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Original Article

Determination of Selection Criteria of Plants in Urban Coastal Landscapes: An Example of the Eastern Black Sea Coast, Turkey

Hilal Kahveci[1], Cengiz Acar[2]

[1]Department of Interior Architecture and Environmental Design, Bilecik Şeyh Edebali University, Faculty of Fine Arts and Design, Bilecik, Turkey
[2]Department of Landscape Architecture, Karadeniz Technical University, Faculty of Forestry, Trabzon, Turkey

Abstract

Deciding on plant species when considering planting design in landscape design studies is a complex phenomenon. Considering the planting designs implemented, especially in urban areas, it is observed that exotic species are used instead of the species that grow naturally in the region, and compositions that are not suitable in terms of design elements, principles and functions are created. For this reason, our aim in this study is to determine the effective plant characteristics in the preference of plants and to reveal which characteristics come to the fore. The plant characteristics that emerged as a result of the research were collected under five main groups: urban tolerance, landscape effect, regenerative characteristic, functional characteristic, and economic characteristic; and under 29 subgroups. In our study, the scoring method was used for selection criteria on 218 plant species grown in the Eastern Black Sea coastal areas, and the numerical data obtained from the scores were evaluated by factor and cluster analysis with the SPSS 16.0 program. Urban tolerance and landscape effect selection criteria came to the fore in the application-oriented designs of these plants growing on the Black Sea coast, and species such as *Tilia rubra* DC, *Aesculus hippocastanum* L., *Elaeagnus angustifolia* L., *Eucalyptus camaldulensis* Dehnh., and *Juglans regia* L., ecologically pleasing, and esthetically enriching the place, were found to have the highest score.

Keywords: Coastal plants, landscape design, scoring method, urban green areas

Introduction

The fact that more than half of the world's population lives in cities causes an increase in socio-economic activities such as transportation, trade, industry and tourism, which are necessary for economic development. It also causes many environmental problems such as climate change, increase in temperatures, melting of glaciers, storms, and changes in natural vegetation (Antrop, 2004; Baykal & Baykal, 2008; Eby et al., 2008; Karadağ, 2009). It is especially observed that the coastal landscapes, where the relationship between ecological wealth and human activities in the urban coasts develops in a balance, deteriorates due to factors such as rapid population growth, industrialization, and technological developments over time (Cetin, 2016). This has necessitated some precautions in today's cities and incorporation of sustainable landscape planning in design approaches (Korkut et al., 2017).

Proper landscape planning enables the protection of biological diversity and structure of the landscape, thus ensuring food production and security and sustainably supporting the local population (Çiftçioğlu & Bozdereli, 2020). The landscape includes both the natural and cultural assets that exist around us, and it is the common area of work for people of many different professions, primarily landscape architects. The landscape is a system that includes the basic elements that provide the best living environment (Çabuk & Değerliyurt, 2014). As a visual art, the difference between landscape and plastic arts such as painting and sculpture, is that it supports life within it (Gültekin, 1990). As a professional discipline, landscape architecture helps us to use our environment in the best way and to maintain and repair the relationship between humans and the environment. In addition, it provides people with a variety of esthetically pleasing experiences by offering different experiences (Robinson, 1992). Plants are one of the most important components within the scope of landscape architecture, studied as a professional discipline. The living physical structure of the plant material increases its importance as a perceptual and functional element (Acar, 1997; Yılmaz et al., 2018). The dull and lifeless appearance of solid materials such as stone, wood, concrete, iron, and other such materials can be brought to a more pleasing and

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Corresponding Author:
Hilal Kahveci
e-mail:
hilal.kahveci@bilecik.edu.tr

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acceptable situation for humans by the natural and warm appearance of the plants. Plants provide this effect with their dynamic development and change over time, and add a fourth dimension to the landscape (Gültekin, 1990).

Today, plants are seen as indispensable and important parts of all the components of an urban green space (Yılmaz & Irmak, 2004). Unlike their natural habitat, plants in the cities are often exposed to different climate and air quality (Altunkasa & Uslu, 2020), hydrology, biodiversity and soil structure. In addition, many factors such as mechanical damage, water, and soil and air pollution make it difficult to grow plants in urban ecosystems (Önder & Akbulut, 2011). Therefore, a policy of implementing large-scale planting practices using suitable plants which are cheaper to grow and more adaptable to the local conditions will significantly reduce the cost. Asgarzadeh et al. (2014) emphasize that selecting suitable plants in urban areas is of vital importance in order to avoid environmental and financial losses that may occur. Herbalists and planting designers have tried to classify plants to develop general models for good planting design for generations. Although a perfect planting approach does not emerge, it will be beneficial to simplify and consider the most important aspects of these approaches (Rainer & West, 2015).

Until today, urban plant selection has focused on esthetics and composition-forming characteristics (Yılmaz et al., 2018). However, in natural environments, plant species create natural communities based on positive (and negative) ecological interactions. Urban greening efforts are increasingly needed to promote the sustainability and habitability of world cities (Tabassum et al., 2020). In planting studies carried out in urban open green areas, wrong species selection, wrong land use, and selection of plant taxa that are not suitable for the local ecology by non-experts have been shown to cause failure in obtaining the desired results from the planting design studies, and to deteriorate the urban ecology (Bekçi et al., 2015).

Monotonous planning and implementation of projects to plant plants that are not appropriate for the urban identity have been carried out in Turkey, which has a rich natural plant cover. Restricting factors in terms of easy access to plant material, maintenance, and cost meet the needs of the city for some time, but such planting cannot create a sustainable green environment. In urban green areas, mostly exotic plants of foreign origin are planted in the green areas of public institutions, recreation areas, streets and refuges, and residential gardens. The most prevalent reason for this practice is that selections are made without analyzing the urban vegetation, without determining the species suitable for use, and without using scientific methods (Başer & Yıldızcı, 2011; Bekçi et. al., 2013).

The mild climatic zone that Turkey is situated in supports the growth of many plants with different characteristics, resulting in a large diversity of flora, unlike in the surrounding countries (Önder & Akbulut, 2011). Turkey has the richest flora in the mild climate zone, with approximately 12,000 native taxa of flowering plants and ferns. Being a large peninsula, Turkey has a rich floristic diversity, with its general geographic location on the planet, situated at the junction of Euro-Siberian, Iranian-Turan and Mediterranean regions with regard to floristic plant geography, with different topographic features, such as lakes, streams, several microclimatic zones, soil types, and plant geography, all of which give Turkey the position of being a gene center of many species. Being the gene center, Turkey hosts, among its flora, a large population of endemic genera (34.4%), which can be listed as the main reasons for this floristic wealth (Avcı, 2005). The coastal habitats in the area along the coast of the Eastern Black Sea are some of the regions of Turkey with significant species diversity. In this context, in our study, plant species identified in the coastal area of the Eastern Black Sea were considered, and plant selection criteria for their use in urban areas were evaluated, in 2016.

In this context, our purpose in this study can be listed as follows:

- Determination and recording of the natural vegetation of the Eastern Black Sea coastal area.
- Inclusion of plant species in natural vegetation structure during the sustainable planning in urban areas, due to their advantage of easy adaptation.
- Determination of priority characteristics of plants as part of the plant selection criteria in urban landscape designs.
- Constitution of a basis for future landscape design and planning studies in coastal areas by emphasizing that the country's limited natural resources should be used in the best way.

This study was conducted within the scope of the PhD thesis.

Methods

The Eastern Black Sea Region, which has important coastal areas, contains coastal habitats that differ both in terms of climatic and topographic structure, and has a rich variety of plant species that create a visually dynamic effect.

Our study area is located in coastal habitats along the coastline of the north of the Black Sea Coastal Road, parallel to the Black Sea coast in the Eastern Black Sea Region (41°29′N-40°57′N; 41°31′E-38°07′E). Our research was started from the border of Georgia in the province of Artvin in the East, and was carried out at 141 different points, over a distance of approximately 346 kilometers, to the west of Rize, Trabzon, and Giresun provinces, to the provincial border of Ordu (Figure 1). The research area is within the climate zone of the Eastern Black Sea, according to Turkey's Eastern Black Sea macroclimatic types. The characteristics of this climate type are defined with precipitation at the highest levels depending on the sea effect, warm winters, and hot and abundant precipitation in summers. The temperature–precipitation graphs were created according to the Walter method (Çepel, 1995) using the temperature and precipitation data obtained from the Meteorology Stations (Figure 2).

