Kastamonu Uni., Orman Fakültesi Dergisi, 2018, 18 (2): 108-120 Research Article
Kastamonu Univ., Journal of Forestry Faculty
Doi:10.17475/kastorman.344949

The plant species used as edge elements and their usage types: The case of KTU campus

Emine T. EREN, Tuğba DÜZENLİ*, Elif Merve ALPAK

Karadeniz Techical University, Faculty of Forestry, Trabzon, 61080, TURKEY
*Corresponding author: tugbaduzenli@gmail.com

Received Date: 18.10.2017 Accepted Date: 31.03.2018

Abstract

Aim of study: Planting is a landscape arrangement that best integrates aesthetic, functional, ecological and symbolic influences. There are various organization styles, these styles can be generally classified as formal and naturalistic styles. Plants could be used to create borders, for architectural purposes, to create spaces, to screen bad views, for aesthetic purposes, to create emphasis, to compliment buildings, for erosion control, to direct movements, to screen light, to control noise, to provide shade and for climate control. The present study aims to identify the types of plants used as border elements, the space and purposes of their use.

Area of study: This study was conducted at the Karadeniz Technical University, located on the Trabzon city.

Material and Methods: The main material of the study is planting border elements and Karadeniz Technical University, Kanuni Campus. In the study, observation, data collection, analysis and evaluation were used. At the stage of observation, KTU Kanuni Campus, which is a study area, visited the situation of planting border elements and photographs were taken of the samples that could best represent them

Main results: Accordingly, it was determined that the plant border elements at KTU Kanuni campus were used to separate the buildings with the garden, to create spaces, to screen bad views, for aesthetic purposes, to create emphasis, to complement the buildings, to cover the elevation differences, to direct movement, to form borders, to screen the light, and to control the noise.

Research highlights: The aim of the present study was to reveal the functions of plant border elements formed with the abovementioned species. In the present study, the adaptation, aesthetic and functional effects of the observed plant border elements on the landscapes they surround and the environment were also investigated.

Keywords: Plant, Planting design, Border element, Place of use, Intended use, Ornamental plant

Sınır elemanı olarak kullanılan bitkiler ve kullanım işlevleri; KTÜ kampüsü

Özet

Çalışmanın amacı: Bitkilendirme; estetik, işlevsel, ekolojik ve sembolik etkileri en iyi şekilde bütünleştiren bitkisel peyzaj düzenlemesidir. Çeşitli düzenleme stilleri vardır; bu stiller, genel olarak formal ve naturalistik stil şeklinde sınıflandırılabilir. Bitkiler peyzajda; sınır oluşturma, mimari kullanım, mekân oluşturmak, kötü görüntü perdelemek, estetik kullanım, vurgu oluşturmak, yapıları tamamlamak, erozyon kontrolü, hareketi yönlendirme, ışığı perdeleme, gürültüyü kontrol etmek, gölge temini ve iklim kontrolü gibi amaçlar için kullanılabilmektedir.

Çalışma alanı: Bu çalışma Trabzon ilinde bulunan Karadeniz Teknik Üniversitesinde yürütülmüştür.

Materyal ve Yöntem: Bu çalışmanın ana materyalini, KTÜ kanuni kampüsündeki bitkisel sınır elemanları oluşturmaktadır. KTÜ Kanuni kampüsünde sınır bitkisi olarak kullanılan bitkiler hangi türler olduğu, kullanım yer ve amaçları yerinde yapılan gözlem ve analiz çalışmaları ile tespit edilmeye çalışılmıştır.

Temel Sonuçlar: Buna göre; çalışmada KTÜ Kanuni kampüsündeki bitkisel sınır elemanlarının, bina bahçe ayrımını sağlama, mekân oluşturmak, kötü görüntü perdelemek, estetik kullanım, vurgu oluşturmak, yapıları tamamlamak, kot farkını örtme, hareketi yönlendirme, sınır oluşturma, ışığı perdeleme, gürültüyü kontrol etmek gibi amaçlarla kullanıldığı tespit edilmiştir.

Araştırma vurguları: Bitkisel sınır elemanı olarak kullanılan bitkilerin, tür teşhislerinin yanında kullanım amaçları da tespit edilmiştir. Tespit edilen kullanım amaçları incelendiğinde, daha çok estetik ve fonksiyoneldir.

Anahtar kelimeler: Bitki, Bitkilendirme tasarımı, Sınır elemanı, Kullanım yeri, Süs bitkisi

Introduction

A border is more than a two-dimensional line. Although border theories are often associated with the built environment, they actually expand the idea between the design and spatial order in the botanical spaces positively. In this framework, borders exist in every stage of architectural action with structural and / or botanical aspects such as closing, opening, separating, preserving, defining relationships, identifying, communicating, marking, separating the activities and directing movement (Marcuse, 1999; Uçar and Özsoy, 2006).

The borders must be compatible with the architectural approach of the environment in which they could be used aesthetically. The border elements, also called enclosure elements, include walls (of stone, brick or concrete material), screens, iron-wood railings or green hedges (Lang, 1987; Lynch, 1992; Başal et al., 1993; Tanrverdi, 2001; Bilen, 2004; Bulut et al., 2008; Yörük et al., 2006). The height of border elements is determined based on the law, environment and function. The quality and the grade of the enclosure should be decided based on the environment. There are several different types of material and solutions that could be used in borders. In addition to the aesthetic and usage principles for the border element design, psychological effects should also be considered (Yücel, 2006).

