



RESEARCH PAPER

Evaluation of Plants Identified with Historical Places in Terms of Characteristic Properties and Size

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Received: 15 October 2021 / Revised: 20 June 2022 / Accepted: 16 July 2022 / Published online: 29 July 2022
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Abstract

In addition to the facilities historical sites offer to city-dwellers, they play an important role in shaping a city. Over time, these places experience change through restoration, and changes are observed in plant presence and plant composition. This situation causes alienation between people-places. Plants represent many concepts with both their physical features and the meaning given to them by society from past to present. This study investigates the evaluation of plants as elements strengthening the meaning of historical places. Among the 28 plants most frequently used and best recognized by the public, the plants identified with historical places in İstanbul were revealed with this study. Additionally, the presence of a correlation between these plants, categorized according to characteristic properties and size, with the historical places was examined and which plant categories were associated with which historical places. In order to reveal the plant-place identification, a survey study was completed with a total of 500 people, including 100 primary school students, 100 middle school students, 100 high school students, 100 university students and 100 university graduates in İstanbul. In conclusion, for historical places, the *Platanus*, *Pinus*, *Rosa*, *Salix* and *Cercis* species came to the forefront with broad-leaved and conifer trees and flowering bushes chosen in terms of characteristic properties, while trees and shrubs were chosen in terms of size. Additionally, chi-square analysis revealed that educational level and gender differences were effective on plant-place identification. Thus, plants were determined to be used as effective identifying markers for places.

Article Highlights

- We determined the assessment of plants as elements strengthening the meaning of places
- We revealed the plant-historical place identification
- We revealed that *Platanus*, *Pinus*, *Rosa*, *Salix* and *Cercis* species are identified with historical places.
- We revealed that broad-leaved and conifer trees and flowering bushes are preferred for historical places in terms of characteristic properties.
- We revealed that trees and shrubs are preferred for historical places in terms of size.

Keywords Plant-place identification · Plant-place relationship · Plant-place-people · Historical place-plant

Introduction

Shaped by the effect of many factors from past to the present day, towns gain their own specific appearance over time. Currently, all of these values specific to cities are called the urban identity (Özgeriş 2018). Our living spaces,

architecture and linked urban identities have undergone change in an undeniable way with the process of globalization (Ulu and Karakoç 2004). Cities and objects related to cities were plundered after World War II (Levy et al. 1997) and the national identity understanding and search was interrupted. Excessive population growth caused by migration caught cities unprepared and cities were unable to meet demand and this caused destruction of nature (Cropper and Griffiths 1994). As a result of this, the speed of renewal movements in cities increased, cultural structure differentiated and all of this negatively affected places; this led to cities not developing within a certain pattern and the inability

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to protect the values of the city (Rowe et al. 1993; Doğan et al. 2018). Luxury buildings constructed with the latest technologies and slums are seen within the same urban texture and this situation caused the formation of new urban identities and images. However, it is very important to develop cities by preserving all natural and cultural values reaching the present day from the past and to ensure the urban image and urban identity reach future generations (Doğan et al. 2018). What makes a city a city is the different features of that city and qualities that distinguish it from other cities. These qualities play an important role in the urban identity (Sakıcı 2017).

Cities comprise five urban image elements of paths, edges, districts, nodes and landmarks ensuring spatial organization (Lynch 1960). The general character of a city is determined by architectural structures, open-green spaces and their interrelationships. Open-green spaces balance the disrupted relationship between humans and nature and have an important place in improving urban living conditions. Open-green spaces have great importance in terms of human life and needs in urban spaces (Tolunay et al. 2019). Historical sites are assessed as a part of open-green spaces. These areas have many physical and ecological functions like illuminating the city's past, providing esthetic value to the city, ensuring physical comfort, offering recreation opportunities and reducing noise and pollution (Tırnakçı and Aklıbaşında 2018). In addition to the facilities historical sites offer to city-dwellers, they play an important role in shaping a city. These areas are very important places in terms of physical, esthetic, psychological, technical, social, economic and urban health. Over time, these places experience change through restoration, and changes are observed in plant presence and plant composition (Tırnakçı and Aklıbaşında 2018; Yılmaz et al. 2020). This situation causes alienation between people-places. In this respect, it is important to meet the emotional needs of people in space design and to provide a sustainability in which their past and memories will exist (Bahadır 2014). When designing urban open spaces, the spatial features and activities of that location in past periods should definitely be assessed and should be reflected in the design (Doğan et al. 2018). Thus, people's sense of belonging to the place can be increased and their ties with the past can be ensured (Bahadır 2014). If the environment in which people live loses its semantic value or identity and becomes undefinable by the society, it may result in chaos (Aydinli 1993).

