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Evaluation of the Degree of Prospectivity of Certain Introduced Evergreen Shrubs

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Abstract: ***This article describes of decorative and prospective species. Genus Pyracantha, Laurocerasus, Ligustrum, Berberis and Buxus of evergreen shrubs and provides recommendations for wide use in green construction for optimization of urban environment.***

Keywords: introduced, evergreen, decorative, prospective, rhizogenes, optimization, green construction.

1. Introduction

Currently, a great attention in green construction of Uzbekistan is paid to evergreen coniferous plants with the needles of different shapes and colors. Moreover, specific crown habit and different degree of sustainability in a sharply continental climate of Uzbekistan are typical for different types of coniferous plans. Conifers against the background of deciduous plants look great at all seasons of the year. However, for higher decorative effect they lack the bright spots that are flowering and fruiting deciduous plants. During the introduction of great importance is the reaction of plants to unfavorable soil and climatic conditions (moisture deficiency, the duration of dry periods, low winter and high summer temperatures, etc.) [4]. If factors such as drought and salinity of the soil, dry air with the modern development of agricultural technology (the presence of artificial irrigation, soil washing, creating shading, spray, etc.) Amenable to artificial control person, limiting the effect of temperature factor (as very low, so and very high) to a great extent determines the stability of the introduced plants in the soil of new climatic conditions.

The planting should be introduced in addition to the large number of conifers evergreen shrubs of different species. Which, having a striking effect by Evergreen, have more decorative during flowering and fruiting. This makes them truly superior compared to deciduous and coniferous plants and constitutes a greater degree of influence on optimization of environment.

2. Material and Methods

The research has been carried out in Uzbekistan (Tashkent city, Botanical Garden named after Rusanov F.N., Uzbek Academy of Science). The objects of our research are 9 species and one form of plants which refer to 5 genera of 4 families. *Ligustrum L.* genus of *Oleaceae Lindl* family is represented by 3 species, *Pyracantha* M. Roem. genus of *Rosaceae* Juss. family is represented by 4 species, *Berberis* L. genus of *Berberidaceae* Juss. family is represented by 1 species, *Buxus* L. genus of *Buxaceae* Dumort family is represented by 1 species and one form [1].

The habitat of the studied species is located in different regions of the world. Thus, such species as *Pyracantha* and *Ligustrum* are common in Eastern Asia and Europe, *Buxus* - in the Mediterranean, *Laurocerasus* - in North America and the Mediterranean, *Berberis* - in Eastern Asia.

The objectives of the research included the issues of studying the bio-ecological features, sustainability degree and evaluation of new decorative qualities in soil and climatic conditions. Also revealed was the ability to root formation to accelerate the receipt of planting material, the optimal timing of propagation at different times during the year. The seed reproduction was studied. The grafts of various sizes and locations were prepared on shoots of different ages. Different stimulators were used and their impact on the rooting speed was studied. Their dynamics of growth and development were studied, and phenological observations were conducted [5,6,7,8,9,10,11]. Identify promising, established assessment of decorative when growing under the new conditions, and developed recommendations for the use of these species in different types of plants.

Most of these species belong to the VI-VII climatic zones [1], is it grows naturally in subtropical climate. Forms relating to the area VII, is limited to the absolute minimum limit of 5°S to + 10°S, ie, the plant is enough thermophilic (*Ligustrum lucidum, L. henryi, L. japonicum, Pyracantha crenulata* and *Laurocerasus caroliniana, L. officinalis*). Therefore, in very cold winters may freeze slightly, to varying degrees. Species *Pyracantha coccinea, Buxus sempervirens, B. s. f. angustifolia* are (V) VI zone, where the limit is an absolute minimum of -5°S to + 5°S, also shown in brackets V climatic zone with absolute negative temperatures from - 10°S to -5°S. This indicates a higher hardiness of these species. This group includes and *Berberis julianae*.

3. Results and Discussion

In order to determine the degree of prospectivity of these species, their resistance to low winter temperature [2] and to high summer temperature [3] was identified. The findings are presented in table-1.

