


AESTHETIC PLANT SUGGESTION FROM ÇANAKKALE FLORA TO URBAN LANDSCAPE: *ARBUTUS UNEDO* L.

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ABSTRACT. Planting designs have different functional and aesthetic effects in cities. The most important benefits of using natural vegetation in these designs could be counted as promoting the city's natural resources and contributing to the city's economy and ecology. Species in natural vegetation should be given priority, especially in terms of reducing water consumption and minimizing maintenance needs. This study was carried out in Çanakkale, taking into account this importance. In the study, *Arbutus unedo* L. (Kocayemiş, Davulga, Strawberry tree) plant, which is widely found in both Gallipoli and Biga peninsulas of Çanakkale Province and whose fruit is used locally, has been discussed. The plant, which is the subject of the study, is found in very small areas in the urban design of Çanakkale. When examined in terms of urban landscape plants, it was determined that mostly exotic (foreign to the region) plant species were used, which created the necessity of the study. However, the use of natural plant species with different functions in the landscape design of the city will give the city an identity and make it attractive. For this reason, the dendrological features, design elements and effects of different seasons of natural species unique to each city should be well known. In the study method, the natural habitats of the *Arbutus unedo* L. plant in Çanakkale were examined in situ and photographs were taken, the characteristics of the plant and its landscape value were presented with a table. In this context, it is aimed to popularize the use of *A. unedo* L. in Çanakkale urban landscape designs. As a result of the study, the dendrological characteristics of the plant, its ecological demands and its usage possibilities in terms of landscape architecture were determined and it was facilitated to compare it with different plants. In addition, a design proposal is presented for the use of the natural vegetation in urban design.

Keywords: Functional design, natural vegetation, planting design, Strawberry tree, urban landscape design.

INTRODUCTION

As a result of urbanization, the physical change of landscapes and the living environments of plant and animal species are adversely affected. With this change, natural lands are fragmented, and local and region-specific ecosystems, vegetation and fauna begin to disappear. In addition, this change accelerates with the widespread use of non-native (exotic) species in urban landscape designs [1,2]. For these reasons, it is very important to consider the ecological data of the region in urban designs and to know the plant species in the vegetation. In addition, for sustainable and more livable cities, it is important to protect the biological diversity that ensures the sustainability of the urban structure [3,2].

Plant groups in which more than one plant community is located in a certain region are called vegetation [4]. If it is known how the vegetation is shaped, it can be determined correctly with which species and where the plants should be used in terms of landscape design. In this context, besides the dendrological characteristics of plants, it is necessary to examine the communities they form depending on environmental conditions. According to the definition made by Koç (1985), the branch of science that studies these communities is called

plant sociology [5]. Plants that fit together in terms of plant sociology mean plants that support each other, and all species in this community must be taken into account. As an important element of the maquis vegetation in the Çanakkale region, the *Arbutus* plant is compatible with the plant communities in the region and is an important element of the flora.

Flora can be briefly defined as the plant life of a particular area [6]. The factors affecting the diversification of the flora and its variation according to the regions are: geographical location, climate, sun exposure, altitude, geomorphological structure and soil characteristics. These features have different effects on plants over time. Thus, in the region, the most adapted species after many years form the flora and can survive until today. At the same time, they are most suitable for use in desired functions in urban designs.

In landscape architecture studies to increase the open-green space potential of cities, it is important to select plant species that are effective with their aesthetic features and that take place in the flora (or belong to the same family). Because in this way, the city will have green areas designed with long-lasting plants that require the least maintenance and water. In this context, the biodiversity of the region should be investigated and the species in the flora suitable for use in landscape designs should be determined. Successful designs can be made by knowing the ecological demands, dendrological and morphological characteristics of these species and considering their contributions to the landscape in different seasons. However, as Kösa and Karagüzel (2014) stated in their studies, scientific studies on the use of plants in the region's flora in landscape designs are not sufficient [7]. For this reason, many species in the flora of Turkey with good design quality are not used in landscape designs [8].

In this study, it is aimed to popularize the use of *Arbutus unedo* L. plant in the flora of Çanakkale in landscape designs. For this purpose, the plant has been studied in different regions in Çanakkale in its natural environment and it has been determined that it is widespread. However, it is not included in the landscape designs in public spaces in the city center and it is not produced or sold in nurseries. In order to facilitate the use of the plant, its features and usage possibilities in terms of landscape architecture were evaluated with a chart. Thus, the properties of different plants can be compared. In addition, an exemplary plant composition was made by considering the sociological relations of the plant in its natural habitats.