Places have their own emotions, features and identities. These are provided by the spatial elements and components creating the place (Doğan et al. 2018; Moneo 1984). Place identity is the set of qualities that make a place readable or meaningful to people by separating it from other places (Oktay 2011). Symbolizing a place means to associate, announce, promote and adopt the history, location and

activities of that place; in short, its whole scope (Sakıcı and Piskin 2019). The image first offered by places is a compound of both natural and structural elements and is never erased from our minds (Oktay 2011; Tırnakçı and Aklıbaşında 2018). This is the projection and connotations of that place within us. The symbol of that space comprises an integration with that space from that point on. Just as a symbol comes to mind when a place is mentioned, seeing that symbol recalls that place. The basic point of all semi-otic models is that people perceive objects with a second meaning apart from their real meanings and through positive or negative emotions evoked by the object (Aydinli 1993). According to this explanation, the sign is a whole consisting of the signifier (object) and the signified (the meaning attributed to the object) (Özek 1980). The symbolic value of a place is important in terms of the cultural sustainability of that place. Plants are the most important among the elements and components creating places.

Plants comprise the vital structure of open-green spaces (Tyson 1998). Plants are known to have many benefits in both esthetic and functional senses in society and open-green spaces (Elings 2006). Especially when organizing urban outdoor spaces, it is very important to make the correct choice of plants in the correct locations as plants are a living material and have significant effects in bringing people closer to nature (Sakıcı et al. 2013). Plants provide many contributions to people. These contributions may be collected under four headings. These are that; (i) they distance people from stressful urban environments (Armstrong 2000; Kaplan 1992), (ii) they appeal to the mental and physical senses of people, animating the past and motivating the desire to research and find new things (Relf 1992), (iii) they appeal to the senses and increase interest and concentration (Gezondheidsraad 2004), and (iv) they meet individual needs. Plants are a part of our lives and they remind us that we are living. They play an important role in a person feeling respect for the self (Gezondheidsraad 2004; Mattson 1992; Lewis 1996; Hewson 1994; Rice and Remy 1994). Plants used in urban environments are elements contributing to the urban ecosystem in a functional sense like providing energy saving, creating humidity (Beckett et al. 2000; Akbari et al. 2001), reducing noise (Çepel 1988; Walker 1991), reducing wind, dust and greenhouse effects (Novak et al. 2000; Akbari et al. 2001; Nowak and Crane 2002), and preventing light reflections (Heisler 1986; Walker 1991; Heisler and Grant 2000). Plants that are well-known and recognized by people provide cognitive and mental stimulation and thus are known to have the feature of animating the past (Elings 2006). The choice of plants as descriptors of any concept depends on their physical nature and the metamorphic creative capacity of the human brain (Davies 1988). Guiraud's (1994) "Homological Systems" and Jacobson's "Logic of Abstraction" (Fiske 1996) reveal that the meaning of space can be

ascribed to the plant and can be a sign of this space due to its use and time (Aksoy 1987). As a result of effects induced in individuals by plants, they are loaded with meaning and then this situation causes plants to gain symbolic meaning. Symbolic meaning directs a person's thoughts and creates a value like positive or negative effect, liking or disliking or accepting or rejecting (Ozbilen and Kalın 2001). This study is based on the semiotic theory produced by Roland Barthes by defining the relationship between the sign and the interpreter (Barthes 1973). Plants have a very important function in identifying and emphasizing our physical surroundings (Sakıcı and Piskin 2019).

It is very important to make the correct choice of plants in the historical places, as plants create the symbolic value of the place. When designing historical places, the plants used in those areas in the past should definitely be evaluated. Thus, it can be ensured that the past is revived with mental stimulation and the sense of belonging to the place increases. However, the symbolic meanings of plants and their psychological benefits to humans have not been adequately examined. To our knowledge, none of these existing reviews have provided a detailed review of the symbolic meanings of plants. Whereas, plants have been used throughout history with symbolic meaning and certain places are identified with certain plants. Plants have a different level signified and show a difference according to special cultures and society as a result of people's interaction and usage with plants (Fiske 1996; Ozbilen and Kalın 2001). One of the oldest beliefs about plants is the concept of the "Tree of Life". "Tree of Life" refers to a ladder joining two different worlds (heaven and real world) (Davies 1989). In many cultures it has become a tradition to plant a tree to represent freedom because of its long life and majestic trunk. Some plants evoke death due to the emotions evoked by their physical form. The usage of the pyramidal cypress tree in the cemetery is meaningful (Arrien 1992). In Iranian gardens, plants created a religious philosophy with cypress symbolizing death and flowering trees representing life and hope (Aslanı 1984). In Greek belief, the plane tree is considered as a tree

under which academic discussions were held (Cooper 2012). With this study, to address the knowledge gap, we carried out this research, first to explore (1) which plants identify with historical gardens and then to emphasize (2) the need to choose plants linked to the space features and then to reveal (3) the size groups and characteristic properties which came to the fore among selections of plants for the historical gardens, and to ensure (4) animation of the past with mental stimulation and to preserve (5) the identity of the place in terms of planting with appropriate plant selections.

