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Study of ornamental plants in parks and gardens of Absheron and Turkiye

Shalala Gulmammadova[1*], Minara Hasanova[1], Arzu Chigh[2]

[1]Institute of Dendrology, Ministry of Science and Education of the Republic of Azerbaijan, Khazar Distr., Mardakan Settl., 277 Sergey Yesenin Str, AZ1044, Baku, Azerbaijan
[2]Department of Horticulture, Faculty of Agriculture, Siirt University, Siirt, Türkiye

***For correspondence:** shalala.g@mail.ru*

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The article describes the results of research work on the study of the taxonomic composition and origin of ornamental trees, shrubs and herbaceous plants in the parks and gardens of Absheron and Turkiye, determining the number of trees, shrubs and herbaceous plants, forms of creating compositions, rules for grouping plants in compositions according to biological and decorative features, the use of small architectural forms, decorative forms of pruning trees and shrubs, the selection of promising species for landscaping, the prospects for using plants in various plantations. It was revealed that the studied plants adapt well to the conditions of Absheron and Turkiye, are promising and are recommended for the design of parks, gardens, squares, and the creation of various compositions.

***Keywords:** Ornamental, plant, composition, landscape, introduction*

INTRODUCTION

In recent years, extensive work has been carried out in Absheron to develop green areas, create various compositions and improve the environment. In connection with the growth of cities and their newly created and changed structural plans, along with individual elements and territories, the entire urban environment is changing.

The rapid growth of housing construction in Baku and the reconstruction of the old part of the city's development significantly expand the boundaries of the capital of the republic. In this regard, the issue of greening the city, which should go in parallel with housing construction and its territorial growth, arises with all its urgency. According to the existing sanitary and hygienic standards in large industrial cities, including Baku, the area of green spaces should be 45-50% of the total living area, or 26-30 m^2 per inhabitant (Bochkova, 2017).

Ornamental tree and shrub plantations, flower beds and lawns determine the originality and beauty of cities and towns, and significantly improve the life of the population. Tropical plants introduced from the local flora and foreign countries, mainly from the Mediterranean countries, Holland, Turkey, Iran are widely used in the landscape design of Absheron when creating various compositions. Along with local plants, they enrich the parks, gardens, streets, squares, boulevards of Baku, contribute to the development of biodiversity and the rational recreation of people.

When designing, it should be remembered that in the end result, not only the materials and tools used by the designer but also the competent organization of the workspace play an important role (Vasilyeva et al., 2018).

Azerbaijan has accumulated vast experience in the field of architecture and urban planning. There is invaluable historical material on the development of landscape architecture over many centuries. During the reconstruction of existing and the formation of new cities of the republic, progressive ideas of an ecological urban planning approach to the planning and development of

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populated areas, the spatial organization of urban (developed) and natural (open) territories, and the harmonious relationship of architectural complexes and the natural landscape are being developed (Yeliseyeva, 2016).

Currently, the main task of landscape design is considered to be the creation of beauty and harmony in combination with the convenience of using the infrastructure of buildings, smoothing out the conflict between urbanization forms and nature, which often suffers from them (Konstantinova, 2018).

When creating flowerbeds and flower beds, one should try to make them not only beautiful from spring to autumn but also easy to maintain, and in no case should life be sacrificed for beauty (Kizima, 2015).

When planning the use of various tree species for landscaping, their functional purpose should be determined in advance. When planting in permanent places, it is necessary to once again clarify the features of the growth and development of trees so that they do not obscure windows, do not tightly cover balconies, loggias, terraces, arbors (Maksimenko and Maksimtsov, 2022).

Parks and gardens of Baku are the main green areas for mass recreation, walking and entertainment. In the conditions of Absheron, which do not have natural forests, these green areas are the main factors that improve the living conditions of the urban population and enrich the architectural appearance of the city. When planning and restoring the city of Baku, it is necessary to separate large areas for parks, gardens, squares (Shikanyan, 2018).

