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Research Article

EVALUATION OF URBAN GREEN AREAS IN TERMS OF PLANT DESIGN, THE CASE OF KURUCAŞILE (BARTIN)

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ABSTRACT. Urban green areas are physical formations that directly affect the quality of life and space of the city in which they are located. Therefore, these areas must be a model with their genuine characters. Open and green areas and understanding of plant texture and plant design have an important role in realizing this. In the study, it is aimed to ensure the recognition of the plants that constitute the main component of the open and green areas of Kurucaşile (Bartın) district and to reveal their usage conditions according to plant design principles. In this context, plant material has been determined, their suitability in the field has been evaluated by considering the dendrological and ecological characteristics of these plants, problems have been revealed and solutions to these problems have been recommended. According to the research results, the vegetative material in the area is quite weak in terms of species diversity and density. Considering the usage of detected plants in terms of design principles, color suitability (33%,) physical environment (20%) and motion control (31%) were observed to be the most considered factors, whereas other characteristics were generally ignored. The results of the research are intended to set an example for the use of plants in the subsequent physical development of the district and contribute to the formation of unity in terms of plant design.

Keywords: *green area, urban area, plant design, Kurucaşile, Bartın.*

INTRODUCTION

In our day, there is an intense urbanization problem along with increasingly intensifying industrialization. Researches show that urban areas are much denser in terms of population, although they cover a smaller surface area compared to rural areas [1].

The cities of our age, overpopulating and with dense housing within limited residential areas, are exposed to changes in the microclimate structure and consequently, city-specific climates are formed [2]. To reduce these effects, more open green areas and urban development models compatible with ecosystems are recommended whereas high- rise buildings are not [3]. Urban green areas contribute significantly to the regulation of the artificial urban climate. These areas not only regulate urban landscape but also regulate the urban ecosystem by contributing to improving air quality and reducing the impact of urban heat islands by increasing the humidity in the air and lowering the temperature [4].

In urban spaces, green areas are of great importance in terms of human life and needs. These areas have many physical and ecological functions such as providing circulation and physical comfort among different urban uses, providing aesthetic value to the city, offering recreation opportunities and reducing noise and pollution. In order to fulfil these functions, they should be planned according to a system in urban planning and comply with certain standards [5]. Integrated approaches respecting and incorporating nature

should be adopted in planning works and landscape design principles should be taken into consideration for the sustainability of the cities [6].

Increasing urbanization and the resulting visual pollution greatly spoil the natural appearance of the environment. On the other hand, plant designs that are not made in accordance with the design principles prevent the perception of the environment as a whole. In order to ensure integrity in the design, it is necessary to know the dendrological properties of the plants that make up the composition and to make planting applications according to the aesthetic and functional qualities that these properties reveal. Plants are elements that grow and develop in the landscape and undergo many changes over time. Despite all these variations, it is difficult to create a composition using the main principles of planting design, but it can reveal successful landscape studies.

Within the scope of the research, ornamental plants used in urban green areas in Kurucaşile (Bartın) district were determined and evaluated according to their aesthetic and functional use in plant designs. It is aimed to create healthier environments in cities, the living environment of which is getting disrupted day by day.

