreational areas, it not only enhances visual appeal but also improves the microclimate. Within the framework of the "Green Space" project, introducing Red Maple can expand green areas and improve the quality of life for urban residents. However, successful introduction of this species to Uzbekistan requires consideration of several factors. For instance, pre-treating saline soils, establishing irrigation systems, and using growth stimulants to adapt to extreme climate conditions are necessary. Additionally, careful site selection for planting is

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crucial to prevent its shallow root system from damaging sidewalks and pathways. The Red Maple (Acer rubrum), with its bioecological characteristics, aesthetic appeal, and adaptability, is a promising species for greening urban and rural areas in Uzbekistan. Its fast growth, air quality improvement, climate moderation, and support for biodiversity make it a valuable plant for the "Green Space" project. However, Uzbekistan's arid climate, water scarcity, and saline soils may hinder its growth. Addressing these challenges requires developing irrigation systems, improving soil quality, and carefully managing integration with local ecosystems. With proper care and planning, Red Maple can enrich Uzbekistan's urban landscapes and contribute significantly to ecological sustainability. Its introduction not only brings aesthetic charm but also serves as an effective tool in combating climate change and enhancing the quality of life for the population.

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