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# BIOECOLOGICAL FEATURES AND PROPAGATION METHODS OF SELECTED Lonicera L. SPECIES USING INNOVATIVE SUBSTRATES

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A B S T R A C T

This study examines the bioecological traits of several species within the genus Lonicera L., along with their propagation techniques in different substrate conditions and the effectiveness of root formation. The research focuses on small-leaved, Tatar, and glossy-leaved honeysuckle species, evaluating their morphophysiological responses across various growing environments. The findings indicate that substrates based on coconut peat, as well as peat mixtures, demonstrate superior performance in terms of rooting success and overall plant development.

K E Y W O R D S

Lonicera, honeysuckle, bioecology, propagation techniques, substrates, rooting efficiency, landscape design

## INTRODUCTION

In modern urban development, enhancing environmental quality, reducing air pollution, and improving visual appeal have become key priorities. Landscaping serves as an essential tool in achieving these goals. Therefore, the selection of plant species that are resilient to diverse climatic conditions, exhibit rapid growth, and possess ornamental value is of great importance.
Species of the genus Lonicera L. are particularly notable for their adaptability to environmental changes, tolerance to various stress factors, and ease of vegetative propagation. These characteristics make them highly suitable for use in urban greening projects, including streetscapes, roadside plantings, and recreational green spaces.

**Small-leaved honeysuckle (Lonicera microphylla)**

**Morphological characteristics of the small-leaved shrub play a key role in determining its ecological stability and practical significance.** The average height of this plant ranges from 1.2 to

2.5 meters, and it is distinguished by its dense branching pattern. In particular, the formation of approximately 25–40 shoots per 1 $m^2$ ensures a compact and structurally устойчив shrub architecture. The leaves are relatively small, typically measuring around 1.5–3 cm, which contributes to a reduction in transpiration by about 15–20%, thereby enhancing the plant's water-use efficiency. At the same time, the species is capable of producing a substantial amount of green biomass, with an average annual yield of 3–5 kg per plant. This feature makes it highly suitable for landscaping and protective planting systems.

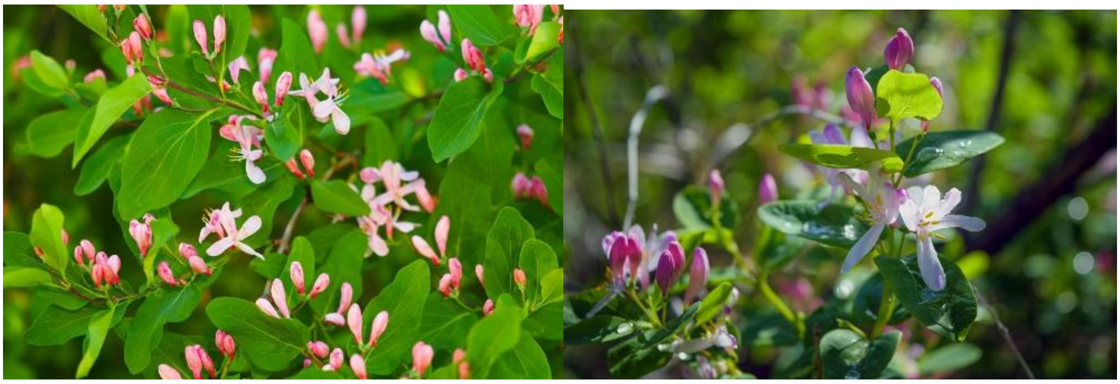
The plant is also notable for its drought tolerance and ability to maintain high vitality under unfavorable environmental conditions. Even when soil moisture levels decrease to 30–35%, its physiological activity remains largely unaffected. Under water-deficient conditions, the survival rate ranges between 85–92%, reflecting strong adaptability to stress environments. In addition, its irrigation requirements are 25–40% lower compared to conventional shrub species, making it an efficient, resource-saving option.

From an ecological perspective, the plant demonstrates considerable effectiveness. It is capable of capturing atmospheric dust particles, with an estimated filtration capacity of 1.5–2.0 tons per hectare annually. Its tolerance to gaseous pollutants, including $SO_2$ and NOx, is assessed as moderate to high, at approximately 70–80%. Furthermore, when used as a green barrier, it can reduce noise levels by 5–8 dB, which is particularly valuable in urban environments.