Determination of Selection Criteria of Plants

Deciding on plant species while designing the planting in studies on landscape architecture is a complex phenomenon. One of the methods used in our study is to determine the effective plant characteristics in the preference of plants and to reveal which characteristics are priorities. Many studies were considered while determining the design characteristics of plants (Acar, 1997; Acar et al., 2007; Asgarzadeh et al., 2014; Burton et al., 2009; DiSabato-Aust, 2003; Kendal et al., 2011; Mackenzie, 2006; Malczewski, 1999; Mechelen et al., 2014; Yılmaz, 2005; Ying Li et al., 2011). The plant characteristics that have emerged as a result of the literature review are categorized in five main groups: urban tolerance, landscape effect, regenerative characteristic, functional characteristic, and economic characteristic. The sub-factors of each main characteristic (29 items) are given in Figure 3.

The Braun-Blanquet method, which is a floristic analysis method, was used in the identification of plants (Akman & Ketenoğlu, 1987; Braun-Blanquet, 1964). In the study, 218 plant taxa were identified in the Eastern Black Sea coastal areas, values were recorded in the Excel 2010 program,

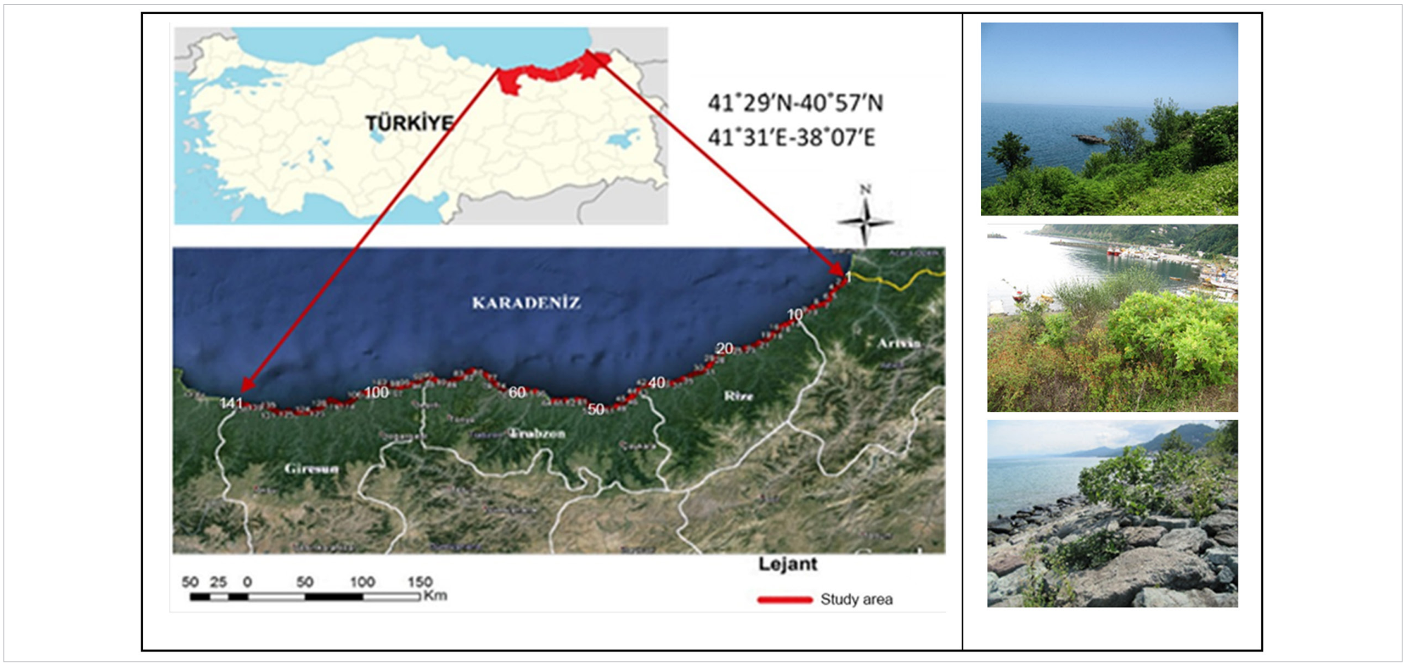

Figure 1.
Working Field.

a score table was created, and data were obtained by statistical analysis. While creating the score table, a value from 1 to 5 (5 highest factor value, 1 lowest factor value) was assigned to the relevant property of the plant. For example, according to the method used in the literature, the drought factor of the urban tolerance criterion of *Castanea sativa* Mill plant was considered between 1–5, and it was rated as 4 (partially strong). This method was applied to the factors in the selection criteria for all plants. The sum of the values (from 1 to 5) was subjected to factor analysis and cluster analysis, according to the characteristics of the plant taxon in the literature. The definitions of these characteristics and the matrix of the score values are given in detail in Table 1. The effects of the data obtained on plant species distribution were investigated with statistical analysis at 99% and 95% significance levels.

In the "Results" section of the study, some of the species detected in the coastal areas of the Eastern Black Sea were simulated (in the Photoshop environment) and offered as suggestions for urban greenfield vegetation.

Results and Discussion

In this study, 218 plant taxa were identified in existing habitats in the coastal areas of the Eastern Black Sea. The list of all the plants identified in the study, their family, life forms/endemicity, and the percentage compositions in their habitats are given in the Appendix List 1. The plant taxa most abundantly found are *Ficus carica* (56.74%), which is the most common plant species in the coastal habitats, followed by *Robinia pseudoacacia* (51.77%), *Torilis arvensis* subsp. *arvensis* (50.35%), *Clematis vitalba* (47.52%), *Alnus glutinosa* subsp. *barbata* (44.68%), and *Eupatorium cannabinum* (43.97%).

Landscape Score Evaluation of Coastal Plants Identified in the Study

The coastal plants in landscape architecture are classified according to five different main criteria. These criteria are grouped as urban tolerance, landscape effect, regenerative characteristic, functional characteristic, and economic characteristic. According to the factors in the subgroups of these criteria, each plant was given a separate value and scored for the values in Table 1. Factor analysis was conducted to reveal the relationship between the main criteria affecting the plant selection in coastal vegetation, according to their data.

The factor analysis of the score values of the different plant species revealed the urban tolerance and landscape effect parameters as effective in the emergence of the first factor, which explains 54.08% of the total variance, while the next two factors responsible for 21.04% of the variance are the regeneration characteristic and economic characteristic. Thus, as a result of the factor analysis of the five main factors

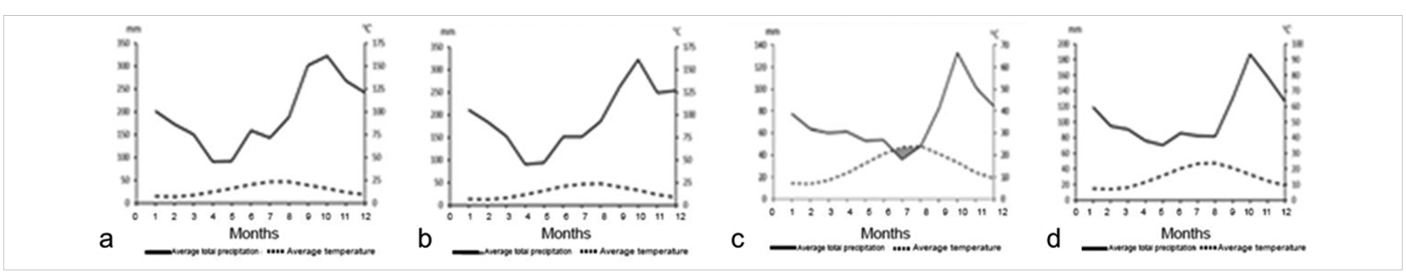

Figure 2.
Temperature–Precipitation Graphs of the Provinces According to the Walter method (a: Artvin, b: Rize, c: Trabzon, d: Giresun).