The Benefits of Utilizing the Flora in Landscape Designs

Plants have versatile functions. They maintain the balance of oxygen and carbon dioxide, control the temperature of the earth, prevent erosion, add organic matter to the soil, and ensure the continuity of the ecosystem. Except those; they are used in agriculture, furniture, textile, pharmaceutical and chemical industry and as ornamental plants. Plants, which are so important for the ecological balance and the needs of societies, should be investigated in all their aspects [9,10]. In addition, the use of green space for the next 50 or more years is determined by the plant designs made in urban areas.

Ecological designs will be obtained if the plants in the flora are composed by considering their unity in their natural environment. Naturally designed landscape areas to be formed; while helping to sustain many native plants whose habitats are declining, they will become functioning ecosystems that can provide food and shelter for animals and insects. Urban dwellers also prefer these areas more than artificial designs.

Ecological landscape design enables cities to become more livable places, minimizing energy use, and maximizing profit with minimum resource use. In addition, it increases the level of use of the existing potentials of landscapes and ensures that their temporal changes can be positively controlled [11,12]. Making ecological designs aims to obtain designs that are fast developing, high in sustainability, healthy, reflecting the regional identity and needing the least maintenance. In addition to providing the highest benefit to the users, the herbal

designs made rapidly enrich the urban ecosystem, contribute to the urban economy and the effective use of water. In addition, as Çelik Çanga (2021) stated in his study, it has very important ecological functions in terms of repairing the ecosystem and creating a habitat [13].

Considering the urban conditions, the flexibility of the region's plant community should be taken into account in the selection of street trees. Because road trees face the problem that their roots cannot reach oxygen in tree pits. Most of the existing soil is buried under asphalt and concrete, and minimal existing bare soil is compacted by foot traffic [14].

RESULTS AND DISCUSSION

Floristic Features of Çanakkale Region

The vegetation of Çanakkale Province varies depending on the Mediterranean and Black Sea transition climate. The forest existence in the province covers approximately 56% of the total area of the province, and the northern slopes of Kaz Mountains (Ayvacık, Bayramiç and Yenice Districts) and the higher parts of Biga and Çan districts are characteristic with forest vegetation. Depending on the altitude, oak and chestnut species from leaves, red pine, larch and endemic fir species from conifers form a mixed plant unity. 0-400 meters in the province. Red pine forests, especially on the coastline, form mixed formations with leafy oak species on the elevations, and this vegetation structure manifests itself in the form of maquis (evergreen or deciduous shrub forms) in the western and southern parts [15].

Akman et al., (1978) defines the Mediterranean climate as a subtropical climate located between 30°-45° north and south latitudes. He also states that the subtropical climate character creates a transition zone between tropical and temperate climates. The characteristics of this climate are seen in the Çanakkale region. The summer months are sunny, hot and dry; the winter months are mild and rainy; There are effective winds blowing from the sea throughout the year. The region has a low-rainfall Mediterranean bioclimate type bioclimatically. The Mediterranean vegetation type is extremely heterogeneous in floristic and phytosociological aspects. This situation arises from climatic, historical, biogeographical, physiognomic, geomorphological and pedological features [16].

The *Arbutus* genus which are from Ericaceae family, has 12 species. Of these, *Arbutus unedo* L. (Kocayemiş) was identified by floristic studies in different areas of Turkey [17,18,19,20]. It is distributed in the Mediteraen (Mediterranean) floristic region, North West and Central America, Central and Southern Europe, North West Africa, Canary Islands and Western Asia. The natural distribution area in Turkey was determined by the Grid system, according to Davis's study of flora. Accordingly, A-1, 2, 3, 4, 5, 6, 7, 8, 9; B-1,2; C-1,2,4,6 squares and Gökçe island [21], especially in the Marmara, Aegean, Mediterranean Regions with Mediterranean climate and in the Black Sea Region; It grows naturally on dry, rocky and slopes or in Red pine forests, maquis vegetation with Oaks, wild Olive trees, Myrtle trees and heaths, and many other trees and typical shrubby species [22,23,24,19,20]. It is densely located in the coastal and middle parts of the provinces of Sinop, Trabzon, Ordu, Giresun, Zonguldak and Artvin in the Black Sea Region; It grows in Çanakkale, Balıkesir, Bursa, Kocaeli, Sakarya, Bolu, Mersin, Hatay, Kahramanmaraş's Baş Konu Mountain (at an altitude of 300-500m), around İzmir, on the Yakacık ridges of Muğla, Antalya, İstanbul, and in the Thrace region [25,26,27].

