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SUSTAINABILITY OF INTRODUCED *Lonicera* L. SPECIES TO ABSHERON CONDITIONS

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УСТОЙЧИВОСТЬ ИНТРОДУЦИРОВАННЫХ ВИДОВ *Lonicera* L. К УСЛОВИЯМ АПШЕРОНА

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Abstract. The study provides a comprehensive analysis of the results of the introduction of 13 species of the genus *Lonicera* L. in the conditions of Absheron. Information was obtained on the developmental biology of the introduced species *Lonicera* L., vegetation features, growth of shoots were studied. The results of many studies of the relationship between winter hardiness and the duration of the growing season are given. It was found that the vegetation can be divided into 6 phenological groups according to the start and end times of the vegetation, and the plants were selected for their sustainability to adverse conditions. The analysis of the collected material shows the distribution of plants by phenogroups and their winter hardiness.

Аннотация. В работе проведен комплексный анализ результатов интродукции 13 видов рода *Lonicera* L. в условиях Апшерона. Получены сведения о биологии развития интродуцента *Lonicera* L., изучены особенности вегетации, роста побегов. Приведены результаты многих исследований зависимости зимостойкости от продолжительности вегетационного периода. Установлено, что растительность можно разделить на 6 фенологических групп по времени начала и окончания вегетации, а растения отбирали по устойчивости к неблагоприятным условиям. Анализ собранного материала показывает распределение растений по фенограммам и их зимостойкость.

Keywords: *Lonicera* L., phenology, phenogroup, winter hardiness, height growth.

Ключевые слова: *Lonicera* L., фенология, фенограмма, зимостойкость, рост в высоту.

Introduction

At present, Azerbaijan is exposed to anthropogenic factors related to the development of industry and oil and gas production. Climate change with increasing CO₂ emissions in the biosphere

is causing degradation of vegetation, as well as deteriorating the environmental situation in cities and villages. The problem of creating a favorable environment for humans is growing rapidly [1].

The introductory experience conducted at the Institute of Dendrology shows that many introduced trees and shrubs can be used for landscaping. In order to determine the decorative properties of plants, their resistance to adverse factors, their ability to be used in landscaping, it is necessary to thoroughly assess the winter hardiness, growth and development dynamics, reproductive characteristics. In the field of practice of the Institute of Dendrology, the analysis of species of the genus *Lonicera*, their inclusion in the range of woody plants in landscaping is important and allows to make recommendations for use in various fields of agriculture.

Nine species are widely used because they are very decorative during flowering and fruiting. White, pink, yellow flowers, leaves of different shades, beautiful shoots of plants in decorative landscaping attract people in landscaping. These plants are used in single and group plantings, live fences, low-lying fences, alpine hills, lianas in the design of green attics [2].

In the introduction of the *Lonicera* L., the natural distribution areas of the northern hemisphere, especially the promising species in Europe, Central and Eastern Asia, the Himalayas, East Asia, North and Central America, were used. The species studied are mainly distributed in Southeast Asia. According to the literature of many authors, they first spread in these areas [3, 5]. In the experimental fields of the Institute of Dendrology, 6 species of the genus *Lonicera* were adapted to the conditions of Absheron, which passed the introductory test.

Seeds of 7 new species were obtained from different countries on the basis of exchange; research is being carried out to propagate them with seeds and pens in Absheron conditions. In order to analyze the sustainability and degree of acclimatization of the studied *Lonicera* species in the Absheron Peninsula, observations were made on the seasonal and generative development of the species, winter hardiness and growth of shoots.

The study analyzed the start and end dates of the growing season, which was phenological observations, and divided into 6 groups according to the phases of seasonal development:

1. Quick-growing and early growing vegetation include *L. caerulea* and *L. tatarica*.
2. *L. ruprechtiana*, *L. xylosteum*, *L. prolifera*, *L. nigra* species that start and end vegetation early and in the medium term.
3. Early and late termination of vegetation: *L. caprifolium*.
4. Late-onset and early vegetation: 3 species include: *L. caucasica*, *L. maackii*, *L. chrysantha*. Species from these groups do not freeze in winter or the unitary shoots are damaged.
5. Late-growing and medium-growing vegetation: *L. maximowiczii*, *L. ledebourii*.
6. Delay vegetation: *L. vesicaria* is observed. These species start and end their vegetation late. In Absheron, severe frosts destroy the surface of the plant.