Materials and Methods

One of the most important features of the components and elements of a place is that they communicate the meaning of the place to the user (Doğan et al. 2018). Plants express many concepts with both physical features and the meaning given by society from the past to the present. The decision was made to perform this study in order to determine the assessment of plants as reinforcing elements for the meaning of place. In order to determine which plants were identified with historical sites, firstly an attempt was made to determine plants recognized most by people in İstanbul with a preliminary survey. In the preliminary survey, the participants were asked to write down ten different plant species they knew. According to the preliminary survey results, 65 different plant species were noted by the public and when the reference distribution of these plants are examined, the decision was made to choose the most commonly chosen 28 plant species as study material (Table 1). To reveal people's perception of plant-place interactions, though difficult, targeted data collection may be provided by experimental studies (Sakıcı and Piskin 2019; Ozbilen and Kalın 2001). It has been demonstrated that public participation is important in environmental assessment and that education level and gender are effective in preferences (Stokes et al. 1990). In the light of this information, in order to reveal the plant-place identifications, a survey study was completed

Table 1 Grouping of the plants used in the study according to the characteristics properties and size

Group names	Plants	Characteristics properties of plants	Size of plants
1.Group	<i>Picea, Pinus, Cupressus</i>	Conifers	Trees
2.Group	<i>Platanus, Salix, Tilia, Magnolia, Populus</i>	Broad-leaf trees	
3.Group	<i>Cercis, Lagerstroemia, Acacia, Nerium</i>	Small flowering trees	Small trees
4.Group	<i>Olea, Elaeagnus,</i>	Small gray-colored fruit trees	
5.Group	<i>Round Robinia</i>	Commonly-used small tige trees	
6.Group	<i>Thuja, Buxus, Euonymus</i>	Shrubs used as live fencing	Shrubs
7.Group	<i>Rosa, Tamarix, Viburnum, Jasminum</i>	Flowering shrubs	
8.Group	<i>Lonicera, Vitis, Bougainvillea</i>	Twining-climbing plants	Climbers
9.Group	<i>Tulipa, Papaver, Viola</i>	Flowers	Groundcover

to determine which of these 28 plants were identified with historical sites. The survey was conducted in Istanbul in Turkey. The population of Istanbul is 15 million 840 thousand 900 people. The minimum sample size was found to be 384 people at the 95% confidence level and 0.5% standard deviation. Participants were selected on a completely voluntary basis. Considering that educational level and age distribution is an important factor in plant-place identification (Stokes et al. 1990), the survey was applied to groups with different educational level. With this aim, 100 people each in five categories of educational level (primary school, middle school, high school, university students and university graduates) were determined and the study was completed with a total of 500 people. Additionally, in order to determine the effect of gender on plant-place identification, care was taken to ensure balance in the gender distributions of participants in each of the educational level groups. The survey questioned the demographic characteristics of participants (gender and education level) and which three plants identified with historical places from the 28 plants determined. A template was created with plant names and images when applying the survey to ensure visual recognition of plants and prevent negative situations like not knowing, not recalling or mistaken plant names. This created template was shown to the participants during the survey to help them remember the plants. Surveys were administered to primary school, middle school, high school and university students in groups in classes, and to university graduates individually. At the evaluation stage, these plants were divided into five groups in terms of size and nine groups in terms of characteristic properties (Table 1) (Sakıcı and Piskin 2019). Thus, it has been tried to determine which size groups and which characteristic features are identified with historical places.

In this study, the size groups and characteristic properties which came to the fore among selections of plants for the historical sites were revealed with the aid of frequency tables. Chi-square (χ^2) test was used to determine the effects of education level and gender differences on plant preference, the characteristics of plants and size of plants for historical garden in this study.

Table 2 Gender distribution according to the educational level of the participants

Educational level	Primary school	Secondary school	High school	University	University graduate	Total
Gender						
Female	46	44	88	59	62	299
Male	54	56	12	41	38	201
Total	100	100	100	100	100	500

Results

Demographic Characteristics of Participants

The survey study was applied to 100 people each in five different educational levels of primary school, middle school, high school, and university students and university graduates living in İstanbul, and the study was completed with a total of 500 surveys. Of those participating in the survey, 299 were women and 201 were men. The gender distribution of participants is given in Table 2 and age distribution is given in Table 3.

Determination of Plants

A preliminary survey was completed with the aim of determining the plant species best known by participants and these 500 people were requested to write down ten plants. Responses were listed from best to least known for every educational level and in total (Table 4). Among these plants, plants known by at least 10% of the participants (50 people) were chosen as study material. Among the plants, daisy, orchid and cactus were included; however, as daisy mostly grows wild in meadows and orchid and cactus are mostly indoor plants these plants were excluded from the study. The study was completed with 28 plants.