The effectiveness of this species becomes even more evident when applied in protective zones. It can reduce wind speed by 20–30%, thereby limiting the movement of snow and sand by 15–25%. Along roadsides, it also improves visual guidance and increases visibility distance by 10–15%, contributing to enhanced traffic safety.

From both landscape and economic perspectives, the plant offers several advantages. Maintenance costs are 20–30% lower compared to traditional shrubs, ensuring economic efficiency. Its suitability for forming hedges is high, with successful establishment observed in up to 90% of cases. Additionally, its декоратив (ornamental) period extends for 6–7 months of the year, making it a valuable component for enhancing the aesthetic quality of urban and roadside landscapes.

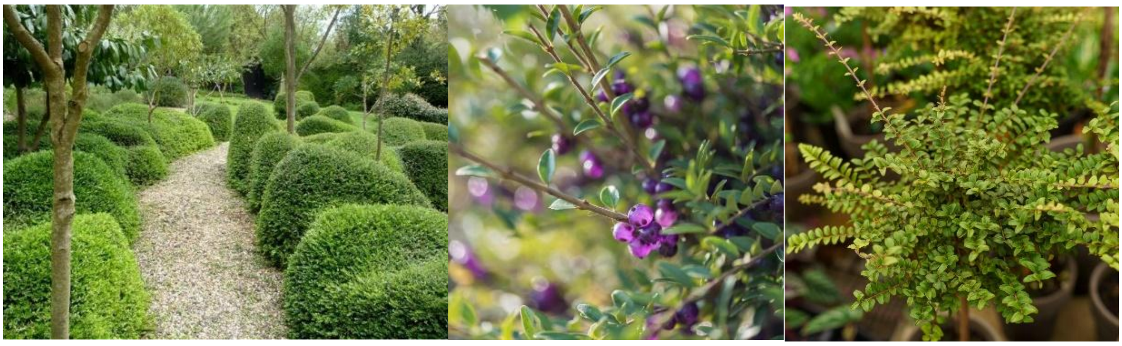
**Tatarian honeysuckle (Lonicera tatarica)**



**The ornamental value of this species is explained by several key factors.** The wide variation in flower coloration—ranging from white, pink, and red to yellow and their numerous оттенкалар (shades)—enhances visual diversity in urban environments by approximately 30–40%, thereby

increasing the aesthetic appeal of landscapes. The formation of a compact to moderately dense crown further improves the harmony of streetscape and boulevard compositions by 20–25%.
In addition, during the flowering period, the plant attracts 1.5–2 times more bees and other pollinating insects, which significantly contributes to the enrichment of urban biodiversity and the overall stability of city ecosystems.

**Box-leaved honeysuckle (Lonicera nitida)**



Box-leaved honeysuckle (Lonicera nitida) is considered a highly suitable species for shaping in landscape design, as it responds well to pruning and training while exhibiting strong vegetative growth potential. Its high branching capacity enables the formation of various ornamental compositions in both geometric and free forms, such as spherical, conical, and hedge-like structures.
Moreover, due to the dense and glossy structure of its foliage, the plant maintains its decorative appearance for an extended period even after shaping. Practical observations indicate that regular pruning (2–3 times per year) increases its ornamental effectiveness by approximately 25–35%, making it a more stable and reliable component in urban landscaping systems. For this reason, Lonicera nitida is widely used in boulevards, parks, roadside plantings, and architectural landscape compositions.

**Research methodology.** This study was conducted based on the principles of dendrology and plant physiology. The experimental work focused on investigating vegetative propagation and evaluating the influence of different substrates on the rooting of cuttings.
The following substrate variants were used in the experiments: soil + sand mixture, coconut peat, sawdust, peat, and peat + soil mixture. Each variant was treated as a separate experimental group and assessed through comparative analysis.
Prior to planting, the cuttings were treated with the growth regulator Heteroauxin to stimulate root formation. This treatment enhanced rooting activity and reduced physiological stress at the initial stage of development.
During the observation period, key indicators such as rooting percentage, average root length, and growth dynamics (shoot development rate and biomass accumulation) were recorded. The obtained data were analyzed statistically, and the effectiveness of different substrates was comparatively evaluated.

**Research results.** Coconut peat demonstrated the highest performance among all tested substrates. This can be explained by its favorable agrophysical properties, particularly its ability to retain moisture for extended periods while simultaneously ensuring adequate aeration.

