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Evaluating Different Planting Design Compositions for Visual Landscape Quality in Street Planting

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ABSTRACT

Street greening in urban settings fails due to several extreme conditions or inappropriate plant species and compositions. In recent years, urban transformations have been carried out in Erzurum, one of the most important cities of the Eastern Anatolia Region of Turkey. Seventeen different planting design compositions produced by digital simulation for the Cumhuriyet Street, the most important street and trade center of the city, were evaluated using visual landscape quality method. The Design Scenarios was sorted by a questioners which was held by 150 participants for sorting color size and form and the results were evaluated in the SPSS statistic software. The most preferred plant designs for the street had spherical form, pink color, slight texture and 1.5-2 meters tall. In addition, the proportion of closure in the plant designs produced in our study was computed and it was compared with the results of the analysis. The results are important in putting the outcomes into practice regarding the participation of public in the reformation of urban living areas.

Keywords: Planting design, road tree, streetscape, urban plants, visual effect assessment

Görsel Peyzaj Kalitesi Yönünden Cadde Ağaçlandirmasinda Farkli Bitkisel Tasarim Kompozisyonlarının Değerlendirilmesi

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ÖZET

Kentlerde cadde ağaçlandırmaları; uygunsuz bitki türleri kullanımları ve ekstrem koşullardan dolayı çoğu zaman başarısız olur. Türkiye'nin Doğu Anadolu Bölgesi'nin önemli kentlerinden olan Erzurum kenti son yıllarda kentsel dönüşüm süreci içerisine girmiştir. Şehir merkezinde önemli bir odak noktası olan Cumhuriyet Caddesi üzerinde simulasyon tekniği kullanılarak ana aksda 17 farklı bitkisel tasarım çalışması yapılmıştır. Bitkilerle form, ölçü, doku ve renk özelliklerine göre farklı kompozisyonlar oluşturularak alanı kullanan 150 kişi ile birebir anket çalışması yapılmıştır. Anketlerin değerlendirilmesinde SPSS istatistik yazılımı kullanılarak varyans analizi yapılmıştır. Sonuçta en çok yuvarlak/küresel formlu, 1,5-2m uzunluğunda, pembe renkli, hafif tekstürlü ağaçların oluşturduğu bitki kompozisyonu tercih edilmiştir. Buna ilaveten bitkilerin kapalılık oranları hesaplanarak çıkan analiz sonuçları ile karşılaştırılmıştır. Sonuçlar kentsel alan yenileme çalışmalarında halkın katılımının sağlanması açısından önemlidir.

Anahtar kelimeler: Kent bitkileri, bitkisel tasarım, görsel etki değerlendirmesi, yol manzarası, yol ağacı.

INTRODUCTION

Apart from being a place we live in, today the cities are complicated and multi-dimensional structural areas. It has been debated whether there is a relationship between the physical world where people live in and human attitudes and preferences. As stated by Yıldız and Şener (2006), depending on basic design concepts such as order, unity, scale, proportion, symmetry, balance, rhythm, harmony and contrast, urban design is examined in two main groups: streets and squares. Its area and composition are seen as the organizing power in urban design. Street plants undertake different missions in urban living areas (Aslanboğa 1997; Çelem and Şahin 1997; Ürgenç 1998; Philips 1999; Aslanboğa 2002; Harris et al. 2004; Girling and et al. 2005; Söğüt 2005). These missions can be summarized as follows:

They are important in traffic technique. They clear the street route and help distinguish auto line from pedestrian passages. They control the lights and avoid reflections. They facilitate traffic circulation.

They have visual effect. They contribute the use of design elements such as color, shape and texture in the setting. They can produce compositions fitting into structural areas, using mass-space relation. Sites may gain an activity and balance thanks to plant materials. Urban greening plays an important role in constituting the aesthetics of urban exterior setting. Most of the cities in the world are famous for their street greening and designed boulevards and squares.

They are important for social life. The culture and social life of the societies might be identified with streets and roads. Streets providing access to the city are the liveliest mediums of the social life. They make people like the nature. They form habitational environment in cities. In addition, street trees and plants let us travel in a psychologically relaxing, exciting and peaceful medium.