Findings Related to Plant-Place Identification

For the survey to reveal which plants were identified with historical sites, participants were requested to choose three

Table 3 Age distribution according to the educational level of the participants

Age distribution	<i>n</i>	Min	Max	Average	Standard deviation
Primary school	100	9	10	9.9	0.33
Secondary school	100	13	14	13.7	0.44
High school	100	15	18	16.0	0.75
University	100	18	28	22.3	1.96
University graduate	100	22	59	37.2	8.54

Table 4 Distribution of the plant species best known by participants according to educational level

Education level										Total
Primary school		Secondary school		High school		University		University graduate		
Plants	<i>n</i>	Plants	<i>n</i>	Plants	<i>n</i>	Plants	<i>n</i>	Plants	<i>n</i>	Plants* <i>n</i>
Rosa	81	Rosa	90	Rosa	81	Rosa	75	Rosa	55	Rosa 382
Tulipa	74	Pinus	71	Viola	66	Viola	67	Viola	55	Viola 320
Viola	64	Tulipa	70	Anthemis	56	Pinus	55	Pinus	46	Tulipa 292
Pinus	62	Viola	68	Papaver	55	Anthemis	51	Tulipa	46	Pinus 287
Platanus	55	Papaver	59	Tulipa	54	Tulipa	48	Cercis	38	Papaver 247
Papaver	53	Platanus	56	Pinus	53	Platanus	44	Papaver	38	Platanus 237
Jasminum	50	Jasminum	45	Platanus	46	Papaver	42	Platanus	36	Anthemis 223
Anthemis	48	Anthemis	41	Jasminum	42	Jasminum	41	Salix	34	Jasminum 206
Populus	35	Salix	40	Populus	34	Populus	38	Acacia	29	Salix 171
Picea	30	Populus	39	Salix	33	Salix	34	Tilia	28	Populus 167
Salix	30	Vitis	33	Magnolia	31	Lonicera	33	Tamarix	28	Tilia 138
Vitis	29	Tilia	33	Vitis	30	Cercis	29	Jasminum	28	Cercis 135
Lagerstr	27	Nerium	26	Lonicera	29	Lagerstr	29	Picea	27	Vitis 133
Tilia	26	Olea	26	Phalaen	29	Tilia	28	Anthemis	27	Lonicera 128
Phalaen	25	Magnolia	24	Nerium	29	Picea	27	Cereus	26	Lagerstr 119
Lonicera	22	Cercis	23	Cercis	24	Cupressus	25	Lonicera	24	Picea 116
Cercis	21	Lonicera	20	Lagerstr	23	Nerium	24	Cupressus	24	Nerium 108
Cereus	18	Lagerstr	19	Tilia	23	Phalaen	22	Vitis	21	Phalaen 103
Viburnum	18	Acacia	18	Picea	18	Vitis	20	Populus	21	Magnolia 101
Magnolia	16	Cereus	18	Olea	18	Bougainvil	18	Lagerstr	21	Olea 96
Thuja	16	Dianthus	17	Acacia	16	Thuja	18	Olea	21	Acacia 93
Bougainvil	15	Phalaen	16	Cereus	16	Olea	18	Buxus	18	Cereus 88
Acacia	14	Poa	15	Thuja	16	Tamarix	17	Nerium	18	Cupressus 80
Poa	13	Viburnum	14	Viburnum	15	Magnolia	17	İğde	16	Tamarix 79
Olea	13	Picea	14	Buxus	14	Acacia	16	Viburnum	16	Viburnum 77
Tamarix	12	Bougainvil	10	Tamarix	13	Buxus	16	Euonymus	16	Bougainvil 69
Cupressus	12	Tamarix	9	Dianthus	12	Viburnum	14	Robinia	16	Thuja 69
Eleagnus	11	Cupressus	9	Bougainvil	11	Robinia	14	Bougainvil	15	Buxus 67
Buxus	11	Buxus	8	Eleagnus	11	Narcissus	12	Magnolia	13	Eleagnus 50
Nerium	11	Robinia	8	Narcissus	10	Hyacinthus	12	Hyacinthus	13	Euonymus 50
Quercus	10	Thuja	7	Cupressus	10	Euonymus	12	Thuja	12	Robinia 50
Narcissus	9	Crocus	6	Robinia	10	Cereus	10	Phalaen	11	Dianthus 46
Narcissus	7	Narcissus	6	Euonymus	10	Juniperus	7	Prunus-Plum	10	Poa 44
Chamaerops	7	Euonymus	6	Poa	7	Eleagnus	6	Ranunculus	9	Narcissus 41
Prunus-Plum	6	Eleagnus	6	Prunus-Plum	6	Nymphaea	6	Dianthus	9	Hyacinthus 36
Dianthus	6	Narcissus	5	Narcissus	6	Crocus	5	Nymphaea	9	Narcissus 29
Euonymus	6	P.serrulata	4	Nymphaea	6	Quercus	4	Crocus	8	Prunus-Plum 26
Corylus	5	Hyacinthus	4	Juniperus	5	Chamaerops	4	Carpinus	8	Nymphaea 24
Malus	5	Syringa	3	Hyacinthus	5	Lilium	4	Sansevieria	8	Crocus 24
Lilium	4	Citrus	3	Lilium	4	Begonia	3	Juglans	7	Quercus 23
Nymphaea	3	Lilium	3	Crocus	3	Poa	3	Quercus	7	Lilium 22
Juniperus	2	Prunus-Plum	2	Lavandula	3	Ranunculus	3	Narcissus	7	Malus 21
Triticum	2	Ficus	2	Sansevieria	3	Prunus	3	Chamaerops	7	Chamaerops 18
Crocus	2	Quercus	2	Begonia	2	Lavandula	3	Lilium	7	Juniperus 18
Prunus	2	Other	2	Impatiens	2	Prunus-Plum	2	Begonia	6	Sansevieria 13
Syringa	2			Syringa	2	Corylus	2	Poa	6	Ranunculus 12
Hyacinthus	2			Other	8	Carpinus	2	Wisteria	6	P.serrulata 12