The name *Arbutus* comes from the Celtic language and consists of a combination of the words ar: bitter, butus: shrub or dwarf tree. It got this name because its leaves and fruits are acrid. Other names mentioned in the literature: Kocayemiş, Dağ yemişi, Hoca yemişi, Kocakarı yemişi, Ayı yemişi, Ağaç çileği, Davulga, Yağma, Andıra, Piridim, Strawberry-tree, Killarney, Erdbeerbaum [28,29,8].

Arbutus unedo L. has an important potential in terms of landscape design due to its dendrological features, as can be seen in the studies carried out by many scientists [8] and is suitable for use in Çanakkale urban public open-green areas.

The fruit can be consumed fresh for food purposes, and can be used in the food industry as a filler for desserts, in the production of wine, brandy, liquor, jam, jelly, marmalade, to add flavor to yoghurts. In traditional medicine, its fruits and leaves are valuable for their antiseptic, diuretic, antihypertensive, antimicrobial and laxative properties [20]. In addition, its use as a greenery in cut floristry is very common in recent years. Considering that Turkey is an important market for cut greens both at home and abroad in the last years, its production should be supported. The constant search of consumers in this industry, the research of new species, and the development of arbutus production [30]. However, when we examine the Yalova region, which has the highest potential for producers today, it has been determined that very few producers are sold. In the researches made on the internet, we see that it is produced in a small number of nurseries in Ödemiş, Mersin and Yalova. Some of the sellers report that they were brought from abroad. Those who want to use this plant from companies that make landscape design and application report that they cannot find a qualified plant in the form and size they want from the local producer (Fig. 1).



Fig. 1. Images are from the facility where *Arbutus unedo* is produced in Yalova

Different varieties of the plant have been cultivated: *Arbutus unedo compacta*, *A.unedo rubra* is effective with its dark red fruits. In addition, *A x andrachnoides*, a hybrid species, is used as an ornamental plant. Soiled or covered seedlings that are not too old should be used. Its production can be by seed, cutting, dipping or grafting. Seeds germinate at 4-6 °C, ideally at 10 °C. It is sown directly in autumn or after 1-3 months of cold stratification (at 4°C) in spring, it is soaked in warm water for 5-6 days and surface sown in spring. It can be produced by mild steel and dipping in late summer or by hardwood cuttings in greenhouse conditions in late autumn. Culture varieties are produced by grafting [31]. Due to the difficulties experienced in seed production and low yield, it is recommended to produce with cuttings by applying hormones [32,33]. Beautiful specimens of the plant are found in areas dominated by maquis in natural areas in the Çanakkale region (Fig. 2, 3, 4). Locally, its fruits are sold as food.



Fig. 2. Arbutus has been located in Karabiga together with the forest plants. (2020).



Fig. 3. Arbutus has been located in mixed pine forests around Kocabaşlar village (2020).





Fig. 4. The view of *Arbutus* in the forests of Hacigelen Village (2019).

The arbutus plant was determined in its natural environment in Çanakkale region by Şeker et al. (2004) and examined morphologically. Body thickness is 14.61 cm. was measured. Its leaves average 21.42 mm. wide and 52.44 mm. tall and the average petiole length is 7.62 mm. is Flowering period is November-January. In general, the flowers are narrow-tipped, round, bell-shaped. Although the compound petals are cream colored, light pink and pink petaled types have also been encountered. The total number of flowers in the clusters is 29, the number of flowers in the bouquets in the clusters is between 3-6. The average flower length is 7.52 mm. and flower tip opening is 3.27 mm [34].

CONCLUSION

In the study, *Arbutus unedo* L. (Bigberry) was examined with the plant groups it coexisted in its natural environment, taking into account that it is an element of the maquis and garik vegetation. It has been seen in the vicinity of Çanakkale, near the red pine forests, together with the under-forest vegetation. Considering the natural environment, an exemplary design has been made, the planting places of the plants and their relative distances from each other are given in the plan view. In the design, effective types with their aesthetic features are included. In order to present a layered design example, attention was paid to the use of trees, shrubs, shrubs and groundcovers. A cross-sectional view of the composition is also given so that the design can be better understood (Fig. 45). Species included in the design: *Pinus brutia*, *Arbutus unedo*, *Convolvulus sabatius*, *Gaura lindheieri*, *Hypericum calycinum*, *Nandina domestica*. By using exotic species as well as natural species in the design, the visual effect of the composition is increased and an effect is achieved all year round.