For the development of landscape design in Absheron, it is necessary to study the diversity of species and varieties of newly introduced tropical plants used in the landscaping of the republic, to create various forms of compositions using scientific methods. For this purpose, research work is being carried out in the laboratory "Landscape Architecture" of the Institute of Dendrology of the Ministry of Science and Education of the Republic of Azerbaijan. The purpose of the research work is to study the taxonomic composition and origin of ornamental trees, shrubs and herbaceous plants in the parks and gardens of Absheron, to determine the number of trees, shrubs and herbaceous plants, the forms of creating compositions, the rules for grouping ornamental plants in compositions according to biological and decorative characteristics, the use of small architectural forms, decorative forms of trimming trees and shrubs, the selection of promising plant species for use in landscape design, prospects for using plants in various plantations.

MATERIALS AND METHODS

The objects of research are various types and varieties of ornamental trees, shrubs and herbaceous plants. During the research work, various methods of foreign and local scientists were used. The taxonomic composition of ornamental plants was studied according to the method of Asgerov (2011), the forms of creating compositions, the rules for grouping ornamental plants in compositions according to the methods of Kizima (2015), Yeliseyeva (2016), Gulmammadova (2011) and Mammadov (2006).

RESULTS AND DISCUSSION

When conducting research work in 2019-2022, expeditions were organized on the territory of the National Seaside Park, the Philharmonic Garden, the Garden of Samad Vurgun, Khagani Park, Sahil Park and the Absheron Flower Park. In these parks and gardens, observations were made, herbariums were collected, the taxonomic composition and origin of ornamental trees, shrubs and herbaceous plants were studied, the number of trees, shrubs and herbaceous plants was determined, the forms of creating compositions, the rules for grouping plants in compositions according to biological and decorative characteristics, the use of small architectural forms, decorative forms of pruning trees and shrubs, the selection of promising species for landscaping, prospects for the use of plants in various plantations. The taxonomic composition of plants from 51 families, 78 genera and 97 species was studied in the National Seaside Park, 34 families, 45 genera and 55 species in the Philharmonic Garden, 23 families,

32 genera and 35 species in the Samad Vurgun Garden, 29 in Khagani Park families, 41 genera and 46 species, in the Sahil Park - 16 families, 26 genera and 28 species, in the Park of Flowers - 21 families, 29 genera and 37 species.

In the parks and gardens of Absheron, the creation of various forms of compositions in a regular style was studied - geometric shapes (rectangle, square, circle, rhombus, etc.) and in landscape or landscape style - original forms (flower garden, labyrinth, buta, etc.). Some forms of compositions studied in the parks and gardens of Absheron are shown in Figures 1-6.

The taxonomic composition and origin of the studied ornamental plants in the Park of Flowers on Absheron are shown in Table 1.

In the parks and gardens around the recreation areas, there are flower beds and palm trees, stone terraces are covered with climbing plants. Small architectural forms - fountains, lanterns, benches, sculptures, flower pots, pergolas create comfortable conditions for people resting here and enhance the artistic and architectural image of the park ensemble. Some small architectural forms studied in the parks and gardens of Absheron are shown in Figures 7-9. In geometric compositions, evergreen trees and shrubs are mainly planted in the center of the composition, and herbaceous plants are planted along the edges, and in compositions of the original form, 2 ornamental shrubs and herbaceous plants are mainly used, located in a free, landscape style, flower beds from annuals, biennials and perennials. When creating compositions, the combination of flower colors with each other, the height of the plants, the relationship to light, shade, moisture are taken into account. The plants are planted in such a way that other flowers bloom to replace faded flowers and the continuity of flowering is ensured. High plants are planted in the center of the composition, and low plants are planted along the edges so as not to obscure each other.