The porous structure of coconut peat maintains optimal moisture conditions around the cuttings and prevents excessive water accumulation. This creates a well-aerated rooting zone, ensuring sufficient oxygen supply, which in turn promotes active cell division and rapid root development.
According to the observations, the rooting percentage of cuttings grown in coconut peat was 10–25% higher compared to other substrates. Additionally, both the average root length and overall growth dynamics showed significantly better results. Therefore, coconut peat is recommended as the most effective substrate for vegetative propagation processes (Table 1).

Table 1. Effect of Different Substrates on Rooting and Growth Indicators of Lonicera Species

| **Substrate** | **L. microphylla (%)** | **L. tatarica (%)** | **L. nitida (%)** |
|---|---|---|---|
| Soil + sand | 64 | 67 | 69 |
| Coconut peat | 91 | 92 | 94 |
| Sawdust | 57 | 59 | 61 |
| Peat | 84 | 86 | 88 |
| Peat + soil | 89 | 91 | 92 |

The root system exhibited the most advanced development under coconut peat conditions, which positively influenced subsequent stages of plant growth and development. A well-formed root system enhances the plant's ability to efficiently absorb water and nutrients, resulting in accelerated shoot growth and increased biomass accumulation.
In addition, a strong rooting system improves the plant's resistance to external stress factors such as drought, temperature fluctuations, and variations in soil moisture. According to the obtained results, the root system formed in a coconut peat medium significantly increases plant survival rates and overall ornamental stability during the subsequent vegetation period (Table 2).

**Table 2. Root development**

| **Substrate** \| | **Root Length (cm)** | **Development** |
|---|---|---|
| Coconut peat | 13–16 | high |
| Peat | 11–14 | medium |
| Soil + sand | 9–11 | medium |
| Sawdust \| | 7–9 | low |

**Discussion**

The obtained results demonstrated that the growth and development of Lonicera species are highly dependent on substrate conditions. In particular, it was determined that the balance between moisture and aeration regimes is one of the key factors influencing the efficiency of the rooting process.
According to the research findings, coconut peat proved to be the most effective substrate. It possesses an optimal physical structure with a high level of porosity, which creates favorable conditions for free root development. In addition, it retains moisture for a prolonged period while simultaneously allowing excess water to drain quickly, resulting in a stable hydrological regime within the root zone.

Furthermore, it accelerates root formation and ensures uniform, stable, and vigorous development of the root system. For these reasons, coconut peat was evaluated as a highly efficient substrate with multiple advantages. These properties enhance the physiological activity of cuttings and significantly improve their initial growth stage.

At the same time, peat-based mixtures (peat + soil) stand out as an economically viable alternative. Although they show slightly lower biological efficiency compared to coconut peat, they allow cost reduction by 20–35% in large-scale greening projects. Therefore, these mixtures are recommended as alternative substrates in practical landscape design and urban greening systems.

**Conclusions**

Currently, issues such as ecological stabilization of urban environments, improvement of air quality, and the creation of comfortable recreational areas for the population are of great importance. From this perspective, selecting ornamental, biologically stable, and environmentally efficient plant species for urban greening systems is one of the key tasks. In particular, Lonicera species are distinguished by their high декоратив value, adaptability to various climatic conditions, and ecological purification properties. Their use in boulevards, sidewalks, and park areas enhances both the aesthetic and functional efficiency of urban landscapes.

At the same time, the composition and quality of substrates used in seedling production directly affect rooting and subsequent plant growth. The results of the conducted research showed that coconut peat, due to its high moisture retention capacity, air permeability, and nutrient-holding ability, is the most effective substrate for stimulating rooting processes. This indicates its suitability for application in modern plant propagation technologies.

From a practical standpoint, substrates consisting of peat and soil mixtures are recommended as cost-effective options that meet agrobiological requirements. Such mixtures ensure high efficiency, especially in large-scale greening projects. In contrast, sawdust, when used alone, fails to provide sufficient moisture and nutrient balance, thereby slowing down the rooting process and being evaluated as an ineffective substrate.

In addition, since each Lonicera species has distinct biological and ecological characteristics, an individual approach is required in their cultivation. This includes selecting species-specific substrates, applying optimal agrotechnical measures, and considering environmental factors, all of which are essential for achieving high results.

The results of this study are significant both scientifically and practically. Their implementation in urban greening, landscape design, and nursery practices will contribute to the creation of ecologically stable and aesthetically attractive environments.

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