Visual effect evaluation studies are based on evaluating the visual features, settlement and social life of a place or route in a functional relation on a perceptional foundation. These studies gain functionality in urban settlement in a wide area stretching out from the whole city or settlement to its divisions and even a single route like boulevards, streets and avenues. Daily life shapes physical and design studies (Kaplan et al. 2001). Each individual offers different perceptions in human and environmental relations. This is not related to only the perspectives of people but also their cultural and aesthetical values. Visual quality evaluation studies involve making new arrangements in virtual mediums which form a base for describing ecological and sustainable area use by considering the present handling of the settings and the cultural values of the users (Write 1974; Hull 1986; Daniel 2001; Krause 2001; Arriaza et al. 2004; Müderrisoğlu et al. 2005; Schofield and Coks 2005; Sheppard and Picard 2005; Özgüner and Kendle 2006; Acar et al. 2007).

The scope of the study involves a visual effect evaluation based on the auto and pedestrian passages of the Cumhuriyet Street, one of the most important streets of Erzurum city center. The study aims to answer the following questions by

focusing on the relation between setting and plant use:

Is it necessary to question the awareness of form, size, texture and color features of the plants in living areas?

Is it possible to use building and tree compositions randomly in spatial settings? Do different compositions have different influences on people?

Is it possible to determine the most appropriate plant compositions which are likely to contribute to the visual life quality?

MATERIAL and METHOD

Material

Erzurum is located in the northeastern part of the East Anatolian Region (40^0 15' and 42^0 35' east longitudes and 40^0 57' and 39^0 10' north latitudes) with a surface area of 25.066 km^2 (Fig 1).

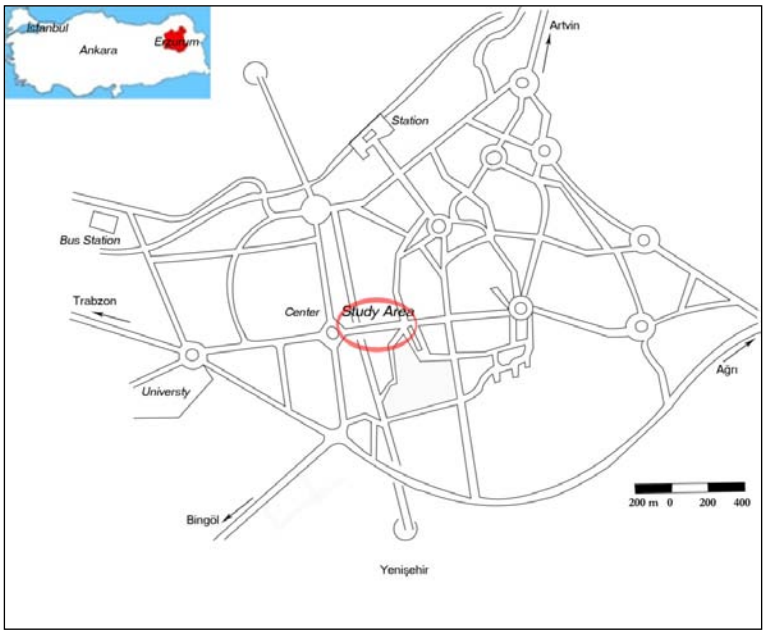

Fig 1. The location of the study area

As an average of 70 year meteorological records, average temperatures of the coldest and the hottest monthy are -8.6 °C and 19.6 °C respectively. The lowest temperature (-36 °C) was recorded in January and the highest temperature (35 °C) in July. Annual rainfall is 453 mm. The number of days with snowfall is 50 and the duration of snow cover is 114 days (Anonymous 2007). Erzurum has a population over 400.000. Although agriculture is the main source of living, the rapid development of winter tourism in the city which is located on a quite high altitude (1959 m) has made tourism and services a leading sector. Along with

winter tourism, spring and congress tourism are also becoming impactant

The pedestrian sidewalks in the Cumhuriyet Street forming the main axis of Erzurum city center are the main material of the study. The area both forms an important connection point for the street axis of the city and it is also intensively used by the pedestrians and shopping centers on both sidewalks (Fig 2).