Borders are obstacles that could or could not be penetrated, separating non-identical regions. Regions are areas with similar features separated by borders. Lynch (1992) defined the borders as important constructs for many users, although not as dominant as other elements in the environment (paths, regions, focal points, sign elements). Lynch indicated that the border between the two regions is an important item that many people use to find directions. Border elements assume functions such as providing privacy, protecting from external factors, specifying boundaries based on the intended use and the location of use. These assumed functions affect their size and building material (Bulut et al., 2008).

The low border elements should be designed 20-60 cm high, medium border elements should be designed 80-140 cm high, and high border elements should be designed 180-250 cm high. The quality and grade of the border elements should be suitable for the environment. There are several different types of material and solutions that could be used in borders. In addition to the aesthetic and usage principles for the border element design, psychological effects should also be considered. For example, if the purpose is to provide privacy and to hide a bad view, the border must be higher than human height and massive, if the aim is to prevent people from entering, they must be sufficiently high that people cannot pass over them and narrow that people cannot pass through them. If it is desired that the border area be open to the beautiful views in the surrounding area, the border element should be partially open and low or should not exist at all (Yücel, 2006).

Work conducted to create borders are permanent and long-lasting. Thus, the landscape border elements create a sense of space effective in the vertical and horizontal direction (Uzun, 1997). Border elements cannot be considered apart from the architectural form and approach in the environment they would be used aesthetically. Therefore, traditional and aesthetic features should be emphasized in their planning (Başal et al., 1993). Border elements could include living and non-living material. Plant border elements have constantly changing features, while non-living elements lack this feature, their size, form, color and texture do not change. The changing and alive nature of plant material require constant maintenance, repair and protection. Non-living border elements do not need that kind of maintenance. Their initial construction costs may be high, but their maintenance and repair costs after construction could be very low. Although the speedy bordering with non-living material cannot be obtained immediately with living material, aesthetic and functional results can be obtained in a short period when they are utilized together (Uzun, 1997).

The main functions of border elements are as follows (Başal et al. 1993; Tanrıverdi, 2001):

1. Making an open and green area distinct by enclosing its borders

2. Being effective on the view of the open and green area
3. To partially or completely block the view from or of the open and green area
4. To prevent humans or animals to enter the open and green area
5. To reduce the wind or noise.

Based on the above mentioned information, the status of vegetal border elements at Karadeniz Technical University, Kanuni Campus were examined in the present study.

Material and Method

The main study material includes plant border elements located at Karadeniz Technical University Kanuni Campus. In the present study, landscape research methods of observation, data collection, analysis and assessment were used. In the observation stage, KTU Kanuni Campus, the study area, was visited to observe the status of plant border elements and photographs of the samples that would represent them the best were taken. During the data collection phase, relevant literature was reviewed. In the analysis stage, all available data were evaluated, plant species that were used as border elements, and the functional and aesthetical principles utilized in landscaping were examined.

Study area

Karadeniz Technical University Kanuni Campus (40 ° 33'N- 41 ° 07 'N, 37 ° 07' E 40 ° 30 'E), which is located within the boundaries of Trabzon province in the Eastern Black Sea region in Turkey was selected as the study area. The population of Trabzon, the third largest city in the region, is 250,000 and the province covers a surface area of 190 km2. Its altitude is 37 m, the annual precipitation is 760 mm and the average temperature is 14,6 ° C. The study area is displayed in Figure 1.

Findings

The study material included the plant border elements located at Karadeniz Technical University Kanuni Campus and on the field. Karadeniz Technical University (KTU) was established on May 20, 1955 as the first university outside Ankara and Istanbul and is the fourth university established in the country. KTU has become institution that includes approximately 55,000 students, 1,800 academic and 1,600 administrative personnel. KTU is in the province of Trabzon, which is located on the historical Silk Road, and is a coastal city in the north-eastern Turkey and known as the center of several civilizations in its history of 4000 years. KTU Kanuni Campus is the home to several natural, exotic and endemic species with different physical and visual functions. The campus is rich in flora. The plants are used for several purposes within the campus. They are used to emphasize architectural structures, for aesthetic concerns, functional goals, engineering and climate control, presentation purposes, orientation, borders. Kanuni campus, which is the study area, occupies 1.422 acres of land. The campus includes 467.581 m2 of indoor space. There are 84.210 m2 (18.4%) of classrooms, 54.110 m2 (11.6%) of laboratories, 6.751 m2 (1.4%) of indoor sports facilities, 12.258 m2 (2.6% of canteen and cafeteria space, 61,008 m2 (13%) of housing and 226,563 m2 (48%) of administrative space. The total area of all outdoor sports facilities is 22.681 m2 (5%) (URL1, 2013).

In campus open green areas, there are good examples of plant border elements based on form, color, texture and their harmony with their surroundings. Since the maintenance is conducted regularly, these elements have continuous aesthetic effects.