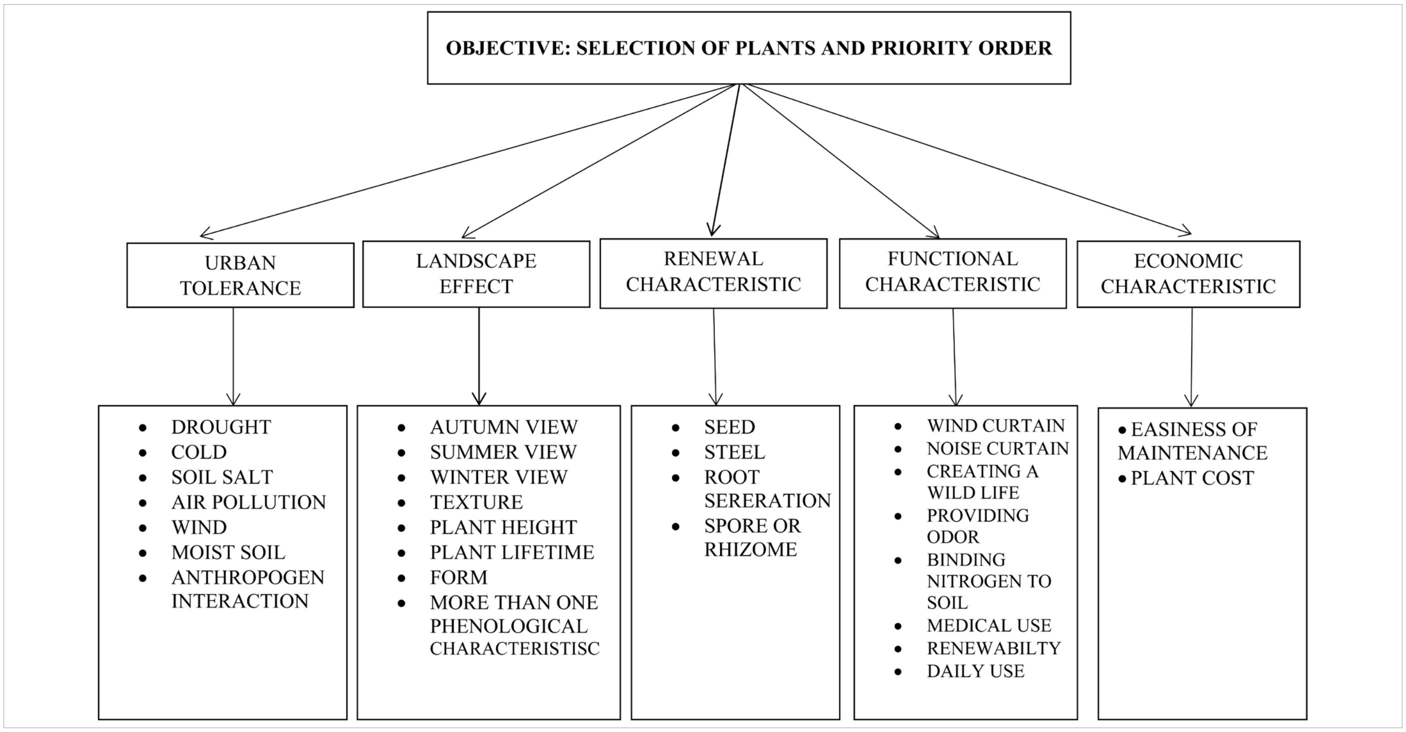

Figure 3.
Criteria of Plant Selection.

representing the selection criteria of the plant species growing in the Eastern Black Sea coasts, two factors affecting the plant selection corresponded to 75.122% of the variance. The numerical data of factor analysis are given in Table 2.

According to the above results, the effects of urban tolerance and landscape are factors of equal importance when evaluating plants of the Black Sea coastal areas for urban landscape design, and are more important compared to the other plant characteristics (Figure 4). From this point of view, we can say that the stronger the landscape effect of the plant and in growth performance in urban environments, the higher its priority of choice in designs.

The groups formed by the plant characteristics according to the given score values were determined by cluster analysis, and two main groups were formed based on the results. The characteristics of urban tolerance and landscape effect constituted the group A, and the remaining functional characteristic, regenerative characteristic, and economic characteristic formed the group B (Figure 5).

Distribution of Plant Taxa According to Selection Criteria

For this Ph.D. study, the numerical values were obtained by scoring the 218 plant taxa detected in the Eastern Black Sea coastal areas according to the selection criteria obtained from the literature review. Plant species with the highest score values are *Tilia rubra*, *Aesculus hippocastanum*, *Elaeagnus angustifolia*, *Eucalyptus camaldulensis*, and *Juglans regia*, which are the types that esthetically add richness to space. The groups formed according to the cluster analysis of the score evaluation of the design characteristics of the plant taxa, and the names of the plants in these groups, are given in Table 3.

- Plant taxa in group 1 are perennial and highly resistant to the effects of the sea. As a result of cluster analysis, woody taxa *T. rubra* DC, *Laurocerasus officinalis* M. Roem., *E. angustifolia* L., *Spartium junceum* L., and *C. sativa* Mill show high landscape effect, and thus the plant species with high landscape score form the first cluster. *S. junceum*, one of these plant species, came to the coastal areas spontaneously after passing the Eastern Black Sea coastal road and created living spaces for itself. In addition, it draws attention esthetically with its linear structure throughout the year, and its effective yellow flowers.
- In group 2, there is only the species *Prunella vulgaris* plant taxon with beautiful herbaceous flowers. *P. vulgaris* can be preferred in the improvement of urban void areas due to its nitrogen retention and soil improvement properties.
- In group 3, there are trees, shrubs and herbaceous plants, and predominantly the pseudomaquis vegetation which can be utilized in planting design projects in coastal areas. In addition, these plant species with flower and leaf esthetics can be utilized to ensure sustainability in landscape designs in urban areas.
- In group 4, there are the two plant taxa with the highest percentage found in coastal areas: *A. glutinosa* (L.) GAERTNER subsp. *barbata* (C.A. MAYER) YALT., *R. pseudoacacia* L. These species are frugal and can adapt wherever they are planted. *Robinia* sp. cultivars of the plant are frequently used in the urban landscape, in the medians, parks, and other spaces.
- In group 5, there are plant taxa with the majority of fruit species growing in coastal areas. *Diospyros kaki* L. FIL., *Cydonia oblonga* MILLER, *Punica granatum* L., *Pyrus communis* L, and *Citrus limon* (L.) Burm.f. Such fruit types are abundant in the Black Sea region and can be used optionally in planting designs, especially in coastal areas and residential gardens.
- In group 6, there are plants which are present at a low proportion. In terms of life forms, this group (ferns, herbaceous perennials, trees, shrubs) shows diversity. Plants in this group can be utilized in areas where we want to create a contrast in form and texture. For example, due to the texture and form differences of ferns and herbaceous species, they can be used in shade gardens.

Table 1.
Plant Characteristics Identification and Score Values

		Description and Score Evaluations				
Criteria	Factors	5	4	3	2	1
Urban Tolerance	Drought	Strong	Partially strong	Medium	Partially weak	Weak
	Cold	Strong	Partially strong	Medium	Partially weak	Weak
	Soil Salt	Strong	Partially strong	Medium	Partially weak	Weak
	Air pollution	Strong	Partially strong	Medium	Partially weak	Weak
	Wind	Strong	Partially strong	Medium	Partially weak	Weak
	Moist soil	Strong	Partially strong	Medium	Partially weak	Weak
	Anthropogen interaction	Strong	Partially strong	Medium	Partially weak	Weak
Landscape Effect	Autumn view	Strong attention-grabbing coloration (Flower, fruit, leaf, stem)	Partially attention-grabbing coloration	Attention-grabbing coloration	Weak coloration	No coloration
	Summer view	Strong attention-grabbing coloration (Flower, fruit, leaf, stem)	Partially attention-grabbing coloration	Attention-grabbing coloration	Weak coloration	No coloration
	Winter view	Strong attention-grabbing calligraphy and coloration (Flower, fruit, leaf, stem)	Partially attention-grabbing calligraphy and coloration (Flower, fruit, leaf, stem)	Attention-grabbing calligraphy and coloration	Weak calligraphy and coloration	No calligraphy and coloration
	Texture	Strong attention-grabbing texture	Partially attention-grabbing texture	Attention-grabbing texture	Weak texture	Ordinary texture
	Plant height	˃15 m	10–15 m	5–10 m	2–5 m	˂2 m
	Plant lifetime	Perennial woody (structural plant)	Perennial shrub	Perennial-biennial herbaceous	Biennial	Annual
	Form	Strong attention-grabbing form	Partially attention-grabbing form	Attention-grabbing form	Weak form	Ordinary form
	More than one phenological characteristic	Having all the characteristics of flowers, fruits, leaves, seeds, and buds	Having several of the characteristics of flowers, fruits, leaves, seeds, and buds	Having at least three of the characteristics of flowers, fruits, leaves, seeds, and buds	Having at least three of the characteristics of flowers, fruits, leaves, seeds, and buds	Having only one phenological characteristic
Renewal Characteristic	Seed	Produced by seed	-	-	-	Not produced by seeds
	Cutting-Vaccine	Produced by cutting	-	-	-	Not produced by cutting
	Root separation	Produced by root separation	-	-	-	Not produced by root separation
	Spore or Rhizome	Produced by spore or rhizome	-	-	-	Not produced by spore or rhizome
Functional Characteristic	Wind curtain	Strong root, stem, dense branch foliation, evergreen	Partially strong root, stem, dense branch foliation, evergreen	Moderately strong root, stem, branch foliation	Partially weak root, stem, branch foliation	Weak root, stem, branch foliation
	Noise curtain	Intense branch foliation, being at least of human height	Partially dense branch foliation, being at least of human height	Moderate branch foliation, being at human height	Partially weak branching, foliation	Weak branching, foliation
	Supporting wild life	Significantly attractive of bees, birds, butterflies, allowing for nesting	Partially attractive of bees, birds, butterflies, allowing for nesting	Medium level of poultry attraction, enabling nesting	Partially weak attraction of bees, birds, butterflies, allowing for nesting	Weak attraction of bees, birds, butterflies, allowing for nesting