Thus, the studied species have different winter hardiness according to phenological groups. The results show that the winter hardiness of the species in the conditions of Absheron is directly proportional to the maturity of the vegetation.

Frost resistance of the studied species is one of the main factors influencing the distribution of introducers in different climatic zones, their height and development. The development dynamics of cultivated plants depends on the ability to maintain generative functions and their degree of winter hardiness.

Prospects and winter hardiness of the species belonging to the genus *Lonicera* were evaluated on the basis of the analyzed methods [6, 7] on the scale of winter hardiness with 5 points:

1 point — the plant is not winter hardy. Should be protected in winter, the umbrella freezes at the level of snow cover. It recovers badly in the spring (*L. ruprechtiana*).

2 points — less resistant to winter. 1 or 2-year-old branches and flower shoots of the plant are destroyed. In cold winters, at the level of snow cover, double and more shoots freeze, recover and sometimes bloom (*L. ledebourii*, *L. nigra*, *L. vesicaria*).

3 points — moderately resistant to winter. Unity twigs are damaged by a shoot of no more than 50–100% over time, but in the spring, they regenerate, bloom and bear fruit (*L. chrysantha*, *L. maximowiczii*, *L. prolifera*).

4 points — winter hardy. Only no more than 50% of the annual branches are damaged at the tip and a very small part of the flower shoot (*L. caucasica*, *L. maackii*, *L. xylosteum*).

5 points — the plant is highly winter-hardy. No damage was observed (*L. caerulea*, *L. caprifolium*, *L. caucasica*, *L. tatarica*) (Table 1).

Table 1

INTRODUCED TO THE GENUS *Lonicera* WINTER HARDINESS
 AND PHENOGROUPS OF SPECIES

Species	Phenogroup	Species area	Winter hardiness (2018–2021)
<i>L. caerulea</i>	TT	Europe, Siberia, Far East, East Asia	5
<i>L. caprifolium</i>	TG	Caucasus, Europe	5
<i>L. caucasica</i>	GT	Caucasus	4-5
<i>L. chrysantha</i>	GT	Far East, China, Korea	3
<i>L. ledebourii</i>	GO	North America	2
<i>L. maackii</i>	GT	South of the Far East, China, Korea, Japan	4
<i>L. maximowiczii</i>	GO	South of the Far East, China, Korea, Japan	3
<i>L. nigra</i>	TO	Europe	3
<i>L. prolifera</i>	TO	North America	3
<i>L. ruprechtiana</i>	TO	South of the Far East, China, Korea	1
<i>L. tatarica</i>	TT	Middle and lower Volga, Southern Urals, Altai	5
<i>L. vesicaria</i>	GG	Korea	2
<i>L. xylosteum</i>	TO	Europe, Siberia	4

Winter hardiness indicators of nine species were studied during 2018–2021. From November to March, the average daily temperature was 4–7 °C. Most species are characterized by good acclimatization. Winter hardiness of many species of octopuses (*L. caucasica*, *L. maackii*, *L. xylosteum*, *L. caerulea*, *L. caprifolium*, *L. tatarica*) was estimated at 4–5 points. The harsh winter conditions of 2018–2019 had a negative impact on some introduced species. The most affected species were *L. ruprechtiana*, and some perennial shoots of this species were threatened with extinction, but most of the shoots were vegetated. *L. ledebourii* and *L. vesicaria* had relatively poor flowering and fruiting due to damaged flower buds. Relative freezing of the tips of single shoots was observed in *L. caucasica*, *L. maackii*, *L. xylosteum*.

One of the indicators of the vital activity of a plant organism is its growth. The seasonal rhythm of height growth characterizes the adaptation of plants to environmental conditions [4].

The height dynamics of the shoots studied according to A. A. Molchanov and V. V. Smirnov's method. Studies have shown that the onset of growth of species of the genus *Lonicera* can vary from 45 to 53 days (Table 2). In *L. caerulea*, the growth of shoots begins early (March 7–10), and in *L. caucasica*, *L. maximowiczii*, *L. maackii*, *L. maackii* species begins late (March 24–30).