Bambusa nana, Berberis thunbergii 'Atropupurea' , *Buxus sempervirens* Rotundifolia, *Cupressocyparis leylandii, Euonymus japonica* Aurea, *Euryops pectinatus, Fagus orientalis, Hydrangea macrophylla, İris* sp. , *Laurocerasus officinalis, Laurus nobilis, Ligustrum japonicum, Parthenocissus quinquefolia, Pelargonium hybrida, Platycladus orientalis, Prunus cerasifera* 'Atropurpurea', *Pyracantha coccinea, Rosa* sp, *Rosmarinus officinalis, Senecio maritima ,Salvia splendens, Spiraea × vanhouttei , Thuja occidentalis, Tilia platyphyllos, Wisteria sinensis* species were used as plant border elements.

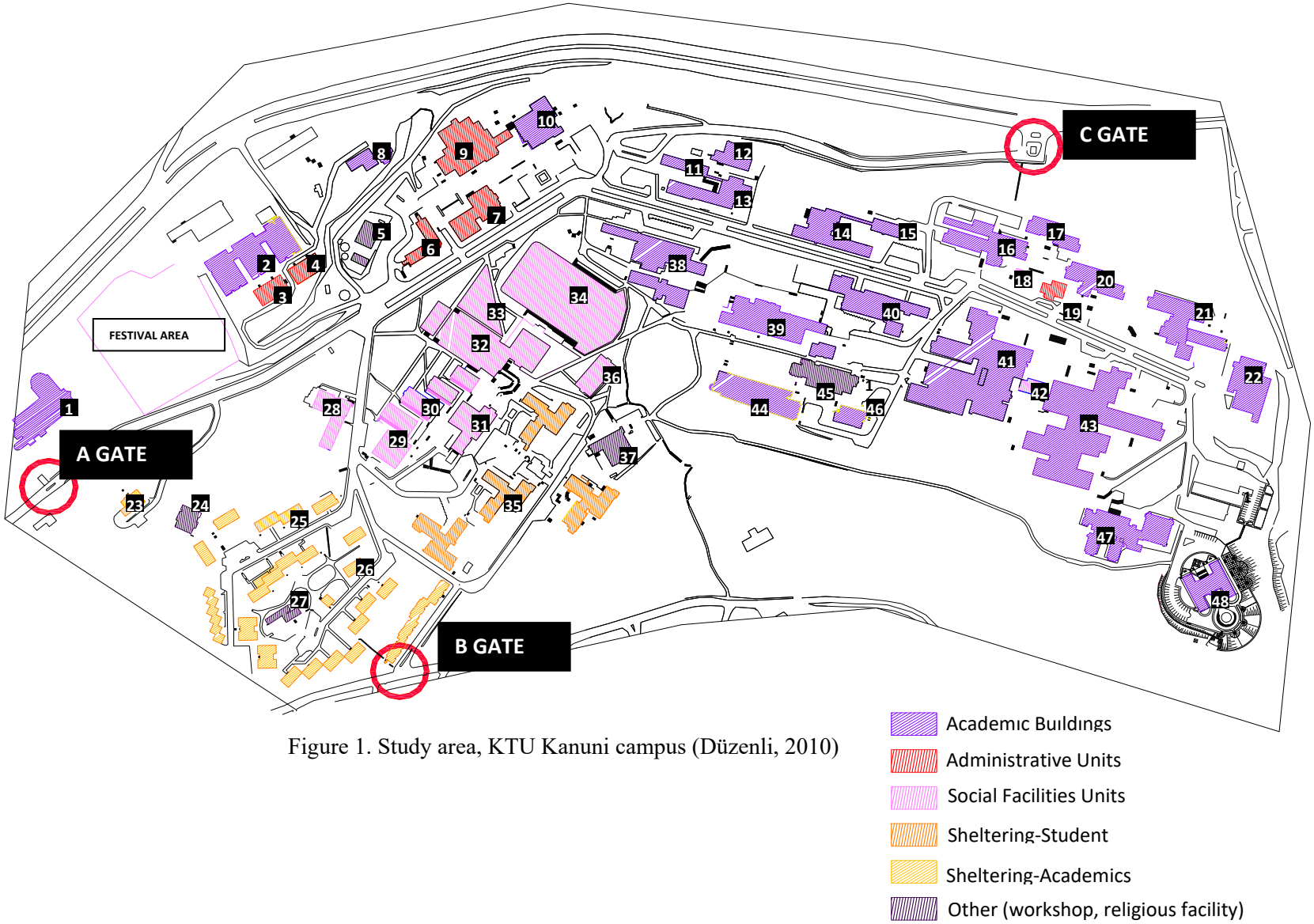
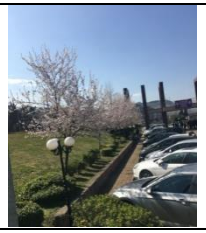
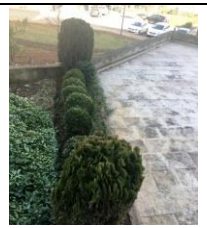
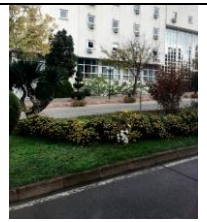


Figure 1. Study area, KTU Kanuni campus (Düzenli, 2010)