	Providing Fragrance	Significantly fragrant (Flower, leaf, aromatic scent))	Partially fragrant	Providing moderate fragrance	Partially fragrant	Weakly fragrant
	Binding nitrogen to soil	Strong degree of nitrogen binding	Partially strong degree of nitrogen binding	Moderate degree of nitrogen binding	Partially weak degree of nitrogen binding	Weak degree of nitrogen binding
	Medical use	Medical use in many fields	Partial medical use	Moderate level of medical use	Partially weak level of medical use	No medical use
	Renewability	Edible fruits, leaves, flowers and roots	Partially edible	Moderate edibility	Edible but not preferred	Not edible
	Daily use	Versatile use (cut flowers Basket making, fence making, children's toys, goods, etc.)	Partially useful in daily use	Occasionally useful	Usable but not preferred	Not usable
Economic Characteristic	Ease of maintenance	Low water demand, no need for pruning, self-growing, resistant to diseases	Partially easy maintenance	Moderately easy maintenance	Partially difficult maintenance	Maintenance is difficult (high water demand, pruning, delicate)
	Plant cost	Affordable, easy to obtain seeds or Cutting and success in production	Partially economical	Moderately economical	Partially expensive	Expensive (rare and difficult to produce)

Table 2.
Factor Analysis of Coastal Plant Selection Criteria

	Factor Aspects		Common
Factors	1	2	Variance
Urban tolerance	**0.97**	0.2	0.98
Landscape effect	**0.97**	0.2	0.98
Renewal characteristic	−0.003	**0.69**	0.48
Functional characteristic	0.16	**0.82**	0.71
Economic characteristic	0.41	**0.65**	0.59
Variance (%)	54.08	21.04	75.12

Note: Criteria with a factor value above >0.50 are shown in bold.

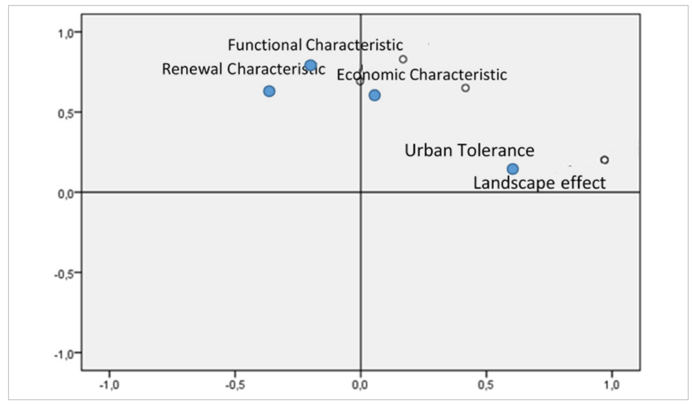

Figure 4.
Distribution of Criteria of Coastal Plant Selection According to Factor Analysis.

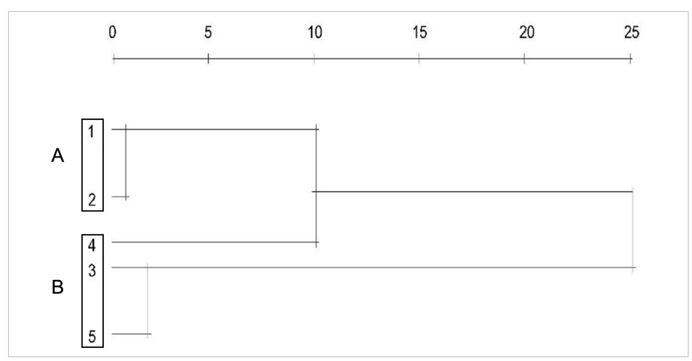

Figure 5.
Cluster Analysis Criteria of Plant Selection.

- In group 7, there are herbaceous (annual, biennial and perennial) plant taxa. These plants are plant taxa found at a low percentage in the study area. They appear in areas such as stony, unproductive soil areas, and fill soils as a growth environment. These types can be easily preferred in rock gardens and dry stone gardens.
- Group 8 comprises plant species that are present at the lowest proportion, but the highest number of plant species are in this group. These species, which can grow in unfavorable environments, can be evaluated in the designs of problematic urban areas. For example, growing plants in unproductive soil in urban void areas is a long and laborious process. In these areas, the species with flower and leaf esthetics such as *Syringa vulgaris* L., *Ulmus glabra* HUDSON,, *Trifolium arvense* L., *Teucrium chamaedrys* L.,