MATERIALS AND METHODS

Kurucaşile, a district of Bartın in the Western Black Sea region, is established on an area of 1 546 km² [7]. The district is surrounded by the Black Sea in the north, Bartın in the south, Cide in the east and Amasra in the west. There are Cenozoic and Mesozoic sedimentary rocks in the research area. Çakraz formation, Himmetpaşa and Gökçetepe formation, and Cretaceous aged Kazpınarı formation cover a large space in the area [8]. The most common soil group in the district is gray brown podzolic soils. Alluvial soils, which occupy a very small amount, are usually located in the subsoil of the valley. These soils with sand, clay, and miles form the most fertile areas. The area dominated by the temperate Black Sea climate, which can receive rainfall in all seasons, is in the "humid climate" group according to the water balance sheet prepared in line with Thornthwaite method. While the *Euxine* section of the *Euro- Siberian* floristic region prevails on the northern slopes of the area facing the Black Sea due to the warm and humid sea climate, *Pseudomaquis* elements are also seen from place to place. Kurucaşile forests are predominantly composed of broad- leaved species; *Fagus orientalis, Carpinus betulus, Carpinus orientalis, Castanea sativa, Ostrya carpinifolia, Tilia argentea* and coniferous taxa; *Pinus brutia, Pinus nigra* subsp. *pallasiana, Pinus sylvestris, Abies nordmanniana* subsp. *bornmuelleriana*.

The material of the research is the plant potential in the open green areas of the district. These consists of Zübeyde Hanım playground, Kurucaşile coastal landscaping, Kapısuyu coastal landscaping, Transportation areas, Refuge landscaping and Cemetery (Figure 1). There are two coastal landscape planning in the research area, namely Kurucaşile and Kapısuyu. In addition to natural taxa, exotic plants are also included in these biotopes, which consist of vegetative arrangement along the walking path and the road axis. Kapısuyu, which is on the Cide road and 3 km from the district center, is an important area in terms of tourism due to its natural beauties. Coastal landscaping has been carried out recently in the area where mostly beaches are used. Kurucaşile coastal recreation area, which is located in the city center, has walking and cycling paths, and a medium- sized fishing port. There are almost no places in the district that offer playground opportunities for children. There is only the Zübeyde Hanım playground located in Kurucaşile to fulfill

this need. The park has a wide view quality with its location close to the seaside and offers people the opportunity for recreation. Other urban green areas in the research area consist of the transportation system and a cemetery in the Liman neighborhood.

Fig. 1. *Research areas (1: Zübeyde Hanım playground, 2: Kurucaşile coastal landscaping, 3: Kapısuyu coastal landscaping, 4: Transportation areas, 5: Refuge landscaping and 6: Cemetery) (Google Earth 2020).*

This research includes studies that will provide the basic data for future sustainable planning by revealing the vegetative potential of Kurucaşile urban green areas. The research method consists of assessment methods such as field studies, data collection, analysis and synthesis. According to this method, firstly, the areas where the research will be carried out were determined by making use of the 1: 1 000 scale development plan and the observations of the area. With the determination of the research areas, field studies were started and the vegetative structure was revealed. For this, primarily, plant identification was carried out and each plant taxon has been evaluated according to plant design principles according to functional and aesthetic uses. Visual control, motion control, physical environment control, and creating space characteristics were evaluated in terms of functional use, whereas, size, shape, color and texture suitability of plants were evaluated in terms of aesthetic use [9].

In creating information about plant material, the study of [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [20], [21], [22], [23], [24], [25] and in the synthesis and evaluation stages, which involves revealing the use of plants for design, the studies of [26] and [27] were used as a reference.

RESULTS AND DISCUSSION

In the research area, the potential of plants in urban green areas, which are created for people to rest, walk, perform various recreational activities and get closer to nature, has been evaluated in terms of plant design principles. Accordingly, the biotopes in the coastal landscaping, Zübeyde Hanım playground, transportation areas, and cemetery have been examined in detail.

- Coastal landscaping; The coastal landscaping in the research area consist of walking and cycling pathways in Kurucaşile and Kapısuyu seafront, as well as the

surrounding green areas. Kurucaşile coastal area, which is located in the center of the district, is formed on a reclamation land (Figure 2). The recreation area gained by reclamation cannot be utilized sufficiently.