Table 1: Degree of resistance of the studied species to winter and summer temperature

Degree of resistance in points	*Frost-resistance*	*Heat-resistance*
Ligustrum lucidum	20	5
Ligustrum henryi	20	2
Ligustrum japonicum	20	2
Laurocerasus officinalis	15	1
L. caroliniana	15	1
Berberis julianae	15	1
Pyracantha coccinea	20	1
P. crenulata	20	2
Buxus sempervirens	15	1
B. s. f. angustifolia	15	1

To assess the stability of the introduced species to low winter temperatures was used a scale developed by the GBS AN SSR [2].

When you use this scale to assess the degree of damage to the plants low winter temperatures characterized by winter hardiness 7 figures in scoring terms [2].

To determine the success of the introduction of a species to the extent that higher summer temperatures influence scale was used, in which the nature of injuries received allocated 5 groups according to the degree of relationship to the high summer air temperatures [4].

Species of the genus *Ligustrum* in conditions of Tashkent in severe winters damaged by low temperatures. Since winter 1968/69 in Tashkent was preceded by a period of warm winters with little snow, accompanied by frequent thaws. In the winter, the majority of privet is not affected, only in 1964 at a temperature of -18°S was observed shrinkage of annual shoots in Japanese privet [7]. Winter 1968-69, she was snowy and freezing, low temperature (up to -29,9°S) stayed for a long time. Low Japanese privet seedlings (plants of the second year of life, 15-30sm) trapped under the snow, is not affected. In higher plants and Japanese privet Henry have frozen perennial shoots up to the level of snow [5]. Over the years, our observations in these species of damage in winter observed in winter 2012.

a **b**

Figure 1: a) Ligustrum lucidum rooted cuttings **b)** *L. lucidum* after cold winters, regrowth stool shoots rooted cuttings 3-year life

According to the scale, less winter-hardy proved *Ligustrum lucidum*, which in the cold winter snow frosted to level, but then spring begins to grow rice. 1.a, b.

In *Ligustrum lucidum* even large uterine shrubs and rooted cuttings all obmerzli. After freezing uterine shrubs and rooted cuttings *Ligustrum lucidum* do not bloom. It is love of light. Very well propagated by seeds and cuttings of 20-30% gives a result. Rooted cuttings is growing very rapidly, than seedlings. In rooting 3 - year of life account for annual growth of 160sm, and the seedlings are 2-year life of 66sm. In *Ligustrum henryi* 101 sm, and the seedlings 3-year life of 82 sm, and *L.japonicum* 135 sm - 80 sm. Seedlings little better develop and 1-2 years ahead of bloom than seedlings. Our experiments showed that all of rooted cuttings of the first year of life, grow slowly, and the second and third years of the greatest enhances growth (table-2).

Table 2: Annual growth in 1-3 year old rooted cuttings

Species	Year			Common yearly growth over 3 years
	2010	2011	2012	
Ligustrum lucidum	31,9	38,4	89,5	159,8
L. henryi	37,8	46,8	16,7	101,3
L. japonicum	35	42,2	58,5	135,7
Laurocerasus officinalis	5,8	6,2	14,1	26,1
L. caroliniana	2,2	3,2	2,5	7,9
Berberis julianae	15,8	26,7	33,8	76,3
Pyracantha coccinea	37,7	62,2	117,5	217,7
P. crenulata	42,8	72,3	59,2	174,3
Buxus sempervirens	2,7	3,2	3	8,9
B. s. f. angustifolia	4,2	4,4	4	12,6

The old 20 year old shoots of plants grow a little slower than the saplings and seedlings, but 20 years of the fastest growing plants (table-3).