Fig 2. The present state of the study area

The width of the street is 15 meters with an addition of 5 meters pavements in its both sides. There are buildings at both sides with different heights. One of the reasons why the Cumhuriyet Street was chosen as study area is that the left side of the street is included in the urban transformation projects and it will be demolished and rebuilt in the scope of Universiade 2011. Following this renewal, the city is intended to gain a new perspective. In addition, this street forms the main axis of the city; it is quite busy; it provides direct impact on the image of the city and therefore needs a special organization due to these features.

Method

The visual landscape quality applied in this study is based on different studies (Wright 1974; Daniel 2001; Krause 2001; Arriaza et al. 2004; Meitner 2004; Todorava et al. 2004; Sheppard and Picard 2005; Acar et al. 2007). The visual qualifications of environment can be evaluated through approaches classified in two groups: approaches based on evaluation of internal aspects of observation and approaches based on the measurement of environmental components (Yürekli 1977). In this study, the combination of these two approaches forms the method.

In the study, different plants in different plant designs were created for the Cumhuriyet Street which is the main axis of the city and it is quite busy during the day. At first, the study area was photographed and then plant species resistant to Erzurum city climate and appropriate to street greening were determined (Yılmaz and Irmak 2004).

Seventeen different plant designs were created on Photoshop 8.0 software with 9 plant species chosen (B*etula verrucosa, Catalpa bungei, Malus purpurea, Malus hybrida, Crataegus monogyna, Fraxinus excelsior, Robinia pseudoacacia 'Umbraculifera', Ulmus glabra, Acer negundo*) (Fig 3).