Table 1. The locations of border elements used in the KTU Kanuni Campus

1	1	2	2	3	3
	**Species:** *Berberis thunbergii* 'Atropupurea' **Height:** 40-50 cm		**Species:** *Senecio maritima* **Height:** 30-40 cm		**Species:** *İris* sp. **Height:** 30-40 cm
4	4	5	5	6	6
	**Species:** *Salvia splendens* **Height:** 20-30 cm		**Species:** *Thujo occidentalis* **Height:** 60-70 cm		**Species:** *İris* sp. **Height:** 30-40 cm
7	7	8	8	9	9
	**Species:** *Wisteria sinensis* **Height:** 1,5-2 m		**Species:** *Cupressocyparis leylandii* **Height:** 6-8 m		**Species:** *Hydrangea macrophylla* **Height:** 70-80 cm
10	10	11	11	12	12
	**Species:** *Ligustrum japonicum* **Height:** 60-70 cm		**Species:** *Spiraea* × *vanhouttei* **Height:** 80-100 cm		**Species:** *Laurus nobilis* **Height:** 70-80 cm

13	13	14	14	15	15	16	16
	**Species:** *Euonymus japonica* Aurea **Height:** 50-60 cm		**Species:** *Hydrangea macrophylla* **Height:** 70-80 cm		**Species:** *Parthenocissus quinquefolia* **Height:** 8-10 m		**Species:** *Fagus orientalis* **Height:** 70-80 cm
17	17	18	18	19	19	20	20
	**Species:** *Tilia platyphyllos* **Height:** 10-12 m		**Species:** *Prunus cerasifera* 'Atropurpurea' **Height:** 10-12 m		**Species:** *Rosa* sp. **Height:** 50-70 cm		**Species:** *Buxus sempervirens* Rotundifolia **Height:** 30-40 cm
21	21	22	22	23	23	24	24
	**Species:** *Rosmarinus officinalis* **Height:** 60-70 cm		**Species:** *Bambusa nana* **Height:** 70-80 cm		**Species:** *Laurocerasus officinalis* **Height:** 50-60 cm		**Species:** *Euryops pectinatus* **Height:** 30-40 cm
25	25	26	26	27	27	28	28
	**Species:** *Pyracantha coccinea* **Height:** 60-70 cm		**Species:** *Pelargonium hybrida* **Height:** 30-40 cm		**Species:** *Platycladus orientalis* **Height:** 70-80 cm		**Species:** *Rosa sp.* **Height:** 40-50 cm

A total of 23 different taxa was identified. Five of these are groundcover plants: *Salvia splendes*, *İris sp.*, *Pelargenium hybrida, Euryops pectinatus, Senecio maritima*. These are 20-50 cm in height. Three are tall plant border elements. These are *Tilia plataphyllos, Laurocerasus officinalis* ve *Cupressocyparis leylandii, Fagus orientalis, Prunus cerasifera* 'Atropurpurea'. These are 200-400 cm in height. Medium height plants are *Hydrangea macrophylla, Berberis thunbergii* 'Atropurpurea', *Thujo occidentalis, Wisteria sinensis, Ligustrum japonicum, ,Rosmarinus officinalis, Buxus sempervirens* 'Rotundifolia', *Platycladus orientalis, Euonymus japonica* 'Aureus', *Euonymus japonica* 'Aurea variagata', *Rosa sp., Spirea x vanhouttei, Laurocerasus officinalis; Fagus sp, Laurus nobilis, Bambusa nana, Pyracantha coccinea* 'Lalendei' species. Three out of 23 taxa belong to the group Gymnospermae, in other words 'naked seed" plants (*Thujo occidentalis, Platycladus orientalis*, *Cupressocyparis leylandii)*. The remaining 18 taxa belong to the Angiospermae category (enclosed seeds). Accordingly, these species are used as border elements as well as for other purposes such as aesthetical, separation, orientation, limitation, canopy, to enhance the effects, to hide bad views. They were used around ornamental ponds, at the central refuge, sidewalk edges, to separate hard-soft grounds, at the edges of pedestrian crossings, roadsides, in front of the walls, as garden and grass field borders. Plants used as border elements at Kanuni Campus;

1. *Bambusa nana*
2. *Berberis thunbergii* 'Atropupurea'
3. *Buxus sempervirens* 'Rotundifolia'
4. *Cupressocyparis leylandii*
5. *Euonymus japonica* 'Aurea'
6. *Euryops pectinatus*
7. *Fagus orientalis*
8. *Hydrangea macrophylla*
9. *İris* sp.
10. *Laurocerasus officinalis*
11. *Laurus nobilis*
12. *Ligustrum japonicum*
13. *Parthenocissus quinquefolia*
14. *Pelargonium hybrida*
15. *Platycladus orientalis*
16. *Prunus cerasifera* 'Atropurpurea'
17. *Pyracantha coccinea*
18. *Rosa* sp
19. *Rosmarinus officinalis*
20. *Senecio maritima*
21. *Salvia splendens*
22. *Spiraea × vanhouttei*
23. *Thujo occidentalis*
24. *Tilia platyphyllos*
25. *Wisteria sinensis*

The plant border element in photo number 1 is *Berberis thunbergii* Atropurpurea. It was used in the central refuge for aesthetic purposes. The leaves of this species are burgundy color and creates a harmony with the leaves of *Prunus ceracifera* Atropurpurea species used next to it.*Salvia splendens* species could be observed in the photograph number four. This species is a seasonal summer flower in the Lamiaceae family. It is an annual plant. It was used next to the ornamental pond in KTU campus, to render the pond form more distinctive. The plant in photograph number 7, used as the border element, is *Wisteria sinensis* species. It is a deciduous creeper woody plant. It has blue-purple fascicle flowers. It was used on the KTU campus wall to break the rigid structure of the wall and to cover it. It has a very effective appearance during flowering periods. *Ligustrum japonicum* species was used as border element in the photograph number ten. This area is one of the shared spaces in the campus.