Table 4 (continued)

Education level										Total	
Primary school		Secondary school		High school		University		University graduate		Plants*	n
Plants	n	Plants	n	Plants	n	Plants	n	Plants	n		
Robinia	2					Dianthus	2	Narcissus	6	Begonia	11
Citrus	2					Syringa	2	Juniperus	4	Corylus	11
Other	4					Wisteria	2	Malus	4	Carpinus	10
						Narcissus	2	Corylus	4	Lavandula	9
						Sansevieria	2	Abies	4	Syringa	9
						Other	7	Cydonia	3	Wisteria	8
								Lavandula	3	Juglans	7
								Impatiens	2	Other	45
								Other	19		

*The plants decided to be used in the study are written in bold

from the 28 plants which they considered to be associated with historical places. As a total of 500 people participated in the survey study, 1500 plant selections were made (500×3). The analysis revealed which plants came to the forefront for historical sites and additionally grouped plants chosen for historical sites according to size and characteristic properties.

It was determined that the plant choices of participants for historical gardens differed according to educational level ($p < 0.05$). It was found that primary school students chose *Rosa* (39%), *Tulipa* (32%) and *Papaver* (24%), middle school students chose *Platanus* (35%), *Pinus* (35%) and *Salix* (33%), high school students chose *Platanus* (36%), *Rosa* (24%), *Salix* (23%) and *Vitis* (23%), university students chose *Cercis* (24%), *Pinus* (22%) and *Tulipa* (21%) and university graduates chose *Platanus* (37%), *Cercis* (36%) and *Pinus* (28%). When the total values of choices are examined, the top five plants most chosen for historical gardens were *Platanus* (26%), *Pinus* (24%), *Rosa* (22%), *Salix* (20%) and *Cercis* (20%), in that order (Table 5).

Analysis based on groups created according to the characteristic properties of plants determined there were statistical differences in terms of educational level for plant groups chosen by participants for historical gardens ($p < 0.05$). According to the analysis results, the most commonly chosen groups for historical gardens were the 9th group (flowers) for primary school students (76 times), 2nd group (broad-leaf trees) for middle school (89 times), high school (67 times) and university graduates (75 times) and 3rd group (small flowering trees) for university students (57 times). When the total values related to selections of these groups are examined, the most commonly chosen groups were the 2nd group (broad-leaf trees) with 331 selections, the 1st group (conifers) with 233 selections and the 7th group (flowering shrubs) with 208 selections (Table 6). Analysis in terms of

gender did not find any statistical difference between the groups ($p < 0.05$). For both genders, the first choice was 2nd group (broad-leaf trees (women 204 times, men 127 times) (Table 7).

Analysis on the basis of groups formed according to plant sizes revealed differences in selection distributions linked to educational level ($p < 0.05$). For all educational levels, the most commonly chosen size was trees (primary school 84 selections, middle school 150 selections, high school 97 selections, university students 105 selections and university graduates 128 selections). When the total values related to the chosen groups are examined, it was determined that mostly trees (564 times) and shrubs (333 times) were chosen (Table 8). There was a significant difference between the size groups chosen linked to gender ($p < 0.05$). The first choice for historical gardens was the tree group for both women (344 times) and men (220 times) (Table 9).