Table 3: The value of the annual increment in height of some of the species studied (uterine plants)

Species	Year		Common yearly growth in 2 years
	2011	2012	
Ligustrum lucidum	21	36,8	57,8
L. henryi	15,9	36,9	52,8
L. japonicum	15,4	6,5	21,9
Laurocerasus officinalis	19,1	21,9	41
L. caroliniana	4,4	6,7	11,1
Berberis julianae	45,1	21,6	66,7
Pyracantha coccinea	125	116,1	241,1
P. crenulata	151	186,9	337,9
Buxus sempervirens	9,9	11,1	21
B. s. f. angustifolia	11,1	12,4	23,5

If we compare the growth rate of rooted cuttings and queen, quickly growing in rooting *Ligustrum lucidum, L. henryi, L. japonicum and Berberis julianae* after the second year (tabl.2,3.).

In *Ligustrum henryi* and *L.japonicum* can obmerznut of the annual shoots. And the other species do not suffer from low winter temperatures and overwinter well in Tashkent conditions (table 1).

In *Ligustrum henryi* and *L.japonicum* after freezing tops annual shoots in the spring of shoot growth occurred Sympodial. Our experiments have shown that after freezing of annual apical shoots (10-15 sm), plants flowered and fruited profusely (figure 2-3). We rooted cuttings *Ligustrum* 2-3 years of life bears fruit abundantly.

a b s

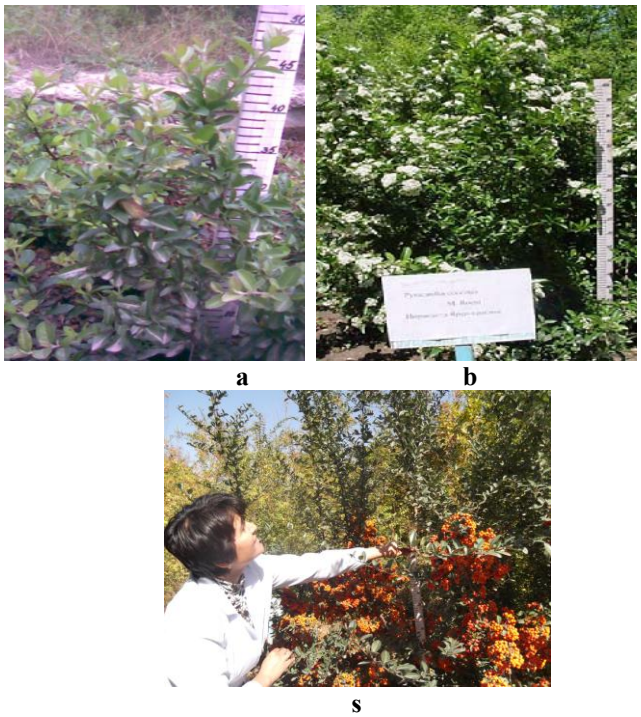
Figure 2: Ligustrum henryi **a,b,s** rooted cuttings 1,2,3-year life

In *Pyrasantha soccinea* after a harsh winter (1969 -29,9°S) flowering and fruiting it was not, and in 1970 there was already a mass flowering and fruiting [6].

According to a verbal communication Babadjanova R. Karakalpakstan *Pyrasantha coccinea* winters in the Botanical Garden to them. Amir Temur in Buston (absolute minimum - 31°S).

Pyrasantha srenulata after a harsh winter (1969 - 29.9°S) for 4 years to the plants do not blossomed and bloomed only in the 5th year, and is already the 6th year of flowering and fruiting was abundant. [6]

During our observations (2010-2012.) The species *Pyrasantha* proved very resistant to low temperatures.

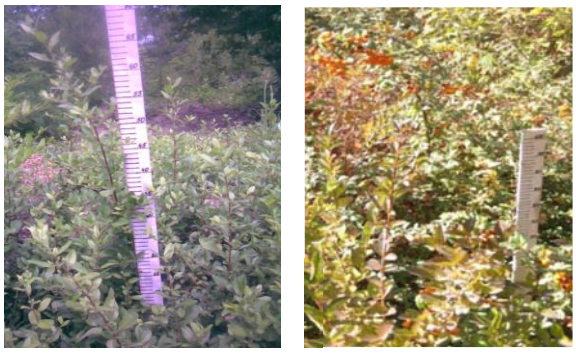


a b s

Figure 3: *Pyracantha coccinea* **a)** rooted cuttings 1- year life, **b)** flowering stalk 2-year life, **s)** rooted cuttings 3-year life

In *Pyrasantha coccinea* and *P. srenulata* fruits remain on the plant all winter, making them very beautiful. Winter, decorative amplified by the fact that the remaining leaves in the winter, too, becomes red and therefore, the whole hive becomes bright red or orange color. It is highly decorative, and quite promising.