Geometric shapes compositions in a regular style

Fig. 1. Square shape

Fig. 2. Rhombus shape

Fig 3. Rectangle shape

Original forms of compositions in landscape or landscape style

Fig. 4. Decorative shape

Fig. 5. Flower shape

Fig. 6. Original shape

Table 1. The taxonomic composition and origin of the studied ornamental plants in the Park of Flowers on Absheron

Family	Genus	Species	Origin
1.*Pinaceae* Lindl.	1.*Cedrus* Mill.	1.*C.deodara* G.Don	Algeria
2.*Cupressaceae* F.W.Neger	2.*Juniperus* L. 3.*Thuja* (L.)Tourk. 4.*Cupressus* L.	2.*J.occidentalis* Hook. 3.*T.occidentalis* L. 4.*C.arizonica* Greene 5.*C.sempervirens for.horizontalis* L. 6.*C.x leylandii* A.B.Jacks. 7.*C.sempervirens* L.	Europe North America California Asia Minor Holland Asia Minor
3.*Magnoliaceae* J.St.Hil.	5.*Magnolia* L.	8.*M. fraseri* Walter	Japan
4.*Oleaceae* Lindl.	6.*Ligustrum* L 7.*Olea* L.	9.*L.japonicum* Thunb. 10. *L.vulgaris* L. 11.*O.europaea* L.	Caucasus, Ukraine Europe Australia
5.*Platanaceae* Dumort.	8.*Platanus* L.	12.*P.occidentalis* L.	North America
6.*Malvaceae* Juss.	9.*Hibiscus* L.	13.*H.syriacus* L.	China
7.*Rosaceae* Juss.	10.*Cotoneaster* Medic. 11. *Pyracantha* Roem. 12.*Photinia* Lindl. 13.*Prunus* Mill.	14.*C.lucidus* Schltdl. 15.*P.angustifolia* Franch. 16.*P.serratifolia* Desf. 17.*P.cerasifera* Enrn.	North Caucasus South China Asia, China Caucasus, Asia
8.*Celastraceae* Lindl.	14.*Euonymus* L.	18.*E.japonicus* Thunb. 19.*E.fortunei* L.	Asia Minor China
9.*Palmaea* Juss.	15.*Phoenix* L.	20.*P.canariensis* Chabaud.	Canary Islands
10.*Buxaceae* Dumort.	16.*Buxus* L.	21.*B.colchica* Pojark.	Asia, Caucasus
11.*Caprifoliaceae* Vent.	17.*Abelia* L. 18.*Lonicera* L. 19.*Viburnum* L.	22.*A.chinensis* R.Br. 23.*L.capriofolium* L. 24.*V.tinus* L. 25.*V.lucidum* L.	China Caucasus, Europe Europe Europe
12.*Asphodelaceae* Juss.	20.*Phormium* J.R.Forst.	26.*P.tenax 'Tricolor'* 27.*P.tenax 'Variegatum'*	New Zealand New Zealand
13.*Pittosporaceae* Lindl.	21.*Pittosporum* Thunb.	28.*P.tobira* Thunb. 29.*P.tobira 'Nana'*	South America Japan
14.*Punicaceae* Horan	22.*Punica* L.	30.*P.granatum* L.	Transcaucasia
15.*Elaeagnaceae* Lindl.	23.*Elaeagnus* L.	31.*E.commutata* Bernh.	Japan
16.*Berberidaceae* Torr.	24.*Nandina* Thunb.	32.*N.domestica* Thunb.	China, Japan
17.*Garryaceae* Lindl.	25.*Aucuba* Thunb.	33.*A.japonica* Thunb.	Japan, Taiwan
18.*Begoniaceae* C.Agardh.	26.*Begonia* L.	34.*B.cucullata* Willd.	South America
19.*Lamiaceae* Lindl.	27.*Teucrium* L.	35.*T.fruticans* L.	Mediterranean countries.
20.*Asteraceae* Bercht.	28.*Cineraria* L.	36.*C.maritima* L.	Mediterranean countries.
21.*Poaceae* R.Br.	29.*Leymus* L.	37.*L.arenarius* L.	Northern Europe
Total: 21 family, 29 genus and 37 species.			