Discussion

One of the most important functions that components and elements of places have is to transfer the meaning of the place to users (Doğan et al. 2018). It is important place identity and preserving the identity of a place (Ozbilen and Kalın 2001). Plants can express many concepts through both physical features and the meaning given to them by society from past to present, so in this study the decision was made to reveal how plants can be assessed as reinforcing elements for the meaning of a space. From the past to the present day, it is known that plants bring some places to mind from the human memory (Sakıcı and Piskin 2019). In a study in Trabzon, Ozbilen and Kalın (2001) stated that some plants were identified with some spaces such as; cypress and plane for mosques and shrines; cypress and cedar for cemeteries;

Table 5 Distribution of plant preferences for the historical garden according to educational level

Ranking	Plants	Primary school	Sec- ondary school	High school	University	University graduate	<i>p</i>	Total
1	<i>Platanus</i>	16	35	25	15	37	0.000	128
2	<i>Pinus</i>	17	35	17	22	28		119
3	<i>Rosa</i>	39	14	24	17	16		110
4	<i>Salix</i>	9	33	23	16	20		101
5	<i>Cercis</i>	14	14	11	24	36		99
6	<i>Tulipa</i>	32	9	22	21	13		97
7	<i>Picea</i>	16	16	6	15	19		72
8	<i>Populus</i>	16	12	7	19	6		60
9	<i>Vites</i>	5	9	23	15	7		59
10	<i>Lagerstroemia</i>	16	11	7	17	8		59
11	<i>Papaver</i>	24	8	10	8	6		56
12	<i>Thuja</i>	12	16	6	11	10		55
13	<i>Jasminum</i>	10	7	20	5	9		51
14	<i>Bougainvillea</i>	6	10	7	10	13		46
15	<i>Lonicera</i>	6	8	14	5	9		42
16	<i>Cupressus</i>	7	10	7	12	6		42
17	<i>Buxus</i>	4	8	11	9	7		39
18	<i>Viola</i>	20	3	8	5	2		38
19	<i>Euonymus</i>	2	9	5	9	6		31
20	<i>Viburnum</i>	5	6	4	5	5		25
21	<i>Olea</i>	5	3	7	4	6		25
22	<i>Tilia</i>	2	6	6	4	6		24
23	<i>Elaeagnus</i>	1	1	6	9	6		23
24	<i>Tamarix</i>	6	4	5	1	6		22
25	<i>Nerium</i>	3	3	4	9	2		21
26	<i>Acacia</i>	3	3	3	7	4		20
27	<i>Magnolia</i>	1	3	6	2	6		18
28	<i>Round Robinia</i>	3	4	6	4	1		18

Bold: most preferred

Table 6 Distribution of preferences based on the characteristics of plants for the historical garden according to educational level

Group	Total		Educational level										<i>p</i>
			Primary school		Secondary school		High school		University		University graduate		
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
2.Group	331	22.1	44	14.7	89	29.7	67	22.3	56	18.7	75	25.0	0.000
1.Group	233	15.5	40	13.3	61	20.3	30	10.0	49	16.3	53	17.7	
7.Group	208	13.9	60	20.0	31	10.3	53	17.7	28	9.3	36	12.0	
3.Group	199	13.3	36	12.0	31	10.3	25	8.3	57	19.0	50	16.7	
9.Group	191	12.7	76	25.3	20	6.7	40	13.3	34	11.3	21	7.0	
8.Group	147	9.8	17	5.7	27	9.0	44	14.7	30	10.0	29	9.7	
6.Group	125	8.3	18	6.0	33	11.0	22	7.3	29	9.7	23	7.7	
4.Group	48	3.2	6	2.0	4	1.3	13	4.3	13	4.3	12	4.0	
5.Group	18	1.2	3	1.0	4	1.3	6	2.0	4	1.3	1	0.3	

Bold: most preferred

Table 7 Distribution of preferences based on the characteristics of plants for the historical garden according to gender

Characteristics properties of plants groups	Gender				<i>p</i>
	Female		Male		
	<i>n</i>	%	<i>n</i>	%	
Conifers (1.Group)	140	15.6	93	15.4	0.092
Broad-leaf trees (2.Group)	204	22.7	127	21.1	
Small flowering trees (3.Group)	121	13.5	78	12.9	
Small gray-colored fruit trees (4.Group)	27	3.0	21	3.5	
Commonly-used small tige trees (5.Group)	13	1.4	5	0.8	
Shrubs used as live fencing (6.Group)	72	8.0	53	8.8	
Flowering shrubs (7. Group)	122	13.6	86	14.3	
Twining-climbing plants (8.Group)	101	11.3	46	7.6	
Flowers (9.Group)	97	10.8	94	15.6	

Bold: most preferred

plane, cedar and acacia for palaces-mansions; rose, cypress and willow for public housing gardens; plane and silk trees for official institution gardens; maple, cedar and willow for city and neighborhood parks; and plane, hydrangea and lily for squares. This study reveal that plants are associated with places. Plants associated with places with historical or architectural features are placed in the human memory subconsciously and when that plant is seen, the place is recalled (Ozbilen and Kalin 2001). Plants have a very important function in recognizing and emphasizing our physical surroundings. Plants associated with places may be used as elements supporting the meaning of the place (Ozbilen and Kalin 2001; Nemutlu et al. 2013). However, changes cause a reduction in the connection between people and place and feeling of belonging (Doğan et al. 2018).