These light-loving plants. In the sun to grow well and abundantly fruitful. In the shadow of growing up, but it did not bear fruit. It is easy to propagate by cuttings summer and winter. Rooted cuttings of the second year of life bloom Fig. 3,4. We rooted cuttings 3-year life-year growth rate of more than 2 meters, ie 220cm.



a b

Figure 4: *Pyracantha crenulata* **a,b** rooted cuttings 2-3year life

Marked freezing of apical shoots from rooted cuttings in 2012 (1-3 year life) at 10-15cm in species *Pyracantha srenulata* (fig.4.a,b).

The first samples were frozen in the winter 1973-74 the *Berberis julianae* Tashkent 25 years of age. Minimum air temperature was -21,6°S [3].

a b

Figure 5: *Berberis julianae* **a)** rooted cuttings, **b)** rooted cuttings 2-year life

According to our observations, we revealed that he was in Tashkent conditions quite promising and highly decorative. In winter the leaves turn a bright color, it enhances her beauty.

We rooted cuttings 3-year life-year growth amounted to 85sm.

He shadow-but feels better even in partial shade. In Tashkent conditions up to 2 m in height. In *Berberis julianae* shoots grow alternately (fig.5.a,b). The first escape grows to more than 2 months and stops its growth. After the cessation of shoot growth is already beginning to increase in the second-order shoots. After 1.5-2 months the termination of 2nd order shoots, it is already beginning to rise about 3 shoots. Each order shoots after the termination does not

continue to rise. It completes the growth in August, according to the weather conditions. As a result, the crown spherical shape obtained (table 4).

Table 4: The period of growth rooted cuttings of the second and third (2011-2012.), the life of *Berberis* and *Buxus*

Years	Start vegetation	Shoots 1-order		Duration in days	Shoots 2-order		Duration in days
		Start	End		Start	End	
	Berberis julianae						
2011	1.03	15.04	30.06	76	20.07	12.09	54
2012	6.03	2.04	3.05	31	10.05	3.07	54
	Buxus sempervirens						
2011	14.03	18.04	30.05	42	22.07	22.09	62
2012	16.03	2.04	3.05	31	-		
	B. s. f. Angustifolia						
2011	14.03	18.04	30.05	42	22.07	22.09	62
2012	16.03	2.04	3.05	31	-		

Leaves are collected into bundles arranged alternately 3 (2-8) on the short shoots. Young annual shoots of leaves collected in the beam, 3 pieces. Spines also collected in the beam 3 and the oldest shoots at 5 pcs. It is drought resistant and winter hardy. Each year, blooms profusely, but few fruits. Very good summer and winter propagated by cuttings. The disease is not sick.

Buxus sempervirens and its shape are (V) VI zone, where the limit is an absolute minimum of -5 °S to + 5°S, also shown in brackets V climatic zone with absolute negative temperatures from - 10°S to -5 °S. This indicates a high winter hardiness of plants.