Ligustrum japonicum species border elements were created to support the sitting units and canopy elements in this area. The purpose was to limit the back of the individuals sitting in this area with this plant species and to make individuals, who sit in this area which is occupied all day long, feel safe. Yet another aim was to provide a hard ground-to-soft ground separation. In the seventh photo, *Tilia platyphyllos* plant species was used as border element. It is indigenous in the Central and Southern Europe. It is rarely found in the wild. It is a tree commonly used for forestation of boulevards and parks. It is indigenous around Rize, Trabzon, Artvin and Çanakkale in Turkey. It was used on the central refuge of the main transportation axis in the KTU Kanuni campus continuously and along with other species. The species was used for the

allee effect in some parts of the main transportation axis, in others, utilized to form a single axis. The species was used to divert the traffic, to limit the driver's area of interest, to prevent vertical and horizontal adverse views, and to separate the two directions in this bi-directional axis. *Rosmarinus officinalis* was used as the border element in photograph number twenty one. It is an evergreen plant with thin needle-like foliage of the Lamiaceae family. It is a bushy plant with purple flowers. It was also used to cover the elevation difference at KTU Kanuni campus. In photograph 20, the border element was created with *Buxus sempervirens* 'Rotundifolia' and *Platycladus orientalis* species. These were used to separate the hard and soft grounds. In the photo number thirteen, *Euonymus japonica* 'Aureus', species, in other words, multicolored and golden versions of *Euonymus* species were used to create border elements. They were used to separate the edges of the pedestrian crossings and the central refuge. The photographs number eleven shows the *Spirea x vanhouttei* species border element. It was used to border the immediate surroundings of the buildings and separate the private areas from the pedestrian sidewalk. The photo number 14 is the continuation of the area in the photo number nine. In the photo number 14, *Hydrangea macrophylla* was used as border element. The aim was to confine the vicinity of the building the same way and separate its private area from the pedestrian sidewalk. In the photo number 26, the geranium plant, *Pelargenium hybrida* species was used to separate the green areas next to the pedestrian sidewalk. Some examples of plant border elements used in the central refuges at the KTU Kanuni campus. *Euryops pectinatus*, a perennial herbaceous species was used as the border element in photograph number thirteen, *Rosa* sp. species was used as the border element in photograph number 24, *Euonymus japonica* 'Aurea variegata' was used as the border element in 13 photograph, in the 22 photograph, *Bambusa nana* was used as the border element, and on the 25 photograph, *Pyracantha coccinea* 'Lalendei' species was used; all these plants were used for aesthetic purposes in the central refuge. Some of plants border elements were used in front of the walls. *Wisteria sinensis* was used in the seventh photo, *Fagus orientalis* was used in the sixteenth photo, *Laurocerasus officinalis* was used in the twenty third photo and *Cupressocyparis leylandii* was used in the eighth photo. They were usually used to cover the bad appearance of the walls. In the eighteenth and twenty-fourth photographs, fences were formed with plant border elements around the green area. In the photograph 12, *Laurus nobilis*, in the 10 photograph *Ligustrum japonicum* species were used as green area borders. In the photographs, some of plant border elements were used on sidewalk edges. *Hydrangea macrophylla* in the 14 photo, *Thujo occidentalis* in the 5 photo, *Spirea x vanhouttei* in the 11 photo, *Iris* sp. in the 3,6 photos, and *Ligustrum japonicum* species in the 12 photo were used for that purpose. These border elements were used for aesthetic, to hide bad views, to reduce noise, to hide to view, directions, separation and limitattion purposes.