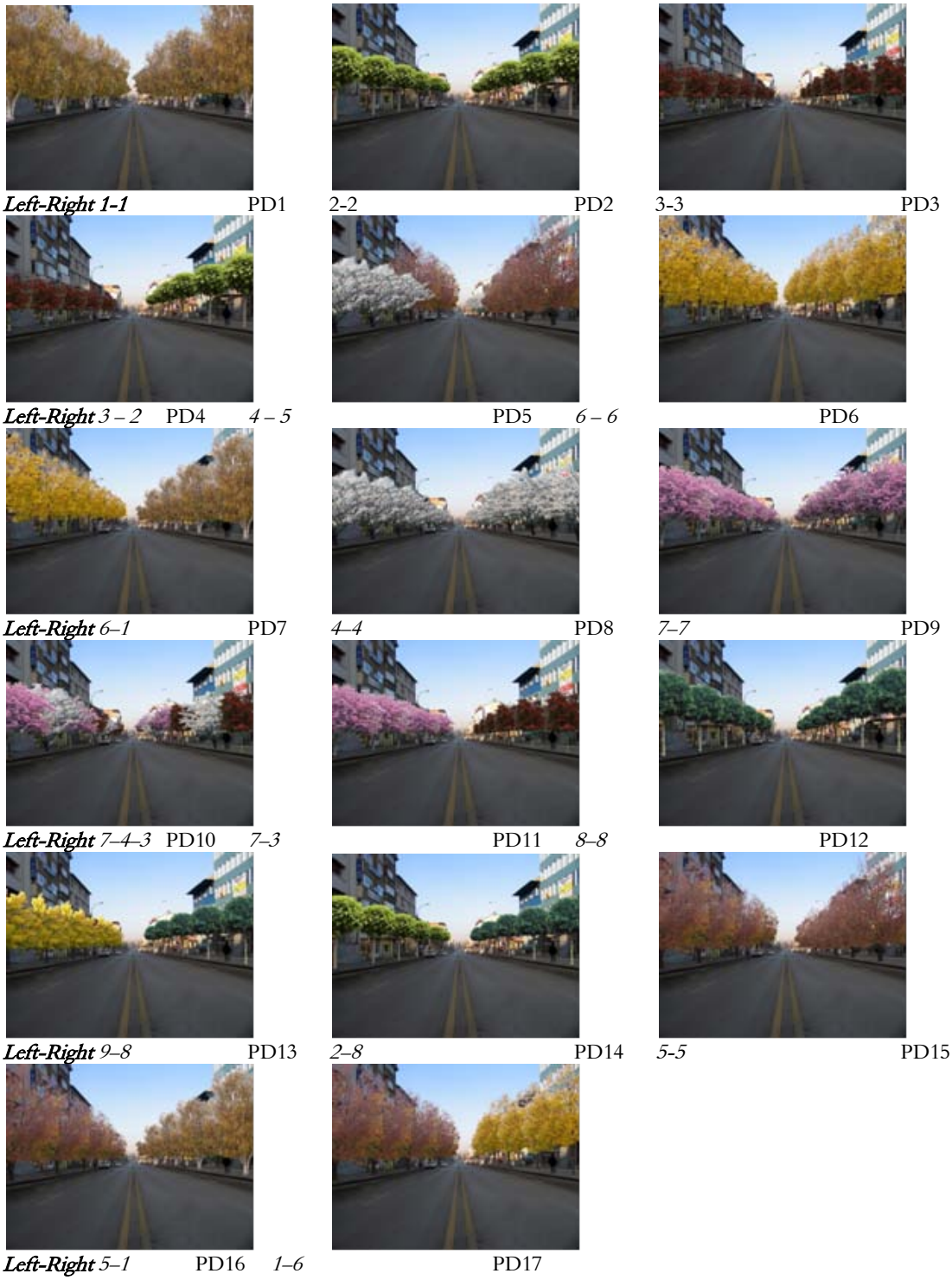

Fig 3. The plant designs evaluated (PD: Plant Design)

1. *Betula verrucosa*: white body, weeping form, medium size and thin texture.
2. *Catalpa bungei*: white flowered, weeping form, short and dense texture.

3. *Crataegus monogyna*: red flowered, scattered form, short and thin texture.
4. *Malus hybrida*: white flowered, scattered form, medium size and dense texture.
5. *Ulmus glabra*: black body, scattered form, tall and dense texture.
6. *Fraxinus excelsior*: yellow in autumn, scattered form, tall and dense texture.
7. *Malus purpurea*: pink flowered, scattered form, medium size and dense texture.
8. *Robinia pseudoacacia 'Umbraculifera'*: white flowered, spherical form, medium size and dense texture.
9. *Acer negundo*: scattered form, tall and dense texture

Real street trees were photographed to create the designs. In this way, we used real forms to obtain the user comments on the designs. We carried out a one-to-one questionnaire with 150 observers (50 Students of Ataturk University Faculty of Fine Arts, 40 Students of Ataturk University Landscape Architecture Department, 20 Street dwellers, 20 Academicians, 20 City dwellers) from different ages, jobs, genders and income groups on the greening designs we developed. The questionnaire consisted of 17 questions, first 6 of which included personal information. The questions of the public questionnaire were printed on cards. The questionnaire applied to students was in the form of a Power Point presentation. During the presentation, each photograph was displayed for 5 seconds. Before beginning the questionnaire, observers were given descriptive information on the scope of the study, evaluation and grading. They were asked to use a grading scale between -3 and +3. The plants were classified into groups of color, form, texture and length. The variance analysis was performed on this classification using the SPSS 10.0 software.

The forms of the trees used in the questionnaire were weeping, spherical, scattered, scattered+spherical, scattered+ conical, scattered+ weeping, conical and conical+ weeping; the lengths, regarding the building scales, were 1/1, ½, < ½ and mixed; the textures were slight, rough, and slight + rough; the colors were yellow, green, red, red + green, white+ brown, white, pink, mixed, pink + red, yellow+ green, brown and yellow + brown.

Another question tried to investigate whether the users were influenced from closure effect or not. In the compositions, the distance between the buildings and street settings was coded as "D" and height was coded as "H". When the proportion of distance to height was D/H=1, a complete closure was provided and as the proportion between these two variables changed, the effect of the closure changed as well. By comparing the results of the coding with the results of the analysis, the relation between the two was observed.

RESULTS

The form, texture, size, and color effects of 17 different plant designs, intended for the same setting, on the users were revealed through grading and analyses in computer medium.

Personal characteristics of the survey participants

The first questions in the survey aimed to obtain information on the social structures of the participants (Table 1).