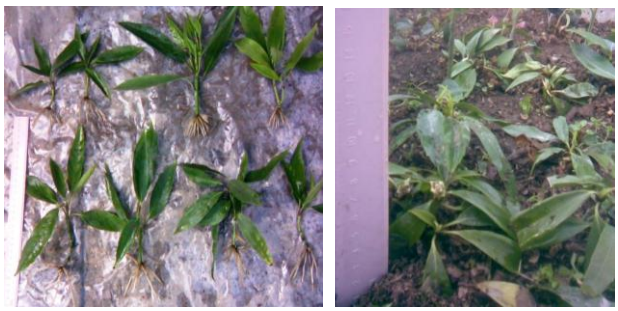
Buxus sempervirens in Tashkent conditions do not bloom, but its shape blooms well, but very few fruits (fig. 6). He shadow. This plant is decorative and highly promising, very good resistance to frost. In Tashkent, stood -29,9°S. Well propagated by cuttings in summer and winter. It grows very slowly. The gain is in the rooting of cuttings, the 3-year life of 9 sm, and more than 20 large summer uterine plants annual increment -9-11 sm (table 3.). We rooted cuttings each year an annual growth rate of more than 2-3 sm (table 2). Shoots grow alternately, like *Berberis julianae*. As a result, the crown turns out he also has a spherical shape. It shoots grow to 2 orders of magnitude (table 4).

It is very drought resistant and winter hardy. Various diseases are not sick.

a **b**

Figure 6: *Buxus sempervirens* **a)** rooted cuttings, **b)** rooted cuttings 2-year life

Species *Laurocerasus caroliniana* VII relate to the area, which is limited to the absolute minimum limit of 5°S to +10°S, ie, the plant is enough thermophilic. Therefore, in very cold winters may freeze slightly, to varying degrees. *Laurocerasus caroliniana* in Tashkent conditions is very slow growing. In Tashkent 27 year old plants of a height of 1 m, and a one-year increase - 4,4-6,7sm (table 3). In rooting annual increment - 2.5-3.2 sm (table 2). Each year, blooms profusely, but did not bear fruit. Propagated by softwood cuttings very well (fig. 7). Plant shade tolerant. They are very resistant to low temperatures cold (-29,9°S). A very decorative, and quite promising.



a **b**

Figure 7: *Laurocerasus caroliniana* **a)** rooted cuttings, **b)** flowering stalk 2-year life

Laurocerasus officinalis refer to VI-VII area, which is limited to the absolute minimum limit from -5°S to + 5°S, ie, the plant is winter-hardy enough in terms of Tashkent. It is highly decorative, and quite promising. He shadow-but in the penumbra grows much better. Every year flowers and fruits. Very good summer and winter propagated by cuttings (fig.8). Rooted cuttings in *Laurocerasus officinalis* first year annual growth rate of 5,8sm, and the second year - 6,2sm and third year - 14,1sm (table 2). In the fallopian plants in the age of about 28 years of annual growth of 19.1 - 21,9sm (table 3).

Figure 7: *Laurocerasus officinalis* **a)** rooted cuttings, **b)** flowering stalk 2-year life

Marked freezing of apical shoots from rooted cuttings in 2012 (1-3 year life) at 10-15sm in species *Pyracantha srenulata, Ligustrum henryi* and *L. japonicum*. At the same time species such as *Laurocerasus officinalis* and *L. caroliniana*, which also belong to the zone VII, not obmerzli.

In conditions of extreme continental climate in Uzbekistan second factor limiting the success of the introduction is the high summer air temperatures (+ 38,8-42°S in June-August) to introduced species that live within the VI-VII areas [1].

To determine the success of the introduction of a species to the extent that higher summer temperatures influence scale was used, in which the nature of injuries received allocated 5 groups by the degree of relationship to the high summer air temperatures [4].

Based on the data in table 1, a large heat resistance (20 points) peculiar *Pyracantha coccinea, P. srenulata, Ligustrum lucidum, L. henryi* and *L. japonicum*

In a minor degree (15 points) from the high temperature part of the leaves change color in some other species.

The number of species and climate zones extent they receive, damage, shown in table 1.

4. Conclusion

Based on the above stated include promising types were all kinds, except Ligustrum lucidum.

The final stage of the research of 9 species and one form of studied plants is to evaluate prospectivity of introduced species in the new conditions in Tashkent. They can be used in green construction at landscaping of shrubs of any purpose and in any arrangement. These figures serve as the basis for inclusion of these introduced species to the list of species suitable for further expansion of their range in cultivated habitat of the Republic.

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