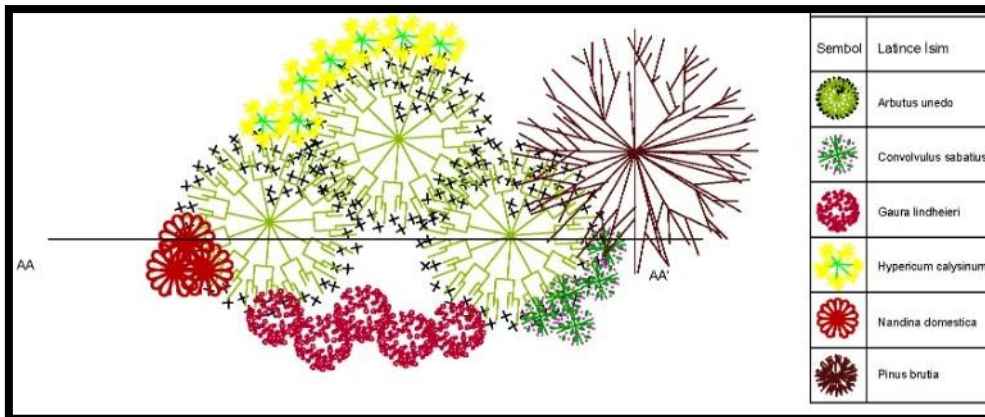




Fig. 5. Plan view of a design sample made with *Arbutus unedo* L. (Original)

In order to encourage the use of *Arbutus unedo* in urban landscape design and to determine the possibilities of use, all its features have been tabulated. Thus, considering that the Big Nuts will be designed with different plants, a comparison opportunity has been created (Table 1 and 2).

Table 1. Ecological and Design Features of Kocayemiş. Prepared using [17,31,35,29].

Plant name	Character	Climate demand	Humidity	Soil demand	Using in PlantDesign	Form	Texture	Color	Other
<i>Arbutus unedo</i> L. Kocayemiş, Strawberry	It is in the woody angiosperm class. Evergreen, tall shrub, small tree or shrub.	In the Mediterranean climate, in regions with cool summers. Prefers sunny or semi-shade locations. It is resistant to cold; withstands -15 °C. It adapts to harsh conditions.	Middle. It is a dry plant. It should be watered less in summer, root rot may occur.	It has high tolerance. It can grow in sandy or well-drained moist soils, arid, poor or calcareous soils. It grows best in both alkaline and acid soils, though the pH is 5.5-6.5.	Natural style, tropical gardens. Suitable for space filler, plant layering, naturalizer, background plant, massive planting, solitary or group parks and gardens. It is effective year-round. It has the functions of limiting, screening, creating space.	Oval, scattered.	Middle	Green, red, white	It is the raw material of alcoholic beverage, jam, jole. Fruits and leaves have vitamin C and antioxidant effects. If the fruit is eaten too much, it can get drunk.

Table 2. Morfolojik ve Dendrolojik Özellikleri. Prepared using [17,31,35,29]

	Height growth	Crown	Root	Leaf feature	Flower feature	Fruit and seed	Trunk, branch and shoot	Regeneration	Pruning
<i>Arbutus unedo</i> L.	4-7m. Grows slow at first, then fast	1,5-3m.	Fringe rooted. It has strong root shoots.	The leaves are leathery, shiny, hard, elliptical, 5-10 cm long, 2-5 cm wide. Thick elliptical leaves are dark green on the upper side, pale green on the underside, glabrous on both sides. The ends are pointed, the edges are saw-toothed.	Bell-shaped, several of them together form compound inflorescences. Fragrant. Their length is 5-8 cm. Flowers and ripe fruits are present on the tree at the same time. It opens at the end of summer, October-early autumn. Flowers in golden-cream color during autumn.	Misty red-orange when ripe, 1-3 cm. spherical in diameter, rough surface, sweet, edible. Seeds are found in 3-5 cells in the fruit. 1000 T.A. 2 g germination is 55%.	Branches;is hairy when young, reddish brown, bark cracked; unpeelable mostly bends. Young shoots are often hairy. Gives strong stump shoots.	High	Appropriate. It can be sheared to give shape. It rarely needs pruning to develop.

Not: This study was presented at The Fourth International Congress on Landscape Architecture Research (ICLAR) with the same name.

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