Table 1. Social structure distribution table of the survey participants

Personal Speciality		%	Personal Speciality		%
Age	15-25	42.7	**Sex**	Woman	48.7
	26-35	32		Man	51.3
	36-50	17.3	**Living quarters**	Village	6
	>50	8		City	84.7
Education	Common school	11.3		Town	9.3
	High school	18	**Occupied house**	House which hasn't garden in city center	24
	University	70.7		Apartment which has garden	66
Occupation	Student	38		Detached house which has garden	10
	Inoccupied	17.3	**Family**	Low	4
	Officer	39.3		Middle	83.3
	Tradesman	5.4		High	12.7

The preferences on different plant designs regarding form

According to the results of variance analysis considering the plant forms, the score yielded a variance at 0.01 levels (Table 2). The mean score given to photographs defined as spherical form (+1.81) was higher than that of the other forms. In other words, the most interesting form was spherical form. This was followed by scattered (+1.14) and scattered + conical (+0.45) forms (Fig 4). The values are presented in Table 3.

Table 2. Table of variance analysis regarding the forms

	Square total	Degree of freedom	Square average	F
Boring - interesting	1611.14	7	230.16	60.97**
Disturbing - comforting	1303.30	7	186.19	52.42**
Non-attractive - attractive	1362.32	7	194.62	57.28**
Relaxing - nonrelaxing	870.29	7	124.33	33.70**
Ugly - beatifull	1191.76	7	170.25	47.60**
Stable moving- stamulative tranquil	920.55	7	131.51	38.50**
Tidy-untidy	1406.16	7	200.88	51.63**
Stressfree- stressful	900.78	7	128.68	37.93**
Unaccented- accented	1095.96	7	156.57	46.57**
Inanimate- animated	1300.00	7	185.72	53.73**
Locality feeling low- Locality feeling high	774.52	7	110.65	31.22**

** $p<0.01$

PD2 PDT14 PD12

Fig 4. Plant designs with the highest score in the survey concerning the form

Table 3. Influence of plant forms on the score given

Criteria	Forms							
	Weeping	Global	Scattered	Scattered global	Scattered conic	Scattered weeping	Conic	Conic-weeping
Boring-interesting	-0.10	**1.81**	1.14	0.18	0.45	-0.34	-0.37	-0.44
Disturbing - comforting	-0.10	**1.68**	0.77	-0.28	-0.35	-0.16	-0.16	-0.18
Non-attractive - attractive	-0.15	**1.70**	1.28	0.42	0.23	-0.19	-0.12	-0.25
Relaxing - nonrelaxing	0.33	**1.39**	0.68	-0.29	-0.28	-0.28	0.05	-0.12
Ugly-beautiful	0.39	**1.62**	1.06	-0.09	-0.04	-0.21	-0.10	-0.13
Stable moving-stamulative tranquil	-0.49	**1.24**	0.85	0.35	0.25	-0.36	-0.30	-0.31
Tidy-untidy	0.18	**1.54**	0.73	-0.74	-0.79	0.03	0	-0.11
Stressfree-stressful	0.33	**1.39**	0.70	-0.36	-0.17	-0.30	0.02	-0.14
Unaccented-accented	-0.10	**1.38**	0.96	0.06	-0.01	-0.22	-0.34	-0.37
Inanimate-animated	-0.32	**1.49**	1.11	0.24	0	-0.32	-0.25	-0.40
Locality feeling low-Locality feeling high	-0.13	**1.28**	0.68	-0.11	-0.19	-0.19	-0.17	-0.07

In addition, the lowest mean scores were obtained from weeping (-0.49), conical + weeping (-0.44), conical (-0.37) and scattered+ weeping (-0.34). The scattered+ weeping was determined as the most boring form with the lowest mean score. The photographs in the question are presented in Fig 5.

PD16 PD15 PD5

Fig 5. The most boring designs concerning form

The preferences on different plant designs regarding plant color

Table 4 presents the results of the variance analysis regarding colors. As seen in the table, the score given to the criteria concerning the color yielded significance at 0.01 levels. Concerning the color of the plants, the color receiving the highest grade was pink and this was followed by green Fig (Table 5).