Table 3.
Groups Formed According to the Score Values of 218 Plant Taxa

Cluster Groups of Plants	Plant Taxa
1. Cluster Group	*Castanea sativa* Mill., *Spartium junceum* L., *Elaeagnus angustifolia* L., *Laurus nobilis* L., *Tilia rubra* DC
2. Cluster Group	*Prunella vulgaris* L.
3. Cluster Group	*Aesculus hippocastanum* L., *Koelreuteria paniculata* Laxm., *Nerium oleander* L., *Phillyrea latifolia* L., *Buddleja davidii* Franch., *Rhus coriaria* L., *Rosa canina* L., *Trifolium pratense* L. var. *pratense* BOISS. ET BAL., *Catalpa bignonioides* Walter, *Cistus creticus* L., *Cistus salviifolius* L., *Fraxinus angustifolia* VAHL, *Rubus sanctus* SCHREBER, *Hedera colchica* (C. KOCH) C. KOCH, *Hedera helix* L., *Humulus lupulus* L., *Hypericum androsaemum* L., *Medicago lupulina* L., *Medicago sativa* L. subps. *sativa* L., *Trifolium resupinatum* L. var. *resupinatum* L., *Acer heldreichii* subsp. *trautvetteri* (Medw.) A.E.Murray, *Platanus orientalis* L., *Trifolium repens* L., *Acer pseudoplatanus* L., *Pinus sylvestris* L., *Helleborus orientalis* LAM., *Pyracantha coccinea* ROEMER, *Salix alba* L., *Smilax excelsa* L., *Agrimonia eupatoria* L., *Ruscus aculeatus* L.
4. Cluster Group	*Alnus glutinosa (*L.) GAERTNER subsp. *barbata(*C.A. MAYER) YALT., *Robinia pseudoacacia* L.
5. Cluster Group	*Punica granatum* L., *Pyrus communis* L., *Crataegus microphylla* C. KOCH., *Citrus limon* (L.) Burm.f., *Medicago sativa* L. subps. *sativa* L., *Morus alba* L., *Cerasus avium* (L.) Monench, *Malus sylvestris* MILLER, *Prunus divaricata* LEDEB. subsp. *divaricata* LEDEB., *Lonicera japonica* Thunb, *Staphylea pinnata* L., *Diospyros kaki* L. FIL., *Diospyros lotus* L., *Erica arborea* L., *Fagus orientalis* LIPSKY, *Cornus sanguinea* L. subsp. *australis* (C.A. MAYER)JAV., *Arbutus unedo* L., *Ficus carica* L., *Clematis vitalba* L., *Ligustrum japonicum* L., *Pinus pinea* L., Eucalyptus camaldulensis DEHNH., *Vitis* sp., *Laurocerasus officinalis* ROEMER, *Olea europaea* L. var. *sylvestris* (MILLER) LEHR., *Corylus avellana* L., *Eriobotrya japonica* (THUNB.) LINDL., *Juglans regia* L., *Cydonia oblonga* MILLER
6. Cluster Group	*Dryopteris filix-mas* (L.) SCHOTT, *Polygonum perfoliatum* L., *Solanum luteum* MILLER, *Urtica dioica* L., *Galega officinalis* L., *Cucurbita sp., Chenopodium ambrosioides* L., *Acacia saligna, Carpinus betulus* L., *Melilotus alba* DESR., *Melilotus officinalis* (L.) DESR., *Frangula dodonei* subsp. *dodonei, Vicia cracca* L. subsp. *cracca* L., *Hypericum bithynicum* BOISS., *Hypericum perforatum* L., *Populus nigra* L., *Populus tremula* L., *Trachystemon orientalis* (L.) G. DON
7. Cluster Group	*Petasites albus* (L.) GAERTNER, *Ambrosia artemisiifolia* L., *Paspalum distichum* L., *Pteris cretica* L., *Equisetum arvense* L., *Lavatera thuringiaca* L., *Paspalum dilatatum* Poir., *Cirsium vulgare* (Savi) Ten., *Athyrium filix-femina (*L.)Roth, *Amaranthus hybridus* L., *Solanum dulcamara* L., *Solanum italicum, Lepidium virginicum* L., *Pteridium aquilinum* (L.) KUHN, *Lapsana communis* L. subsp. *intermedia* (BIEB.) HAYEK, *Sambucus ebulus* L., *Sambucus nigra* L., *Daucus carota* L., *Argyrolobium biebersteinii* BALL, *Chenopodium album* L. subsp. *album* L. var. *album* L., *Geranium columbinum* L., *Acanthus mollis* L., *Anthemis cretica* L., *Polygonum hydropiper* L., *Polygonum persicaria* L., *Convolvulus arvensis* L., *Cota tinctoria* var. *pallida* (DC.) U.Özbek & Vural, *Centaurium erythraea* RAFN, *Mercurialis perennis* L., *Pulicaria dysenterica* (L.) BERNH., *Mercurialis annua* L., *Scabiosa columbaria* L. subsp. *columbaria* L. var. *intermedia* (POST) MATTHEWS, *Leontodon hispidus* L. var. *glabratus* (W. KOCH) BISCH., *Setaria glauca* (L.) P. BEAUV., *Galium album* MILLER subsp. *prusense* (C. KOCH) EHREND. ET KRENDL, *Galium* sp., *Sonchus asper* (L.) HILL subsp. *glaucescens* (JORDAN) BALL, *Sonchus arvensis* L. subsp. *uliginosus* (BIEB.) BEG., *Sonchus oleraceus* L., *Polystichum braunii* (SPENN.) FEE, *Solanum americanum* Mill., *Petrorhagia saxifraga* (L.) LINK, *Lycopus europaeus* L., *Digitaria ischaemum* (SCHREBER EX SCHWEIGGER) *Cynosurus echinatus* L.
8. Cluster Group	*Verbascum* sp., *Verbascum thapsus* L., *Verbascum blattaria* L., *Verbascum gnaphalodes* BIEB., *Ulmus minor* MILLER, *Tanacetum parthenium* (L.) SCHULTZ BIP., *Torilis arvensis* (HUDS.) LINK subsp. *arvensis* (HUDS.) LINK, *Sanguisorba minor* SCOP., *Syringa vulgaris* L., *Ulmus glabra* HUDSON, *Trifolium arvense* L., *Teucrium chamaedrys* L., *Typha shuttleworthi W. KOCHET SONDER, Spiraea vanhouttei* (Briot) Carriere, *Symphyotrichum squamatum* (Spreng.) G.I.Nesom, *Sorghum halepense* (L.) PERS. var. *halepense* (L.) PERS., *Sigesbeckia orientalis* L., *Salix caprea* L., *Verbena officinalis* L., *Origanum vulgare* L., *Origanum vulgare* subsp. *viridulum* (Martin-Donos) Nyman, *Oenanthe pimpinelloides* L., *Salvia verticillata* L., *Rumex crispus* L., *Salix babylonica* L., *Rhus chinensis* MILL. var. *chinensis, Phytolacca americana* L., *Oenothera biennis* L., *Artemisia absinthium* L., *Beta trigyna* WALDST. ET KIT., *Foeniculum vulgare* MILLER, *Asplenium scolopendrium* L., *İnula conyzae, Calamintha menthifolium* (Host) Stace subsp. *menthifolium, Calamintha nepeta* (L.) Kuntze subsp. *glandulosum* (Req.) Govaerts, *Crithmum maritimum* L., *Alcea biennis* Winterl, *Eupatorium cannabinum* L., *Ailanthus altissima* (MILLER) SWINGLE, *Eryngium maritimum* L., *Echium italicum* L., *Echium vulgare* L., *Cichorium intybus* L., *Lythrum salicaria* L., *Carpinus orientalis* Mill., *Datura stramonium* L., *Dorycnium pentaphyllum* SCOP. subsp. *herbaceum (VILL.) ROUY, Cyperus longus* L., *Dactylis glomerata* L., *Cynodon dactylon* (L.) PERS.var. *villosus* REGEL, *Euonymus europaeus* L., *Philadelphus coronarius* L., *Betula pendula* Roth., *Clerodendrum bungei* Steud., *Commelina communis* L., *Plantago lanceolata* L., *Plantago major L.* subsp. *major, Acer negundo* L., *Lotus angustissumus* L., *Lotus corniculatus* L. var. *corniculatus* (BIEB.) ARC., *Datisca cannabina* L., *Matricaria chamomilla* L., *Asplenium adianthum-nigrum* L., *Achillea maritima* (L.) Ehrend.&Y.P.Guo subsp. *maritima, Cynoglossum creticum* MILLER, *Heracleum platytaenium* BOISS., *Hieracium* sp., *Campanula alliariifolia* WILLD., *Campanula rapunculoides* L., *Atriplex hastata* L., *Holcus lanatus* L., *Polygonum aviculare* L., *Crepis foetida* L. subsp. *foetida, Crepis foetida* L. subsp. *rhoeadifolia* (BIEB.) CELAK., *Crepis setosa* HALL. FIL., *Echinochloa crus-galli* (L.) P. BEAUV., *Euphorbia* sp., *Oenothera biennis* L., *Picris hieracioides* L., *Raphanus raphanistrum L., Calystegia sepium* (L.) R. Br., *Calystegia silvatica* (KIT.) GRISEB., *Conyza bonariensis* (L.) Cronq., *Conyza canadensis* (L.)Cronq., *Centaurea iberica* Trevir. & Spreng., *Centaurea jacea* L., *Avena fatua* L. var. *fatua* L.

Typha shuttleworthi W. KOCH ET SONDER, *Spiraea vanhouttei* (Briot) Carriere, *Salix caprea* L., *Verbena officinalis* L., and *Origanum vulgare* L. can be used.

Conclusion and Recommendation

In this study, we aimed to address the coastal area of the Eastern Black Sea Region, which has a rich flora and vegetation structure due to the natural structure of the land and the favorable climatic conditions, in terms of landscape design and planning. In this context, plant species that grow naturally in the coastal areas have been identified, and the characteristics of plant selection criteria for sustainable urban coastal areas have been revealed. The selection priority of plants is important at the planting design stage. The plant selection criteria of 218 plant taxa obtained in our study were determined. There are studies published in the literature on evaluating plant selection criteria for plant application in different areas in landscape architecture (Acar et al., 2007; Asgarzadeh et al., 2014; Li et al., 2011). In our study, the selection criteria of the plants were determined as a result of the literature review, and the factors in the subgroups of the criteria were scored for each plant. Accordingly, each plant was given a value (in the range of 1–5) according to 29 sub-factors under 5 main characteristics. Burton et al. (2009) gathered the plant characteristics under 9 main groups according to their morphological, physical, and regenerative characteristics, and evaluated them with 24 subgroups. In

Figure 6.
Proposed Planting Compositions (1: Trachystemon orientalis*, 2:* Lythrum salicaria*, 3:* Thypa shuttleworthii*, 4:* Spartium junceum*, 5:* Dorycnium pentaphyllum *subsp.* herbaceum*, 6:* Salvia verticillata, *7:* Cistus salviifolius, *8:* Fagus orientalis*, 9:* Pteridium aquilinum *, 10:* Carpinus orientalis, *11:* Salix babylonica, *12:* Petasites albus*, 13:* Thypa shuttleworthii, *14:* Achillea maritima *subsp.* maritima, *15:* Holcus lanatus, *16:* Teucrium chamaedrys, *17:* Medicago lupulina*, 18:* Crithmum maritimum *L., 19:* Achillea maritima *subsp.* maritima, *20:* Eryngium maritimum*).*

this study, the characteristics of the plants were constituted as negative or positive (1 or 0) and were subjected to statistical analysis. Ying Li et al. (2011) and Asgarzadeh et al. (2014) developed a method of plant selection in urban areas and investigated it with expert groups after determining the criteria for the plants. At the end of the query, the data were evaluated according to the AHP method and the suitable plants were listed according to the study areas.

The ecological, functional, and esthetic characteristics of the plants are important in terms of adapting to the environment where they are located and adapting to the area where they will be planted, in the designs to be prepared. Ferguson (1992) emphasized the importance of plant characteristics in designs in his work, and classified plant taxa according to their design characteristics. DiSabato-Aust (2003) explained the plant characteristics in her work in order to have the best designs, and classified the plants accordingly. In addition, the esthetic characteristics that plants exhibit after adapting to the environment, the way people benefit from plants, their care, and production characteristics were also evaluated. With this study, it can be said that in the use of plants identified in coastal areas for landscape designs, the urban tolerance of the plant, especially its landscape effect, and its functional, regenerative, and economic characteristics will affect plant species selection.