Fig. 7. Decorative fountain

Fig. 8. Flower pot

Fig. 9. Street lamp

According to the agreement concluded between the Institute of Dendrology and the Department of Gardening of Baku City, the Institute of Dendrology studies the bioecological features of new trees, shrubs and herbaceous plants introduced from local and foreign flora, selects promising species adapted to local soil and climatic conditions and introduces them into the landscaping in Absheron. On the territories of parks and gardens of Absheron, the forms of trimming ornamental trees and shrubs were studied. Form pruning is carried out in order to preserve the natural forms of green spaces and give them artificial forms.

Safarov (1955) mentioned some of the features of *Pinus eldarica* Medw, which is drought-tolerant and does not require soil, is resistant to adverse environmental conditions, windy and salty conditions, and is indispensable in regions with difficult soil and climatic conditions. The use of this plant in the park, which is our research area, creates an advantage in terms of sustainability in landscape studies. It is grown because it is compatible with environmental conditions and adapts well.

Farzaliyev and Afonin (2016) said that *P.eldarica* is a non-frost resistant plant. It withstands single temperature drops to -22°C, but the isometric line of January temperatures of -3.5°C serves as the actual border of its distribution in Azerbaijan. Sufficient moisture must be provided for these plants to grow. Young plants can grow in Absheron in areas with a total annual precipitation of 200 mm, provided that periodic and supplementary irrigation is provided.

Natural woody and shrub species that can be used in landscape architecture have been determined in the province of Sivas in Turkey, and it has been reported that the *Juniperus communis* species can be among the plants that can be used in erosion prevention among the species that can easily grow on rocky and calcareous soils with strong root structure because Sivas has a mountainous and rough terrain (Bozkurt, 2021). In addition, researchers have included *J. communis* among the taxa that can be used in roadside and refuge vegetation. It can also be used for reforestation in mining areas. *J. communis,* which is among the plants that stand out in terms of aesthetic features such as flower, leaf, beauty of form, fruit, shadow effect, leaf color in autumn and creating a winter landscape, is also in our research area and gives beautiful images (Bozkurt, 2021).

According to Polat and Tunalıoğlu (2012), olive has dendrological properties such as visual quality value, color, texture, shape and size, and visual appeal, fascination, attractiveness, etc. It is one of the rare trees that can be examined with other parameters. The olive tree offers interesting views with its leaf, stem and flower and fruit colors. It creates interesting views that present the patterns of life according to the years with the patterns on its body like a history page and emphasize it with its branching shape. The arrangement of the leaves on the branches is interesting with the texture of the branches and stems. It is expected that the visual characteristics of the olive trees in Samed Vurgun Park will also come to the fore in this direction and have an aesthetic and functional impact.

The *Taxus cuspidata* plant is an interesting, dense shrub. It is a preferred species in landscaping, especially with its adaptations in cold and shaded areas. Low maintenance (USDA, 2022). The use of this species in Samed Vurgun Park draws attention. Sustainability is also ensured by the ease of maintenance.

According to Pignatti (1982), the plant *Platanus acerifolia* is a species with wide adaptation to various soil types, including strongly alkaline soils (Gratani et al., 2020). It is highly adaptable to various stress conditions along with pollution (Gratani and Varone, 2007; Pourkhabbaz et al., 2010). Because of such properties, it was widely used in gardens, irrigation channels and roadsides in England. It is known as the "London Plane" in England with its usage starting from the 1600s (Cennamo and Cafasso, 2002). It has started to be used in squares and boulevards in Italy (Pignatti, 2017). The shade of this plant species, which is also used in the park we researched, is used.

According to Ljubojević and Pušić (2022), *Hibiscus syriacus* provides a variety of ecosystem services, such as urban forestry, genetic resources, biodiesel production, erosion control, land reclamation, and plant breeding in public green areas. Due to its aesthetic features and rapid growth, it has become an ornamental plant that is

widely used in urban afforestation because it is preferred in the arrangement of public green areas (Vaz et al., 2017). *H.syriacus* provides soil stabilization and prevents landslides (Gomez-Baggethun and Barton, 2013). This decorative plant is used as a hedge plant and solitary in public green areas, due to the plant's mental and physical health-enhancing properties (Chan et al., 2012). The use of such a species in our park creates positive effects both aesthetically and functionally.