Table 4. The table of variance analysis regarding plant color

	Sum of Squares	df	Mean Square	F
Boring- interesting	1867,19	11	169,75	46,13**
Disturbing - comforting	1556,19	11	141,47	40,92**
Nonattractive - attractive	1591,25	11	144,66	43,67**
Relaxing - nonrelaxing	1136,77	11	103,34	28,78**
Ugly - beatifull	1331,86	11	121,08	34,33**
Stable moving- stamulative tranquil	1199,32	11	109,03	32,93**
Tidy-untidy	1614,32	11	146,75	38,47**
Stressfree- stressful	1074,14	11	97,65	29,33**
Unaccented- accented	1187,99	11	107,99	32,43**
Inanimate- animated	1536,17	11	139,65	41,45**
Locality feeling low- Locality feeling high	925,95	11	84,18	24,12**

**p<0.01

Table 5. Influence of plant color on the score given

Criteria	Color											
	Yellow	Green	Red	Red-Green	White-Brown	White	Pink	Mix	Pink-Red	Yellow-Green	Brown	Yellow-Brown
Boring- Interesting	0,06	1,81	0,39	0	0,45	1,29	**2,11**	1,60	0,78	0,36	-0,25	**-0,47**
Disturbing - Comforting	0,06	**1,68**	0,27	**-0,49**	-0,35	0,99	**1,85**	0,69	0,38	-0,06	0,05	-0,28
Nonattractive - Attractive	0,10	1,70	0,83	0,45	0,23	1,45	**2,16**	1,81	0,79	0,39	-0,01	**-0,24**
Relaxing - Nonrelaxing	0,21	1,39	-0,01	**-0,51**	**-0,28**	0,98	**1,77**	0,54	0,19	-0,07	0,23	-0,12
Ugly – Beautiful	0,31	1,62	0,81	**-0,27**	-0,04	1,13	**2,06**	0,90	0,69	0,10	-0,02	-0,15
Stable Moving StamulativeTranquil	-0,23	1,24	0,31	0,17	0,25	0,67	**1,68**	**1,59**	0,68	0,53	**-0,30**	**-0,30**
Tidy- Untidy	0,34	**1,54**	0,35	-1,13	-0,79	0,92	**1,63**	0,53	0,17	**-0,35**	0,21	-0,16
Stressfree- Stressful	0,21	**1,39**	0,01	**-0,53**	-0,17	0,81	**1,63**	0,81	0,37	-0,19	0,17	-0,14
Unaccented- Accented	0,07	1,38	0,85	0	0	0,82	**1,67**	1,25	0,66	0,13	-0,23	**-0,41**
Inanimate- Animated	-0,08	1,49	0,67	0,13	0	0,82	**1,88**	**1,85**	0,99	0,36	-0,27	**-0,32**
Locality feeling low- Locality feeling high	-0,05	**1,28**	0,46	-0,17	-0,19	0,61	**1,49**	0,91	0,43	-0,05	-0,08	-0,16

The most attractive design concerning color is presented in Fig 6. This design involves *Malus purpurea, Robinia pseudoacacia 'Umbraculifera' and Catalpa bungei.*

The most boring design regarding color effect was the plant arrangement involving *Ulmus glabra* and *Fraxinus excelsior* with yellow+ brown color which received -0.47 points (Fig 7).


PD9


PD12


PD

Fig 6. The designs receiving the highest score concerning color


PD17

Fig 7. The plant design receiving the lowest grade regarding color

The preferences on different plant designs regarding plant texture

Table 6 presents the results of the variance analysis concerning texture. As seen in the table, the score given to the criteria concerning the texture yielded significance at 0.01 levels.

Table 6. Variance analysis table regarding plant texture

	Sum of Squares	df	Mean Square	F
Boring- interesting	275,50	2	137,75	32,09**
Disturbing - comforting	440,43	2	220,21	56,71**
Nonattractive - attractive	286,48	2	143,24	37,56**
Relaxing - nonrelaxing	388,27	2	194,13	50,14**
Ugly - beatifull	411,56	2	205,78	53,08**
Stable moving- stamulative tranquil	102,95	2	51,47	13,80**
Tidy-untidy	796,28	2	398,14	96,58**
Stressfree- stressful	397,06	2	198,53	55,39**
Unaccented- accented	285,03	2	142,52	38,79**
Inanimate- animated	296,27	2	148,13	38,54**
Locality feeling low- Locality feeling high	211,39	2	105,69	28,11**

**p<0.01

The plants with mixed texture, slight+ rough, were placed in the lowest group as they received the lowest score in each category (tidy -0.60, disturbing -0.27, and stressing -0.26). Slightly textured plants received the highest score and therefore they were the most attractive ones (attractive 1.07, and interesting 0.92) (Table 7).