It is an undeniable reality that plants have many benefits in both esthetic and functional senses in society and open-green spaces (Elings 2006). Plants positively affect the perceivability of places (Ozbilen and Kalin 2001; Doğan et al. 2018). Since this study deals with plants in historical

areas in Istanbul, first of all, plant diversity in Istanbul will be discussed. Then, the similarities between the plant species found in the historical places in Istanbul and the size group, characteristic group and plants identified with the historical places that emerged as a result of this study will be discussed.

The plant diversity in Istanbul is not limited to natural species. İstanbul has a large variety in terms of exotic plants. This giant city has a separate importance due to its historical past. Many plants whose natural living area is not İstanbul and belong to a variety of regions of the world are distributed throughout the city. The diversity of exotic plants and the reflection of some of these in cultural life adds a unique meaning to İstanbul. Some of these were brought to İstanbul from their endemic regions for a variety of reasons, some have become naturalized to İstanbul and some of these plants have added a unique meaning to İstanbul with their reflections in cultural life and these plants have entered the urban identity (Avcı 2008). The diversity of İstanbul in terms of plants is not limited to only natural species. Trees were planted in İstanbul with a variety of campaigns in recent times like the “100,000 trees for İstanbul” campaign in the 1990s and during these activities many non-native species were planted in a variety of locations in

Table 9 Distribution of preferences based on the size of plants for the historical garden according to gender

Size of plants	Gender				<i>p</i>
	Female		Male		
	<i>n</i>	%	<i>n</i>	%	
Trees	344	38.4	220	36.5	0.017
Small trees	161	17.9	104	17.2	
Shrubs	194	21.6	139	23.1	
Climbers	101	11.3	46	7.6	
Groundcover	97	10.8	94	15.6	

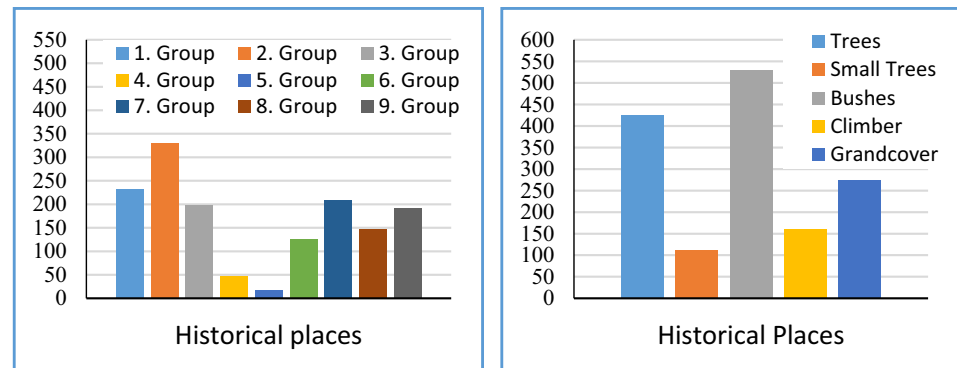
Bold: most preferred

Table 8 Distribution of preferences based on the size of plants for the historical garden according to educational level

Size of plants	Total		Education level										<i>p</i>
			Primary school		Secondary school		High school		University		University graduate		
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Trees	564	37.6	84	28.0	150	50.0	97	32.3	105	35.0	128	42.7	0.000
Small Trees	265	17.7	45	15.0	39	13.0	44	14.7	74	24.7	63	21.0	
Shrubs	333	22.2	78	26.0	64	21.3	75	25.0	57	19.0	59	19.7	
Climbers	147	9.8	17	5.7	27	9.0	44	14.7	30	10.0	29	9.7	
Groundcover	191	12.7	76	25.3	20	6.7	40	13.3	34	11.3	21	7.0	

Bold: most preferred

Fig. 1 Preferred plants according to its size and characteristic properties for the Historical Places



the city (Yaltırık et al. 1997). This and similar campaigns have caused changes in the vegetation of the İstanbul city. Changes cause a reduction in the connection between people and place and feeling of belonging (Doğan et al. 2018).