Fig. 2. *Kurucaşile coastal areas.*

As the sea effect is dominant in the area, the herbal material is generally selected from the species that are resistant to the salt effect of the sea and winds and can grow naturally in the area. It was observed that *Cupressus sempervirens*, *Eriobotrya japonica*, *Morus alba*, *Pinus nigra* subsp. *pallasiana*, *Robinia pseudoacacia*, *Salix alba* trees and shrubs such as *Lonicer*a *japonica*, *Nerium oleander*, *Pyracantha coccinea*, *Rosa* sp. and *Yucca filamentosa* were preferred in the green zone along the walking path. *Ficus carica* subsp. *carica*, *Ostrya carpinifolia*, *Buxus sempervirens*, *Juniperus oxycedrus* subsp. *oxycedrus* and *Spartium junceum*, one of the natural woody taxa, has been used for visual purposes at certain intervals in the area. All of the plants are made up of young individuals, yet they cannot create shaded environments.

In some regions, intensive planting is observed, while in some parts of the area, only a few trees or shrubs have been used and large grass areas have been created. These areas include *Alcea pallida*, *Alcea rosea*, *Iris germanica* and *Lilium candidum* herbaceous plants.

Another coastal recreation in the district is the Kapısuyu beach. The area, where there is no intensive use, consists of walking path and planting design around it. Young individuals of *Laurus nobilis*, *Morus nigra*, *Platanus orientalis*, *Populus nigra* ssp. *nigra*, *Robinia pseudoacacia* and *Tilia rubra* ssp. *caucasica* plants are rarely seen along the pathway. Among these, it is determined that *Tilia rubra* ssp. *caucasica* and *Platanus orientalis* could not develop healthily.

Some of the vegetative arrangement in the area is located within borders. In these areas, in addition to *Anthemis frutescens* and *Oxalis acetosella*, there are also shrubs like *Nerium oleander*, *Ruscus aculeatus* var. *acuelatus*, *Vinca major* cv. "Variegata" and *Vitis vinifera*.

- Zübeyde Hanım playground; It has been determined that the children in the district live in a very restrictive environment and there is almost no place to play. For this reason, children generally prefer to play at main roads and streets. Zübeyde Hanım playground, right next to the Municipality building in Liman neighborhood, partially serves this purpose even though it contains limited activities.

The park, with its wide scenery quality and its location close to the seaside, offers people the opportunity to sit and relax. Besides, the Atatürk bust in the area creates a gathering environment. There is no plant design around the recreation areas and the Atatürk bust.

Pinus nigra subsp. *pallasiana*, *Buxus sempervirens* and *Rosa* sp. are located on the green bands in front of the walls. There are *Cupressus macrocarpa*, *Platanus orientalis*, *Prunus x domestica*, *Pyrus communis* subsp. *communis* and *Salix babylonica* in one corner of the area. These trees are older individuals that existed before the establishment of the facility, rather than being used for shading.

- Transportation areas; The transportation system in the research area consists of the main road that divides the district into two and secondary roads connected to this main axis. The main road serves crossing traffic between Bartın and Kastamonu and entrance and exit to the inner part of the city. The side roads that provide passage to Şile, Kargacak, Ömerler and Liman neighborhoods are generally two- way and their widths are suitable for the traffic load of the region. Pedestrian and vehicle traffic are intertwined in the area.

A limited number of *Tilia argentea* can be seen as road trees in the area. There are elderly *Salix babylonica* individuals and shade pergolas in front of the roadside shops. These pergolas include clutching- climbing exotic plants such as *Campsis radicans* and *Wisteria sinensis*.

In the research area, there is no refuges other than the one on the side of the main road. The circular green area has a plant design which consists of seasonal flowers such as *Dianthus barbatus*, *Petunia x hybrida*, *Salvia splendes* and *Tagetes erecta*.

- Cemeteries; There is a cemetery in the urban part of the district. This cemetery, located in the north of the city, has an important place among urban biotopes with its dense vegetation.

The area is bordered by concrete walls. There is no equipment other than the fountain on the right side of the entrance. The transport axis is of stabilized roads. The graves are placed at randomly and they are maintained by families. The area has a 20% slope which increase eastwards.