The duration of growth of shoots is directly proportional to the end of vegetation of the studied species. The annual ageing rate of crows determines their more or less good overwintering. For species that end their vegetation late, long-term growth of shoots is characteristic. Long-term

169–174-day growth of shoots in *L. vesicaria* species; at least (104–131 days) in *L. chrysantha*, *L. maackii*, *L. tatarica*, *L. xylosteum*. Observations have shown that Dogquzdons have a high ability to form shoots, and even in winter, plants introduced after some damage have the ability to recover the following year.

Table 2

GROWTH OF UNITARY SHOOTS IN NINE SPECIES

Species	The beginning of the growth of the stalks	The finishing of the growth of the stalks	The time of the growth of the stalks (days)
<i>L. caerulea</i>	07.03	10.07	124
<i>L. caprifolium</i>	12.03	15.08	153
<i>L. caucasica</i>	25.03	05.08	131
<i>L. chrysantha</i>	25.03	08.07	104
<i>L. ledebourii</i>	27.03	02.08	146
<i>L. maackii</i>	28.03	13.07	106
<i>L. maximowiczii</i>	24.03	02.08	129
<i>L. nigra</i>	13.03	20.07	128
<i>L. prolifera</i>	15.03	15.08	150
<i>L. ruprechtiana</i>	18.03	16.07	119
<i>L. tatarica</i>	12.03	06.07	115
<i>L. vesicaria</i>	19.03	10.09	173
<i>L. xylosteum</i>	26.03	20.07	105

Integrated assessment of perspective viability is formed on the following 7 indicators:

1. The rate of ageing of shoots
2. Winter hardiness
3. Maintaining Habitus
4. Ability to form shoots
5. Periodic growth
6. Generative development ability
7. Possible methods of reproduction

6 perspective groups were selected by summing the assessments for each indicator: 1 — completely perspective; 2 — perspective; 3 — relatively promising; 4 — less promising; 5 — not perspective; 6 — completely useless (Table 3).

Table 3

INTEGRATED ASSESSMENT OF PERSPECTIVE IN QUADRUPLE SPECIES

Fully promising	Promising	Relatively promising	Less promising	Not promising	Absolutely useless
<i>L. tatarica</i> ,	<i>L. xylosteum</i>	<i>L. vesicaria</i>	<i>L. ledebourii</i>	—	—
<i>L. maackii</i> ,	<i>L. caucasica</i>	<i>L. prolifera</i>	<i>L. ruprechtiana</i>	—	—
<i>L. caprifolium</i>	<i>L. caerulea</i>			—	—
<i>L. maximowiczii</i>	<i>L. nigra</i>			—	—
<i>L. chrysantha</i>				—	—

Most of the species studied (*L. tatarica*, *L. caprifolium*, *L. maximowiczii*, *L. chrysantha*) belong to the first promising group. The growth rate of all *Lonicera* species of this group is the

same as in nature, it is very resistant to winter, and the shoots are completely woody, have the good seedling ability, give annual growth, are characterized by full seed yield and are reproduced by local reproduction seeds.

Representatives of the second group differ in the degree of woodiness of the shoots, the speed and duration of growth of the shoots, their ability to generate growth and winter hardiness. The second group includes 4 species: *L. caerulea*, *L. xylosteum*, *L. caucasica*, *L. nigra*. These species are very resistant to the conditions of the Absheron Peninsula. The homeland of these plants is mainly the Atlantic region, Europe, the Mediterranean coast, Central Asia. Their winter hardiness is lower than that of the first group of plants. All plants, except *L. vesicaria*, which are characterized by poor fruiting, bear good fruit.

The third group consists of two species (*L. vesicaria*, *L. prolifera*). They fall into this group due to their poor developmental function, but it can be taken into account that after 3–5 years of age, these species have higher viability.

The fourth group includes *L. ledebourii* and *L. ruprechtiana*. These species are characterized by unstable flowering and fruitlessness.

L. ledebourii and *L. ruprechtiana* species should be protected from the cold during the harsh winter. There are no unpromising and completely unsuitable species, and the species studied are promising for the Absheron Peninsula and can be widely used in landscaping.

Results

Analysis of the collected material revealed that there is a direct correlation between the distribution of plants by phenogroups, the duration of growth of shoots and their winter hardiness. *Lonicera* species, which end their vegetation in the short and medium-term, are more winter-hardy. Longer growth of shoots in *Lonicera* species, phenological groups with late-onset of vegetation, ending in the medium term and late beginning and ending were recorded.

According to the results of the integrated assessment, most of the introduced species belong to the 1–2 perspective groups.

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