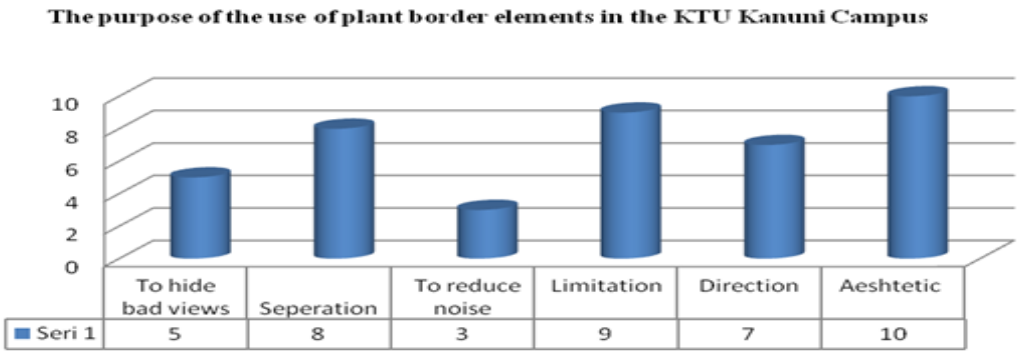


Figure 2. The purpose of the use of plant border elements

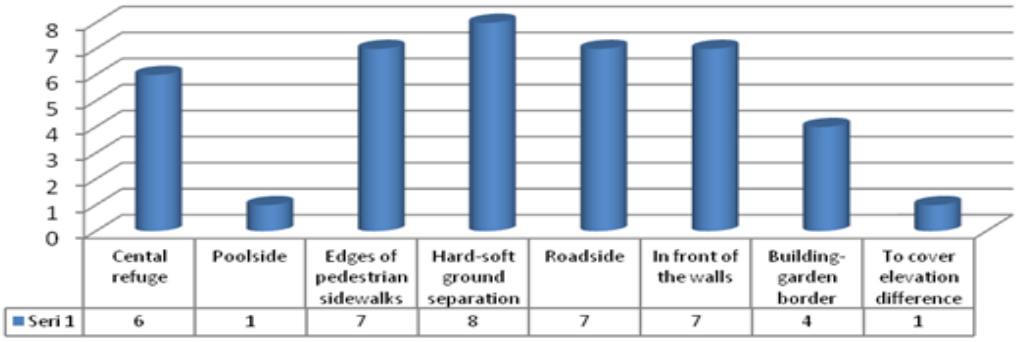


Figure 3. The location of the use of plant elements border

The purpose of the use of plant border elements in the KTU Kanuni campus;

1. To hide bad views
Fagus orientalis
Laurocerasus officinalis
Parthenocissus quinquefolia
Rosmarinus officinalis
Wisteria sinensis

2. **Seperation**
Salvia splendens
Ligustrum japonicum
Senecio maritima
Thujo occidentalis
Spiraea × *vanhouttei*
İris sp.
Laurus nobilis
Buxus sempervirens Rotundifolia

3.To reduce noise
Tilia platyphyllos
Bambusa nana
Pyracantha coccinea

4.Limitation
Ligustrum japonicum
Thujo occidentalis
Spiraea × *vanhouttei*
Senecio maritima
İris sp.
Laurus nobilis
Hydrangea macrophylla
Platycladus orientalis
Buxus sempervirens Rotundifolia

5.Direction
Thujo occidentalis
İris sp.
Spiraea × *vanhouttei*
Laurus nobilis
Tilia platyphyllos
Hydrangea macrophylla
Platycladus orientalis

6.**Aeshtetic**
Berberis thunbergii 'Atropupurea'
Salvia splendens
Wisteria sinensis
Parthenocissus quinquefolia
Euonymus japonica Aurea
Tilia platyphyllos
Rosmarinus officinalis
Pyracantha coccinea
Laurocerasus officinalis
Fagus orientalis

The location of the use of plant border elements in the KTU Kanuni campus;

1. Edges of pedestrian sidewalks
Thujo occidentalis
İris sp.
Hydrangea macrophylla
Spiraea × *vanhouttei*
Ligustrum japonicum
Pelargonium hybrida
Senecio maritima

2. In front of the walls
Wisteria sinensis
Cupressocyparis leylandii
Hydrangea macrophylla
Parthenocissus quinquefolia
Prunus cerasifera 'Atropurpurea'

3. Building-garden border
Spiraea × *vanhouttei*
Hydrangea macrophylla
Rosmarinus officinalis
Fagus orientalis

4. Roadside
Berberis thunbergii 'Atropupurea'
İris sp.
Tilia platyphyllos

Rosa sp.
Pyracantha coccinea
Platycladus orientalis
Euryops pectinatus

5. To cover elevation difference

Rosmarinus officinalis

Result and Discussion

As a result, it was determined that the plant boundary elements in the study areas met the functional requirements and were quite successful in the aesthetic aspect as well. Because the plants on KTU Kanuni campus are maintained regularly. Thus, the KTU Kanuni campus contains very successful examples of aesthetical plant border elements. Plant border elements were used in conjunction with other landscaping elements such as buildings, gardens, roads, pavements, green spaces, refuges and walls. When the observations were conducted, the plant species used as the plant border elements, their locations and purpose of use were taken into consideration.

The plants can be motivated for different purposes when they are used to create a borders. Some of these purposes are;

- ✓ Identification, support and enforcement of structural design (Tarakci Eren and Var, 2016; Şişman et al., 2008)
- ✓ Creating a space (Erdoğan and Erdinç, 2009; Şahin and Dostoğlu, 2009)
- ✓ Connecting objects and spaces (Yılmaz and Özbilen, 2010; Özdemir and Çetinkaya)
- ✓ Enclosure, encirclement, confinement (Sakıcı et al. 2013; Akbulut and Önder, 2011).
- ✓ To provide privacy (Sakıcı and Var, 2013;
- ✓ Hiding unwanted views (screening)(Sakıcı and Var, 2012)
- ✓ Define, highlight, and create focal points (Bekçi et al. 2015)
- ✓ Orientation (Yılmaz et al.2017)
- ✓ Symbolization(Mahmut and Barış, 2012)
- ✓ Providing movement in spaces (Özer et al.,2010)
- ✓ Creating background (Sakıcı et. al.2013)
- ✓ Light, temperature, precipitation, relative humidity, and wind control(Çorbacı and Var, 2011)
- ✓ Noise control (Erdoğan and Yazgan, 2011;Yılmaz and Özer, 1997; Ilgar, 2012)
- ✓ Erosion control (Bekçi et al.2010; Ertekin, 2010).

Similarly, the plant border elements identified within the limits of the study area were used as border elements first, and then for other purposes listed above.