Although there are mainly aged *Cupressus sempervirens* trees in the cemetery, *Juglans regia*, *Ulmus minor* subsp. *minor*, *Hydrangea macrophylla* and *Rosa* sp. species are also available. The use of plants for visual purposes is not very common in the area. However, it is observed that perennial herbaceous plants such as *Gladiolus x gandavensis* and *Tagetes erecta* are used in cemetery arrangements.

A total of 45 ornamental plants, 34 woody and 11 herbaceous, were identified in the urban green areas of the research area. The vegetal material in the area is limited in terms of species diversity and density and mostly consists of natural plants (55.6%). When the use of the identified plants is evaluated according to design principles, it was seen that the physical environment (20%) and motion control (31%) were considered the most in terms of functional use. *Cupressus sempervirens*, *Cupressus macrocarpa*, *Juniperus oxycedrus* subsp. *oxycedrus*, *Morus nigra*, *Buxus sempervirens*, *Euonymus japonicus* cv. "Aurea", *Nerium oleander* and thorny bushes such as *Pyracantha coccinea*, *Rosa* sp., *Ruscus aculeatus* var. *acuelatus*, *Yucca filamentosa* provide motion control. In terms of aesthetic properties of plants, it was determined that only color suitability (33%) was taken into account. It has been determined that other aesthetic properties, especially the suitability in terms of size 4.4), are mostly neglected which causes problems in applications (Table1).

Table 1. *Evaluation of plants identified in urban green areas in terms of plant design.*

TAXON NAME	RESEARCH AREAS	FUNCTIONAL USE				AESTHETICAL USE			
		Visual control	Motion control	Physical environme	Creating space	Size property	Form property	Color property	Texture property
Trees									
Cupressus sempervirens	Area 6	✓	✓			✓			
Cupressus macrocarpa	Area 1		✓						
Eriobotrya japonica	Area 1, Area 2			✓					
Ficus carica subsp. *carica*	Area 2, Area 3			✓					
Juglans regia	Area 6			✓					
Juniperus oxycedrus subsp. *oxycedrus*	Area 2	✓	✓						
Laurus nobilis	Area 3						✓		
Morus alba	Area 2			✓					
Morus nigra	Area 3		✓						
Ostrya carpinifolia	Area 2					✓			
Pinus nigra subsp. *pallasiana*	Area 2, Area 3	✓							
Platanus orientalis	Area 1, Area 3	✓			✓				
Populus nigra ssp. *nigra*	Area 3				✓				
Prunus x domestica	Area 1	✓							
Pyrus communis subsp. *communis*	Area 1			✓					
Robinia pseudoacacia	Area 2, Area 3			✓					
Salix alba	Area 2			✓					
Salix babylonica	Area 1, Area 4								✓
Tilia argentea	Area 4				✓				
Tilia rubra ssp. *caucasica*	Area 3			✓					
Ulmus minor subsp. *minor*	Area 6						✓		

Shrubs									
Buxus sempervirens	Area 1, Area 2		✓						
Campsis radicans	Area 4							✓	
Euonymus japonicus cv. "Aurea"	Area 5		✓						
Hydrangea macrophylla	Area 6							✓	
Lonicera japonica	Area 2								✓
Nerium oleander	Area 2, Area 3		✓					✓	
Pyracantha coccinea	Area 2		✓						
Rosa sp.	Area 1, Area 2, Area 6		✓						
Ruscus aculeatus var. *acuelatus*	Area 3		✓						
Spartium junceum	Area 2			✓				✓	
Vitis vinifera	Area 3					✓			
Wisteria sinensis	Area 4							✓	
Yucca filamentosa	Area 2		✓						
Herbacous Plants									
Alcea pallida	Area 2							✓	
Alcea rosea	Area 2		✓					✓	
Anthemis frutescens	Area 3		✓						
Dianthus barbatus	Area 5							✓	
Gladiolus x gandavensis	Area 6							✓	
Iris germanica	Area 2		✓					✓	
Lilium candidum	Area 2							✓	
Oxalis acetosella	Area 3								✓
Petunia x hybrida	Area 5							✓	
Salvia splendes	Area 5							✓	
Tagetes erecta	Area 5							✓	
Vinca major cv. "Variegata"	Area 3							✓	