In the study, 28 plant species were determined for historical places and it was revealed which of these plant species were identified with historical gardens and the presence of these species in historical gardens was discussed. When examined in terms of plant species, plant species identified with historical places are *Platanus*, *Pinus*, *Rosa*, *Salix* and *Cercis* plant species, respectively. Şen (1993) and Seçen (2011) revealed these species were used in historical places. Yılmaz et al. (2020) investigated the plants in ten different historical squares in İstanbul and identified 58 different species, including the top five plants in our study. Again Seçen (2011) researched plant species used during the period of the Ottoman Empire and found that *Platanus*, *Pinus* and *Salix* species were widely used. Başer and Yıldızcı (2011) mentioned six plants (*Platanus*, *Tilia*, *Fraxinus*, *Quercus*, *Cupressus* and *Pinus*) that reflected the historical identity of İstanbul and had become symbols of the city due to use through the centuries. These plants included *Platanus* and *Pinus*. *Platanus*, *Salix* and *Cercis* are included among plants used in early Ottoman period gardens and *Cercis* types were included in harem gardens (Seçen 2011). In the Babürname, or Memoir of Babur (Arat 1981), Babur's favorite trees and shrubs appear to include *Platanus*, *Salix* and *Cercis* (Seçen 2011). It is understood from these studies that these five plant species are frequently used in historical gardens. Therefore, the participants identified these plant species with historical places.

Within the scope of the study, plants were divided into five groups according to size as trees, small trees, shrubs, climbers and ground cover, and trees and shrubs were chosen most often for historical sites in terms of size (Fig. 1). No study has been found that examines the vegetative structure in historical gardens in İstanbul in terms of size. However, a study by Ayaşlıgil (2019) revealed that trees were mostly used for historical places. Yener (2016) stated that trees are used extensively in historical places in İstanbul. However,

there is no literature on the intensive use of shrubs in historical areas in İstanbul. This situation reveals the originality of the study.

Within the scope of the study, plants were divided into nine groups in terms of characteristic properties of conifers (1st group), broad-leaf trees (2nd group), small flowering trees (3rd group), small gray-colored fruit trees (4th group), commonly-used small tige trees (5th group), shrubs used as live fencing (6th group), flowering shrubs (7th group), twining-climbing plants (8th group) and flowers (9th group). For historical sites, it was revealed that mostly broad-leaf trees, conifers and flowering shrubs were chosen in terms of characteristic properties (Fig. 1). No study has been found that examines the vegetative structure in historical gardens in İstanbul in terms of characteristic features. A study by Ayaşlıgil (2019) found that mainly broad-leaf trees followed by evergreen broad-leaf shrubs and conifers were used in historical gardens. Moreover, it was determined that trees with leaves providing shade were mostly used in early period garden creations (Seçen 2011). The results of these studies confirm our study. However, there is no literature on the intensive use of flowering shrubs in historical areas in İstanbul.

Conclusion

Plants have a very important function in recognizing and emphasizing our physical surroundings. Plants positively affect the perceivability of places. The symbolic meaning of plants and benefits to people in a psychological sense are topics ignored by the majority of society. From the past to the present day, it is known that plants bring some places to mind from the human memory. Plants associated with places with historical or architectural features are placed in the human memory subconsciously and when that plant is seen, the place is recalled. Changes cause a reduction in the connection between people and place and feeling of belonging. With the aid of this study, the need to choose plants linked to the features of the space when using plants

in open-green spaces and thus provide mental stimulation and animation of the past and to preserve the identity of the place in terms of planting with appropriate plant selections was revealed. Additionally, the associations between plants that are most commonly used in our environment and recognized by people with historical sites were determined and plants were assessed as a reinforcing element for the meaning of historical places.

It is very important that the plants used in planting studies are chosen correctly when landscaping designs are made in historical gardens in terms of both perceivability of the place when seen from a distance, and in terms of renewing memories by animating the past, meeting peoples' expectations of the place, developing a sense of belonging to the place and developing feelings of recognition and familiarity with the place. Additionally, it is important in terms of place identity and preserving the identity of a place. Bringing the features of the area to the forefront when making planting designs close to historical structures and designing planting in a way which reinforces the meaning of the space is important in terms of creating perceivable and understandable places. For this reason, plants associated with places may be used as elements supporting the meaning of the place.

Acknowledgements This study was produced from the Master's thesis called 'Plants Identified with Various Functional Spaces Within the Scope of Landscape Architecture' by Yasemin Piskin under the supervision of Cigdem Sakıcı.

Author Contributions This study was produced from the Master's thesis called 'Plants Identified with Various Functional Spaces Within the Scope of Landscape Architecture' by YP under the supervision of CS. All authors have read and agreed to the published version of the manuscript.

Funding No funds, grants, or other support was received.

Data Availability The datasets generated during and/or analyzed during the current study are not publicly available due to [REASON(S) WHY DATA ARE NOT PUBLIC] but are available from the corresponding author on reasonable request.

Declarations

Conflict of Interest The author declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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