The score values of 218 plant taxa in the plant list were determined and cluster and factor analyses were carried out, according to the obtained results. As a result of these analyses, the plants fell into different groups according to their score values. From these groups, the group of woody plant taxa; *T. rubra* DC, *L. officinalis* M. Roem., *E. angustifolia* L., *S. junceum* L., and *C. sativa* Mill. were the distinctive group. With these plants, skeletal plant planning can be made in urban spaces, adding character to the space for a long time to come.

Perennial plants constitute a significant portion of the plant species identified in our study area. Messer (2008) revealed the landscape design characteristics and usage strategies of herbaceous plants. He states that herbaceous plants are advantageous because they are durable and do not require replanting every year, and increase the quality of life in the urban environment. The herbaceous plant species; *Acanthus mollis* L., *Achillea maritima* (L.) Ehrend. & Y.P.Guo subsp. *maritima*, *Beta trigyna* WALDST. ET KIT., *Calamintha nepeta* (L.) Kuntze subsp. *glandulosum* (Req.) Govaerts, *Calystegia silvatica* (KIT.) GRISEB., *Campanula rapunculoides* L., *Cichorium intybus* L., *C. vitalba* L., *Commelina communis* L., *Cyperus longus* L., *Galega officinalis* L., and *Hypericum perforatum* L. which were identified in this study, can contribute visually and functionally to urban areas.

As a result, planting design projects to be conducted within the framework of the professional discipline of landscape architecture should be ecologically and esthetically suitable for the area to be designed and have a low cost economically. For this reason, the species that attract attention with their ecological and esthetic characteristics should be determined with the idea that naturally grown plant species, not only in the Eastern Black Sea Region but also in other regions, can be evaluated in designs. Research studies on the production, design, application and maintenance properties of these specified species should be among the priority issues.

The ability of plants grown in coastal environments to withstand and survive in difficult environmental conditions such as seawater spray, strong wind, inefficient and shallow soils, and sloping land makes these plants valuable. In addition to being able to withstand ecological difficulties, plants with different esthetic and functional characteristics will help to create rich compositions in planting design applications. For this reason, simulations that can serve as an example to the user were performed by choosing plants from plant taxa of different sizes, forms, textures and colors determined in the study. This proposed planting compositions and the plant taxa used are given in Figure 6.

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Appendix List 1.
Taxon Name, Family Name, Life Form, and Endemicity and Presence Percentage of the Identified Plants (Kahveci, 2016)

	Plant Species	Family Name	Life Form and Endemicity	Presence %
1	*Ficus carica* L.	Moraceae	Phanerophytes	56.74
2	*Robinia pseudoacacia* L.	Fabaceae	Phanerophytes	51.77
3	*Torilis arvensis* (HUDS.) LINK subsp. *arvensis* (HUDS.) LINK	Apiaceae	Therophytes	50.35
4	*Clematis vitalba* L.	Ranunculaceae	Phanerophytes	47.52
5	*Alnus glutinosa* (L.) GAERTNER subsp. *barbata* (C.A. MAYER) YALT.	Betulaceae	Phanerophytes	44.68
6	*Eupatorium cannabinum* L.	Asteraceae	Hemicryptophytes	43.97
7	*Setaria glauca* (L.) P. BEAUV.	Poaceae	Therophytes	43.26
8	*Medicago sativa* L. subps. *sativa* L.	Fabaceae	Hemicryptophytes	40.43
9	*Lythrum salicaria* L.	Lythraceae	Hemicryptophytes	39.72
10	*Conyza canadensis* (L.) Cronq.	Asteraceae	Therophytes	39.01
11	*Raphanus raphanistrum L.*	Brassicaceae	Therophytes	36.17
12	*Holcus lanatus* L.	Poaceae	Hemicryptophytes	33.33
13	*Trifolium pratense* L. var. *pratense* BOISS. ET BAL.	Fabaceae	Hemicryptophytes	31.91
14	*Artemisia absinthium* L.	Asteraceae	Hemicryptophytes	31.21
15	*Cichorium intybus* L.	Asteraceae	Hemicryptophytes	31.21
16	*Ailanthus altissima* (MILLER) SWINGLE	Simaroubaceae	Phanerophytes	27.66
17	*Corylus avellana* L.	Corylaceae	Phanerophytes	27.66
18	*Phytolacca americana* L.	Phytolaccaceae	Hemicryptophytes	27.66
19	*Sambucus ebulus* L.	Caprifoliaceae	Chamaephytes	27.66
20	*Hypericum perforatum* L.	Hypericaceae	Hemicryptophytes	26.95
21	*Datura stramonium* L.	Solanaceae	Therophytes	23.40
22	*Platanus orientalis* L.	Platanaceae	Phanerophytes	23.40
23	*Symphyotrichum squamatum* (Spreng.) G.I.Nesom	Asteraceae	Therophytes	23.40
24	*Commelina communis* L.	Commolinaceae	Therophytes	19.15
25	*Paspalum dilatatum* Poir.	Poaceae	Hemicryptophytes	19.15
26	*Lapsana communis* L. subsp. *intermedia* (BIEB.) HAYEK	*Asteraceae*	Hemicryptophytes	18.44
27	*Pulicaria dysenterica* (L.) BERNH.	Asteraceae	Hemicryptophytes	18.44
28	*Verbascum* sp.	Scrophulariaceae	Hemicryptophytes	17.73
29	*Pteridium aquilinum* (L.) KUHN	Dennstaedtiaceae	Geophytes	17.02
30	*Cirsium vulgare* (Savi) Ten.	Asteraceae	Hemicryptophytes	14.89
31	*Cornus sanguinea* L. subsp. *australis* (C.A. MAYER) AV.	Cornaceae	Chamaephytes	14.89
32	*Fraxinus angustifolia* VAHL	Oleaceae	Phanerophytes	14.89
33	*Plantago lanceolata* L.	Plantaginaceae	Hemicryptophytes	14.89
34	*Avena fatua* L. var. *fatua* L.	Poaceae	Therophytes	14.18
35	*Foeniculum vulgare* MILLER	Apiaceae	Hemicryptophytes	14.18
36	*Laurocerasus officinalis* M.Roem.	Rosaceae	Phanerophytes	14.18
37	*Melilotus officinalis* (L.) DESR.	Fabaceae	Therophytes	13.48
38	*Morus alba* L.	Moraceae	Phanerophytes	13.48
39	*Leontodon hispidus* L. subsp. *hispidus*	Asteraceae	Geophytes	12.77
40	*Paspalum distichum* L.	Poaceae	Hemicryptophytes	12.77
41	*Sorghum halepense* (L.) PERS. var. *halepense* (L.) PERS.	Poaceae	Hemicryptophytes	12.77
42	*Polygonum persicaria* L.	Polygonaceae	Therophytes	12.06
43	*Equisetum arvense* L.	Equisetaceae	Geophytes	11.35
44	*Petasites albus* (L.) GAERTNER	Asteraceae	Hemicryptophytes	11.35

(*Continued*)

Appendix List 1.
Taxon Name, Family Name, Life Form, and Endemicity and Presence Percentage of the Identified Plants (Kahveci, 2016) (Continued)