Similar to our study, in a study conducted in Ankara/Turkey, plant material was evaluated in city parks, public institution gardens, roadside trees and residential gardens in different districts (Aslan, 2020). In this context, *V.opulus* has been widely used in parks, official institutions and residential gardens, either as a single or as a group, in the places studied. Attention has been drawn to the use of this plant as an accent plant for its visual beauty with flower, fruit and autumn coloring. It is also mentioned that it can be a hedge plant. In our park, the plant has been used with the same design idea and adds beauty to the area.

Although mulberry trees are grown especially for silkworm (*Bombyx mori* L.), nowadays they are mostly used as ornamental plants in gardens, especially the delicious fruits of black mulberry, are grown for pharmacological and cosmetic use (Benedetta et al., 2007). Although mulberry trees are generally grown for their fruit, they are seen as shade trees in many parks and gardens. Plantings are available on roadsides and sidewalks. However, female mulberries are generally undesirable in urban areas. It creates pollution due to its fruits, especially in parking lots, cars and around the house. But recently, the use of edible fruit plants in living areas has become popular, and it is also used in some areas. *M.rubra* is used both for its shade and for nutrition because its fruits are a delicious species.

Buxus sempervirens plants grow best in moist, cool, loose, humus, and calcareous soils rich in plant nutrients. It is sensitive to winter frosts. It can be grown under trees, as they are shade-tolerant in moderate and humid climates. It is used alone, in groups, or as a hedge plant in parks and gardens. It can be used easily in shaded areas in gardens and parks. Since it is very suitable for pruning, it can be used as a hedge plant or topiary plant (MEGEP, 2016).

Euonymus japonica is not very picky in terms of soil. It can also be grown in soils with a high lime content. The plant grows in temperate and warm climates. Species that remain green in summer and winter are damaged by cold. It is used in groupings, fences, and curtain plants, or solitary. It is also suitable for growing in pots and on concrete floors such as roofs, balconies and terraces where there is no natural drainage (MEGEP, 2016). This plant has also been used in our research area in accordance with its purposes.

The *Ulmus minor* plant is a deciduous plant that loves full or partial sun. It is used as a filler and naturalizer in landscaping. It is a forest plant in natural-style gardens (Anonymous, 2022a). It is seen that this plant is used according to these criteria in the park we examined.

Laurus nobilis is widely preferred as a solitary and architectural plastic object in group compositions in green fence and curtain plant in landscaping applications due to its evergreen leaves and being highly suitable for pruning. It is also quite resistant to air pollution in cities. Again, since it is drought resistant, it can also be sed in landscaping applications in xeric areas (Pamay, 1971; Anşin and Özkan, 1993; Ürgenç, 1998). However, Yılmaz et al. (2006) stated that when using laurel in landscaping, due to the toxicity in its leaves and fruit, toxicity should be taken into account, especially in children's playgrounds and other green area arrangements (Ertekin et al., 2009). Compliance with these has also been observed in their use in our park.

The pale yellow flowers of *Pittosporum heterophyllum* are fragrant and there are 1-5 per cluster. It is used in all areas, from sunny to shade. The plant likes well-drained soils. It is used as a curtain or hedge plant in the landscape. It is tolerant of pruning. This type of use determined in Samed Vurgun Park has been evaluated in terms of use (Anonymous, 2022b).

CONCLUSION

As a result of research work in the laboratory "Landscape architecture" of the Institute of

Dendrology, Ministry of Science and Education of the Republic of Azerbaijan and Siirt University, Faculty of Agriculture, Department of Horticulture, Turkiye, it was revealed that tropical plants introduced from local flora and foreign countries in parks and gardens adapt well to the conditions of Absheron and Turkiye, are promising and are recommended for use in landscape design, in the design of parks, gardens, and squares in Absheron and Turkiye.

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ORCIDS:

Shalala Gulmammadova: https://orcid.org/0000-0003-2369-7069
Minara Hasanova: https://orcid.org/0000-0001-5222-9366
Arzu Çığ: https://orcid.org/0000-0002-2142-5986