CONCLUSION

The coastal areas of the district, located on the Black Sea coastline, are one of the most important urban open and green spaces that can meet the need for recreation. However, in the area with a visually wide landscape potential, there are not enough studies to

increase the environmental and recreational quality. The coastal recreation in the research area consists of walking and cycling pathways in Kurucaşile and Kapısuyu coastline and surrounding green areas planned by local governments in recent years. In Kurucaşile coastal recreation area, the herbal material has been selected from the species that are generally resistant to the salt effect of the sea and wind and that can grow naturally in the area. It has been observed that these plants have no problems in terms of adaptation to the area. Moreover, it was determined that *Tilia rubra* ssp. *caucasica* and *Platanus orientalis* did not grow healthily in Kapıkuyu coastline. Despite its recreational potential, Kurucaşile coastline cannot be utilized sufficiently. There are no sitting areas in the area and firm grounds are generally used as parking lots. There are small or large scale boat building workshops around the coastline causing noise and visual pollution. Some regulations are required to gather these businesses which are scattered in the area and to perform visual and noise controls.

Zübeyde Hanım playground, which is the only park in the research area, has a wide scenery quality thanks to its location close to the beach and offers people the opportunity to sit and relax. However, the park is quite weak in terms of vegetative elements and the *Nerium oleander* bushes used in the coastal recreations affect the view quality of the area negatively. It has been observed that the park was not planned considering the principle to enable most suitable conditions for different needs of children at different age groups, such as entertainment, resting and basic training. The playground equipment does not measure up the needs of children to play. The area consists entirely of hard ground, with the exception of a few elements in the sandpit. In the park, there are no vegetative elements around the seating areas to provide shade. Besides, there is no accent planting around the Atatürk and it is completely surrounded with hard ground. For this reason, plant design studies, considering the design principles and planning criteria, are needed in the area.

It has been observed that, among urban green areas, insufficient attention has been paid to transportation areas. On the main road, except for a few plants that were placed randomly, there are no trees. The exhibition- oriented products of the stores located on the streets make the pedestrian traffic more difficult. In the area, a limited number of *Tilia argentea* was observed as roadside trees. The planning was carried out without a well-designed space- measure relationship. The plants were subject to severe pruning due to reasons such as eliminating the danger of touching electrical cables and not disrupting transportation (Figure 3). The pruned plants could not preserve their true size and form, but lost most of their beauty and characteristics. Additionally, it was observed that *Tilia argentea* individuals were covered with hard ground up to the root collar and not enough development area was left.

Fig. 3. *Roadside tree planting in the research area and Tilia argentea covered with hard ground up to root collar.*

The cemetery in the north of the city has an important place among the urban biotopes with its dense vegetation. The area is rich in exotic vegetation as well as its natural vegetation potential. Especially old *Cupressus sempervirens* taxa increase their importance in the area. The roads inside the cemetery are stabilized and there are no sitting areas in or around it. In the area, the roads should be covered with suitable materials and small scale urban equipment should be provided.

When the plants determined in the research area are evaluated in terms of ecological suitability, it is determined that they mostly consist of natural taxa and their adaptation to the area is good. These plants are very limited in the area, and used considering neither their dendrological characteristics nor plant design perspective. Yet, it is possible to identify the spaces and emphasize the use of the area by correct use of the plant, which is one of the main instruments of the design. With this study, the plant potential of the urban green areas has been revealed and evaluated in terms of plant design and it has been aimed to guide urban landscape planning.

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