	Plant Species	Family Name	Life Form and Endemicity	Presence %
45	*Ambrosia artemisiifolia* L.	Asteraceae	Therophytes	10.64
46	*Chenopodium album* L. subsp. *album* L. var. *album* L.	Chenopodiaceae	Therophytes	10.64
47	*Conyza bonariensis* (L.) Cronq.	Asteraceae	Therophytes	10.64
48	*Populus nigra* L.	Salicaceae	Phanerophytes	10.64
49	*Salix caprea* L.	Salicaceae	Phanerophytes	10.64
50	*Acer negundo* L.	Aceraceae	Phanerophytes	9.93
51	*Centaurium erythraea* RAFN	Gentianaceae	Hemicryptophytes	9.93
52	*Echium vulgare* L.	Boraginaceae	Hemicryptophytes	9.93
53	*Calamintha menthifolium* (Host) Stace subsp. *menthifolium*	Lamiaceae	Hemicryptophytes	9.22
54	*Hypericum androsaemum* L.	Guttiferae	Hemicryptophytes	9.22
55	*Calystegia sepium* (L.) R. Br.	Convolvulaceae	Hemicryptophytes	8.51
56	*Calystegia silvatica* (KIT.) GRISEB.	Convolvulaceae	Hemicryptophytes	8.51
57	*Matricaria chamomilla* L.	Asteraceae	Therophytes	8.51
58	*Petrorhagia saxifraga* (L.) LINK	Caryophyllaceae	Hemicryptophytes	8.51
59	*Prunus divaricata* LEDEB. var. *divaricata* LEDEB.	Rosaceae	Phanerophytes	8.51
60	*Chenopodium ambrosioides* L.	Chenopodiaceae	Therophytes	7.80
61	*Erica arborea* L.	Ericaceae	Phanerophytes	7.80
62	*Rubus sanctus* SCHREBER	Rosaceae	Phanerophytes	7.80
63	*Trachystemon orientalis* (L.) G. DON	Boraginaceae	Hemicryptophytes	7.80
64	*Ulmus glabra* HUDSON	Ulmaceae	Phanerophytes	7.80
65	*Asplenium scolopendrium* L.	Aspleniaceae	Geophytes	7.09
66	*Crepis foetida* L. subsp. *foetida*	Asteraceae	Therophytes	7.09
67	*Galega officinalis* L.	Fabaceae	Hemicryptophytes	7.09
68	*Galium sp.*	Rubiaceae	Hemicryptophytes	7.09
69	*Campanula rapunculoides* L.	Campanulaceae	Hemicryptophytes	6.38
70	*Digitaria ischaemum* (SCHREBER EX SCHWEIGGER) MÃœHLENB.	Poaceae	Hemicryptophytes	6.38
71	*Hypericum bithynicum* BOISS.	Guttiferae	Hemicryptophytes	6.38
72	*Origanum vulgare* subsp. *viridulum* (Martin-Donos) Nyman	Lamiaceae	Hemicryptophytes	6.38
73	*Vicia cracca* L. subsp. *cracca* L.	Fabaceae	Hemicryptophytes	6.38
74	*Calamintha nepeta* (L.) Kuntze subsp. *glandulosum* (Req.) Govaerts	Lamiaceae	Hemicryptophytes	5.67
75	*Cerasus avium* (L.) Monench	Rosaceae	Phanerophytes	5.67
76	*Echinochloa crus-galli* (L.) P. BEAUV.	Poaceae	Hemicryptophytes	5.67
77	*Inula conyzae* (Griess.)Meikle	Asteraceae	Hemicryptophytes	5.67
78	*Medicago lupulina* L.	Fabaceae	Hemicryptophytes	5.67
79	*Polygonum perfoliatum* L.	Polygonaceae	Therophytes	5.67
80	*Prunella vulgaris* L.	Lamiaceae	Hemicryptophytes	5.67
81	*Ulmus minor* MILLER	Ulmaceae	Phanerophytes	5.67
82	*Vitis* sp.	Vitaceae	Chamaephytes	5.67
83	*Cota tinctoria* var. *pallida* (DC.) U.Özbek & Vural	Asteraceae	Hemicryptophytes	4.96

(*Continued*)

Appendix List 1.
Taxon Name, Family Name, Life Form, and Endemicity and Presence Percentage of the Identified Plants (Kahveci, 2016) (Continued)

	Plant Species	Family Name	Life Form and Endemicity	Presence %
84	*Crepis foetida* L. subsp. *rhoeadifolia* (BIEB.) CELAK.	Asteraceae	Therophytes	4.96
85	*Diospyros lotus* L.	Ebenaceae	Phanerophytes	4.96
86	*Juglans regia* L.	Juglandaceae	Phanerophytes	4.96
87	*Lonicera japonica* Thunb	Caprifoliaceae	Phanerophytes	4.96
88	*Lycopus europaeus* L.	Lamiaceae	Hemicryptophytes	4.96
89	*Nerium oleander* L.	Apocynaceae	Phanerophytes	4.96
90	*Atriplex hastata* L.	Chenopodiaceae	Therophytes	4.26
91	*Centaurea jacea* L.	Asteraceae	Hemicryptophytes	4.26
92	*Cyperus longus* L.	Cyperaceae	Therophytes	4.26
93	*Geranium columbinum* L.	Geraniaceae	Therophytes	4.26
94	*Plantago major L.* subsp. *major*	Plantaginaceae	Hemicryptophytes	4.26
95	*Polygonum aviculare* L.	Polygonaceae	Therophytes	4.26
96	*Rosa canina* L.	Rosaceae	Chamaephytes	4.26
97	*Rumex crispus* L.	Polygonaceae	Hemicryptophytes	4.26
98	*Smilax excelsa* L.	Liliaceae	Phanerophytes	4.26
99	*Convolvulus arvensis* L.	Convolvulaceae	Hemicryptophytes	3.55
100	*Crithmum maritimum* L.	Apiaceae	Chamaephytes	3.55
101	*Datisca cannabina* L.	Datiscaceae	Chamaephytes	3.55
102	*Hedera helix* L.	Araliaceae	Phanerophytes	3.55
103	*Humulus lupulus* L.	Cannabaceae	Phanerophytes	3.55
104	*Mentha spicata* L.	Lamiaceae	Hemicryptophytes	3.55
105	*Punica granatum* L.	Punicaceae	Phanerophytes	3.55
106	*Salix alba* L.	Salicaceae	Phanerophytes	3.55
107	*Salix babylonica* L.	Salicaceae	Phanerophytes	3.55
108	*Solanum woronowii* Pojark	Solanaceae	Therophytes	3.55
109	*Trifolium arvense* L.	Fabaceae	Therophytes	3.55
110	*Amaranthus hybridus* L.	Amaranthaceae	Therophytes	2.84
111	*Athyrium filix-femina (*L.) Roth	Athyriaceae	Geophytes	2.84
112	*Cistus creticus* L.	Cistaceae	Phanerophytes	2.84
113	*Crepis setosa* HALL. FIL.	Asteraceae	Therophytes	2.84
114	*Daucus carota* L.	Umbelliferae	Hemicryptophytes	2.84
115	*Dorycnium pentaphyllum* SCOP. subsp. *herbaceum* (VILL.) ROUY	Leguminosae	Chamaephytes	2.84
116	*Laurus nobilis* L.	Lauraceae	Phanerophytes	2.84
117	*Lotus anqustissumus* L.	Fabaceae	Therophytes	2.84
118	*Malus sylvestris* MILLER	Rosaceae	Phanerophytes	2.84
119	*Oenanthe pimpinelloides* L.	Apiaceae	Hemicryptophytes	2.84
120	*Olea europaea* L. subsp. *europaea*	Oleaceae	Phanerophytes	2.84
121	*Origanum vulgare* L.	Lamiaceae	Hemicryptophytes	2.84
122	*Picris hieracioides* L.	Asteraceae	Hemicryptophytes	2.84
123	*Salvia verticillata* L.	Lamiaceae	Hemicryptophytes	2.84
124	*Scabiosa columbaria* L. subsp. *columbaria* L. var. *intermedia* (POST) MATTHEWS	Dipsacaceae	Hemicryptophytes	2.84

(*Continued*)

Appendix List 1.
Taxon Name, Family Name, Life Form, and Endemicity and Presence Percentage of the Identified Plants (Kahveci, 2016) (Continued)