Table 2. Details on the plant border elements used in KTU Kanuni

Species	**Common name**	**Height**	**Purpose of use**	**Location**
Bambusa nana	Bamboo	20-50cm	Aesthetics	Central refuge
Berberis thunbergii 'Atropupurea'	Barberry	50-80cm	Aesthetics	Central refuge
Buxus sempervirens 'Rotundifolia'	Boxwood	20-50cm	Hard-soft ground separation, To cover the elevation difference	Between the pavement and green areas
Cupressocyparis leylandii	Cypress	800-900 cm	To cover concrete walls, Aesthetics	In front of walls
Euonymus japonica 'Aurea'	Euonymus	50-80cm	To limit the pedestrian crossing in the central refuge	Passenger crossing edges
Euryops pectinatus	Yellow daisy	20-50cm	Aesthetics	Central refuge
Fagus orientalis	Beech	50-80cm	Aesthetics in front of building wall	In front of walls
Hydrangea macrophylla	Hortensia	50-80cm	To hide structural walls, To limit the space, To emphasize the road axis, Orientation, To separate the building hinterland,	Roadside, In front of walls, Building garden border
İris sp.	Iris	20-50cm	Aesthetics, Orientation, To limit the sidewalk axis	Central refuge, Sidewalk edges
Laurocerasus officinalis	Prune	50-80cm	To cover building / garden walls, Aesthetics	In front of walls
Laurus nobilis	Bay tree	50-80cm	In front of buildings, To separate hard and soft grounds	Grass area border
Ligustrum japonicum	Ligustrum	50-80cm	To separate vehicle road and green area	Roadside
Parthenocissus quinquefolia	American ivy	800-900cm	To cover wall	Over the wall
Pelargonium hybrida	Geranium	20-50 cm	To strengthen green area and sidewalk separation	Sidewalk edges
Platycladus orientalis	Thujo	50-80 cm	To separate green area and sidewalk	Sidewalk edges
Prunus cerasifera 'Atropurpurea'	Fountain Cherry	800-1000 cm	Aesthetics	Over the wall
Pyracantha coccinea	Scarlet firethorn	50-80 cm	Aesthetics	Central refuge
Rosa sp	Rose	50-80 cm	Aesthetics	Central refuge
Rosmarinus officinalis	Rosemary	50-80 cm	To cover the elevation difference	In front of building walls
Senecio maritima	*Senecio*	30-40cm	To separate green area and sidewalk	Sidewalk edges
Salvia splendens	Sage	20-50 cm	Improve the distinction of the form of the pond	Near the ornamental pond
Spiraea × *vanhouttei*	Astiibe	50-80 cm	To separate the building hinterland and the sidewalk	Building garden border
Thujo occidentalis	Thuja	50-80 cm	To separate sidewalk and building private space	Sidewalk edges
Tilia platyphyllos	Linden tree	800-1000 cm	Separation Aesthetics	Central refuge
Wisteria sinensis	Wistaria	100-150 cm	Canopy	On the walls

References

Akbulut, Ç. D., Önder, S. (2011). Aksaray Kenti Açık-Yeşil Alanlarının Nitelik ve Nicelik Yönünden İncelenmesi. *Selçuk Tarım ve Gıda Bilimleri Dergisi*, 25(1), 90-95.

Başal, M., Y. Memlük, Yılmaz, O. (1993). Peyzaj Konstrüksiyonu. Ankara Üniversitesi Ziraat Fakültesi Yayın No:1322, Ders Kitabı 381, Ankara, 170s.

Bekçi, B., Dinçer, D., Bogenç, Ç. (2015). Kentsel peyzajda kullanılan vitis vinifera'nın Bartın kent ölçeğinde değerlendirilmesi. *İnönü üniversitesi sanat ve tasarım dergisi*, 5(11), 39-47.

Bekci, B., Dinçer, D., Var, M., Yahyaoğlu, Z. (2010). Trabzon Ve Yöresinde Doğal Olarak Bulunan Bazı Meyveli Bitkilerin Yetişme Teknikleri Ve Peyzaj Mimarlığında Değerlendirilmesi, 3.Ulusal Karadeniz Ormancılık Kongresi, 20-22 Mayıs, Cilt4, Sayfa 1456-1466 .

Bilen, S.Ö. (2004). Kentsel Dış Mekanların Tasarımında Antropometrik Verilere Bağlı Olarak Peyzaj Elemanlarının Ankara Örneğinde Araştırılması. Doktora Tezi, Ankara Üniversitesi Fen Bilimleri Enstitüsü, 159 s.

Bulut Y., Atabeyoğlu Ö., Yeşil P. (2008). Erzurum Kent Donatı Elemanlarının Ergonomik Özelliklerinin Değerlendirilmesi Üzerine Bir Araştırma, *Tarım Bilimleri Dergisi*, 14(2), 131-138.

Çorbacı, Ö. L., Mustafa, Var. (2011). Bartın-Amasra Karayolunun Peyzaj Özelliklerinin Peyzaj Planlama Açısından İrdelenmesi Ve Sorunların Giderilmesine Çeşitli Öneriler. *Journal of Bartin Faculty of Forestry*, 13(20), 23-37.

Düzenli T. (2010). Kampüs açık mekan olanaklarının gençlerin psikososyal yapısına bağlı olarak incelenmesi: KTÜ Kanuni Kampüsü Örneği, Doktora Tezi, Trabzon

Erdoğan, E., Yazgan, E. (2007). Kentlerde trafik gürültüsü sorununu azaltmada peyzaj mimarlığı çalışmaları: Ankara örneği. *Tekirdağ Ziraat Fakültesi Dergisi*, 4(2).

Eren, E. T., Var, M. (2016). Parkların Bitkisel Tasarımında Kullanılan Taksonlar: Trabzon Kent Merkezi Örneği. *Artvin Çoruh Üniversitesi Orman Fakültesi Dergisi*, 17(2), 200-213.

Ertekin, M. (2010). Karayollarında Peyzaj Planlama Ve Bitkilendirme Çalışmaları. *Ecological Life Sciences*, 5(2), 105-125.

Ilgar, R. (2012). Çanakkale şehir içi trafiğindeki araç kaynaklı gürültü kirliliğine yönelik ön çalışma. *Zeitschrift für die Welt der Türken/Journal of World of Turks*, 4(1), 253-267.

Lang, J. (1987). Creating architectural theory: The role of behavioral sciences in environmental design, Van Nostrand Reinhold, NY, 177.

Lynch, K. (1992). The image of the city, MIT Press, Cambridge, London, 47-90.

Mahmut, M., Barış, M. E. (2012). Chınese garden and chınese garden art. *Bartın Orman Fakültesi Dergisi*, 14(22), 47-52.

Marcuse, P. (1999). Walls of Fear, in Ellin, N. (editör) Architecture of Fear, Princeton Architectural Press, New York, 110-114.

Özdemir, A., Çetinkaya, E. (2015). Landscape design project of the inner courtyard of the Laodikeia excavation house Laodikeia kazı evi iç avlu peyzaj tasarım projesi. *Journal of Human Sciences*, 12(1), 1440-1459.

Özer, S., Aklıbaşında, M., Zengin, M. (2010). Erzurum kenti örneğinde kullanılan kuşatma elemanlarının kent imajı üzerindeki etkileri. *Tekirdağ Ziraat Fakültesi Dergisi*, 7(2), 123-130.

Şahin, E., Dostoğlu, N. (2007). Use of Natural Data in the Design of Urban Space. *Uludağ University Journal of The Faculty of Engineering*, 12(1).

Şişman, E. E., Korkut, A., Etli, B. (2008). Tekirdağ Valiliği Tören ve Park Alanı Peyzaj Tasarım Süreci.

Sakıcı, Ç., Karakaş, H., Kesimoğlu, M. D. (2013). An Investigation on The Usage of Plant Material in Open Green Spaces in Kastamonu City Center. *Kastamonu University Journal of Forestry Faculty*, 13(1).

Sakıcı, Ç., Var, M. (2013). Ruh ve Sinir Hastalıkları Hastane Bahçelerinin Tedavi Edici Etkilerinin Ortaya Konulmasi İçin Deneyimsel Kaliteler ve Peyzaj Bileşenlerinin Belirlenmesi. *İstanbul*

Üniversitesi Orman Fakültesi Dergisi, 63(2), 21-32.

Sakıcı, Ç., Var, M. (2012). Design Stages of Plant Lighting and Issues to be Considered at Every Stage. *Kastamonu University Journal of Forestry Faculty*, 12(1).

Uçar, Ö. M. and Özsoy, A. (2006). Sınır Kavramına Mekânsal Bir Yaklaşım: Bahçelievler Örneği. *İTÜ Dergisi*/a, 5(2/1), 11-24.

URL1. (2013). http://www.ktu.edu.tr/ktu-tarihce.

Uzun, G. (1997). Peyzaj Konstrüksiyonu I. Çukurova Üniversitesi Ziraat Fakültesi Yayın No:137, 256s.

Tanrıverdi, F. (2001). Peyzaj Mimarlığı Bahçe Sanatının Temel İlkeleri ve Uygulama Metodları, Atatürk Üniversitesi Ziraat Fakültesi Ofset Tesisi, Erzurum, 311.

Yılmaz, H., Özer, S. (1997). Gürültü kirliliğinin peyzaj planlama yönünden değerlendirilmesi ve çözüm önerileri. *Atatürk Üniversitesi Ziraat Fakültesi Dergisi*, 28(3), 515-531.

Yılmaz, S. and Özbilen, A. (2011). Hayvanat bahçeleri tasarım ilkeleri ve tipolojileri. *Turkish Journal of Forestry*, 12(1), 47-56.

Yılmaz, S., Mumcu, S., Akyol, D. (2017). Algısal Yanılsamaların Peyzaj Tasarımında Değerlendirilmesi. *Journal of International Social Research*, 10(51).

Yörük, İ., B. Gülgün, M. Sayman and Ankaya F.Ü. (2006). Peyzaj Planlama Çalışmaları Kapsamında Ege Üniversitesi Kampüs Örneğindeki Peyzaj Donatı Elemanlarının Ergonomik-Antropometrik Açıdan İrdelenmesi. *Ege Üniv. Ziraat Fak. Dergisi*, 43(1), 157-168.

Yücel, G.F. (2006). Ege Mimarlık Dergisi, Kamusal Açık Mekanlarda Donatı Elemanlarının Kullanımı Yayını, 4, 59.