	Plant Species	Family Name	Life Form and Endemicity	Presence %
125	*Spartium junceum* L.	Fabaceae	Phanerophytes	2.84
126	*Teucrium chamaedrys* L.	Lamiaceae	Hemicryptophytes	2.84
127	*Verbascum blattaria* L.	Scrophulariaceae	Hemicryptophytes	2.84
128	*Verbena officinalis* L.	Verbenaceae	Hemicryptophytes	2.84
129	*Carpinus betulus* L.	Betulaceae	Phanerophytes	2.13
130	*Carpinus orientalis* Mill.	Betulaceae	Phanerophytes	2.13
131	*Cucurbita* sp.	Cucurbitaceae	Chamaephytes	2.13
132	*Cynosurus echinatus* L.	Poaceae	Therophytes	2.13
133	*Dactylis glomerata* L.	Poaceae	Hemicryptophytes	2.13
134	*Dryopteris filix-mas* (L.) SCHOTT	Aspidiaceae	Geophytes	2.13
135	*Elaeagnus angustifolia* L.	Elaeagnaceae	Chamaephytes	2.13
136	*Eryngium maritimum* L.	Apiaceae	Hemicryptophytes	2.13
137	*Euphorbia* sp.	Euphorbiaceae	Hemicryptophytes	2.13
138	*Fagus orientalis* LIPSKY	Fagaceae	Phanerophytes	2.13
139	*Frangula dodonei* Ard. subsp. *dodonei*	Rhamnaceae	Phanerophytes	2.13
140	*Lavatera thuringiaca* L.	Malvaceae	Hemicryptophytes	2.13
141	*Ligustrum japonicum* Thunb.	Oleaceae	Phanerophytes	2.13
142	*Mercurialis annua* L.	Euphorbiaceae	Therophytes	2.13
143	*Pinus pinea* L.	Pinaceae	Phanerophytes	2.13
144	*Polygonum hydropiper* L.	Polygonaceae	Therophytes	2.13
145	*Polystichum braunii* (SPENN.) FEE	Aspidiaceae	Geophytes	2.13
146	*Populus tremula* L.	Salicaceae	Phanerophytes	2.13
147	*Solanum americanum* Mill.	Solanaceae	Therophytes	2.13
148	*Solanum dulcamara* L.	Solanaceae	Hemicryptophytes	2.13
149	*Spiraea vanhouttei* (Briot) Carriere	Rosaceae	Phanerophytes	2.13
150	*Tilia rubra* DC	Tiliaceae	Phanerophytes	2.13
151	*Acer heldreichii* subsp. *trautvetteri* (Medw.) A.E.Murray	Sapindaceae	Phanerophytes	1.42
152	*Acer pseudoplatanus* L.	Sapindaceae	Phanerophytes	1.42
153	*Typha shuttleworthi* W. KOCH ET SONDER	Typhaceae	Hydrophytes	1.42
154	*Agrimonia eupatoria* L.	Rosaceae	Hemicryptophytes	1.42
155	*Alcea biennis* Winterl	Malvaceae	Hemicryptophytes	1.42
156	*Arbutus unedo* L.	Ericaceae	Phanerophytes	1.42
157	*Argyrolobium biebersteinii* BALL	Fabaceae	Hemicryptophytes	1.42
158	*Asplenium adianthum-nigrum* L.	Aspleniaceae	Geophytes	1.42
159	*Buddleja davidii* Franch.	Scrophulariaceae	Phanerophytes	1.42
160	*Centaurea iberica* Trevir. & Spreng.	Asteraceae	Therophytes	1.42
161	*Crataegus microphylla* C. KOCH.	Rosaceae	Phanerophytes	1.42
162	*Cydonia oblonga* MILLER	Rosaceae	Phanerophytes	1.42
163	*Cynoglossum creticum* MILLER	Boraginaceae	Hemicryptophytes	1.42
164	*Galium album* MILLER subsp. *prusense* (C. KOCH) EHREND. ET KRENDL	Rubiaceae	Hemicryptophytes	1.42
165	*Hedera colchica* (C. KOCH) C. KOCH	Araliaceae	Phanerophytes	1.42
166	*Lepidium virginicum* L.	Brassicaceae	Therophytes	1.42

(*Continued*)

Appendix List 1.
Taxon Name, Family Name, Life Form, and Endemicity and Presence Percentage of the Identified Plants (Kahveci, 2016) (Continued)

	Plant Species	Family Name	Life Form and Endemicity	Presence %
167	*Lotus corniculatus* L. var. *corniculatus* (BIEB.) ARC.	Fabaceae	Hemicryptophytes	1.42
168	*Melilotus albus* DESR.	Fabaceae	Therophytes	1.42
169	*Mercurialis perennis* L.	Euphorbiaceae	Hemicryptophytes	1.42
170	*Pinus sylvestris* L.	Pinaceae	Phanerophytes	1.42
171	*Pteris cretica* L.	Pteridaceae	Geophytes	1.42
172	*Pyracantha coccinea* M.ROEMER	Rosaceae	Phanerophytes	1.42
173	*Rhus chinensis* MILL. var. *chinensis*	*Anacardiaceae*	Phanerophytes	1.42
174	*Sambucus nigra* L.	Caprifoliaceae	Chamaephytes	1.42
175	*Solanum luteum* MILLER	Solanaceae	Therophytes	1.42
176	*Sonchus arvensis* L. subsp. *uliginosus* (M.BIEB.) NYMAN	Asteraceae	Hemicryptophytes	1.42
177	*Staphylea pinnata* L.	Staphyleaceae	Phanerophytes	1.42
178	*Syringa vulgaris* L.	Oleaceae	Phanerophytes	1.42
179	*Trifolium repens* L.	Fabaceae	Hemicryptophytes	1.42
180	*Trifolium resupinatum* L. var. *resupinatum* L.	Fabaceae	Therophytes	1.42
181	*Acacia saligna* (Labill.) H.L.Wendl.	Fabaceae	Phanerophytes	0.71
182	*Acanthus mollis* L.	Acanthaceae	Hemicryptophytes	0.71
183	*Achillea maritima* (L.) Ehrend. & Y.P. Guo subsp. *maritima*	Asteraceae	Hemicryptophytes	0.71
184	*Aesculus hippocastanum* L.	Sapindaceae	Phanerophytes	0.71
185	*Anthemis cretica* L.	Asteraceae	Hemicryptophytes	0.71
186	*Beta trigyna* WALDST. ET KIT.	Chenopodiaceae	Therophytes	0.71
187	*Betula pendula* Roth.	Betulaceae	Phanerophytes	0.71
188	*Campanula alliariifolia* WILLD.	Campanulaceae	Hemicryptophytes	0.71
189	*Castanea sativa* Mill.	Fagaceae	Phanerophytes	0.71
190	*Catalpa bignonioides* Walter	Bignoniaceae	Phanerophytes	0.71
191	*Cistus salviifolius* L.	Cistaceae	Chamaephytes	0.71
192	*Citrus limon* (L.) Burm.F.	Rutaceae	Phanerophytes	0.71
193	*Clerodendrum bungei* Steud.	Verbenaceae	Phanerophytes	0.71
194	*Cynodon dactylon* (L.) PERS. var. *villosus* REGEL	Poaceae	Hemicryptophytes	0.71
195	*Diospyros kaki* Thunb.	Ebenaceae	Phanerophytes	0.71
196	*Echium italicum* L.	Boraginaceae	Hemicryptophytes	0.71
197	*Eriobotrya japonica* (THUNB.) LINDL.	Rosaceae	Phanerophytes	0.71
198	*Eucalyptus camaldulensis* DEHNH.	Myrtaceae	Phanerophytes	0.71
199	*Euonymus europaeus* L.	Celastraceae	Phanerophytes	0.71
200	*Helleborus orientalis* LAM.	Ranunculaceae	Hemicryptophytes	0.71
201	*Heracleum platytaenium* BOISS.	Apiaceae	HemicryptophytesEndemik	0.71
202	*Hieracium* sp.	Asteraceae	Hemicryptophytes	0.71
203	*Koelreuteria paniculata* Laxm.	Sapindaceae	Phanerophytes	0.71
204	*Luzula* sp.	Juncaceae	Geophytes	0.71
205	*Oenothera biennis* L.	Onagraceae	Hemicryptophytes	0.71
206	*Philadelphus coronarius* L.	Hydrangeaceae	Phanerophytes	0.71
207	*Phillyrea latifolia* L.	Oleaceae	Chamaephytes	0.71
208	*Pyrus communis* L.	Rosaceae	Phanerophytes	0.71

(*Continued*)

Appendix List 1.
Taxon Name, Family Name, Life Form, and Endemicity and Presence Percentage of the Identified Plants (Kahveci, 2016) (Continued)

	Plant Species	Family Name	Life Form and Endemicity	Presence %
209	*Rhus coriaria* L.	Anacardiaceae	Phanerophytes	0.71
210	*Ruscus aculeatus* L.	Liliaceae	Chamaephytes	0.71
211	*Sanguisorba minor* SCOP.	Rosaceae	Hemicryptophytes	0.71
212	*Sigesbeckia orientalis* L.	Asteraceae	Therophytes	0.71
213	*Sonchus asper* (L.) HILL subsp. *glaucescens* (JORDAN) BALL	Asteraceae	Hemicryptophytes	0.71
214	*Sonchus oleraceus* L.	Asteraceae	Therophytes	0.71
215	*Tanacetum parthenium* (L.) SCHULTZ BIP.	Asteraceae	Hemicryptophytes	0.71
216	*Urtica dioica* L.	Urticaceae	Hemicryptophytes	0.71
217	*Verbascum gnaphalodes* BIEB.	Scrophulariaceae	Hemicryptophytes	0.71
218	*Verbascum thapsus* L.	Scrophulariaceae	Hemicryptophytes	0.71

Note: Kahveci, H. (2016). Doğu Karadeniz Bölgesi Kıyı Kesimi Bitki Örtüsünün Peyzaj Mimarlığı Açısından Değerlendirilmesi, Doktora Tezi, Karadeniz Teknik Üniversitesi Fen Bilimleri Enstitüsü, Trabzon.