Among the designs with slight texture in the survey the design involving *Betula verrucosa* had the highest scores due to its slight texture (Fig 8).

Table 7. The mean scores of the score given to different plant designs concerning the plant texture

Criteria	texture		
	slight	rough	slight + rough
Boring- interesting	**0,92**	**0,76**	0,09
Disturbing - comforting	**0,64**	**0,77**	-0,27
Nonattractive - attractive	**1,07**	0,78	0,21
Relaxing - nonrelaxing	0,54	**0,77**	-0,25
Ugly - beatifull	**0,88**	**0,84**	-0,09
Stable moving- stamulative tranquil	**0,68**	0,44	0,16
Tidy-untidy	**0,63**	**0,80**	-0,60
Stressfree- stressful	0,56	**0,76**	-0,26
Unaccented- accented	**0,79**	0,56	-0,07
Inanimate- animated	**0,90**	0,61	0,02
Locality feeling low- Locality feeling high	**0,56**	**0,56**	-0,12

PD1

Fig 8. The plant design receiving the highest score regarding texture

The preferences on in different plant designs regarding plant length

The survey results indicated that plant designs with plants with a length of ½ of the building scale received the highest score (Table 8).

Table 8. Variance analysis table concerning plant length

	Sum of Squares	df	Mean Square	F
Boring- interesting	712,59	3	237,53	57,63**
Disturbing - comforting	611,61	3	203,87	53,40**
Nonattractive - attractive	867,04	3	289,01	80,58**
Relaxing - nonrelaxing	381,34	3	127,11	32,79**
Ugly - beatifull	628,06	3	209,35	55,19**
stable moving- stamulative tranquil	456,62	3	152,20	42,36**
tidy-untidy	915,30	3	305,10	74,83**
stressfree- stressful	420,30	3	140,10	39,17**
unaccented- accented	632,98	3	210,99	59,63**
inanimate- animated	788,66	3	262,89	71,98**
Locality feeling low- Locality feeling high	354,31	3	118,10	31,88**

**p<0.01

The designs with plants in mixed lengths were evaluated to be the most inappropriate ones (Table 9).

Table 9. The mean scores regarding plant lengths

Criteria	Length			
	1/1	½	<1/2	Mix
Boring- interesting	0,32	**1,95**	1,24	0,23
Disturbing - comforting	0,33	**1,75**	0,84	-0,42
Non attractive - attractive	0,35	**2,11**	1,41	0,34
Relaxing – non relaxing	0,38	**1,33**	0,69	-0,40
Ugly - beautiful	0,42	**1,79**	1,12	-0,16
Stable moving- stimulative tranquil	0,15	**1,29**	**0,99**	0,21
Tidy-untidy	0,38	**1,78**	0,72	-0,96
Stress free- stressful	0,34	**1,47**	0,72	-0,35
Unaccented- accented	0,19	**1,67**	1,05	-0,01
Inanimate- animated	0,22	**1,74**	1,24	0,06
Locality feeling low- Locality feeling high	0,22	**1,23**	0,78	-0,18

The designs created using catalpa and *Robinia pseudoacacia 'Umbraculifera'* were the most preferred plant arrangements concerning length (Fig 9).

PD2

PD12

Fig 9. The most preferred designs concerning length

The mixed design composed of *Malus hybrida* and *Ulmus glabra* was the least attractive plant design concerning length (Fig 10).

PD5

Fig 10. The least preferred design concerning length

DISCUSSION and CONCLUSION

The setting components such as color, form, texture, and strip are important design items that influence users' perceptions. In this study, we tried to investigate to what extent and how the users were influenced from the setting they lived in. In addition, the results of the survey were used to evaluate the direct and indirect impacts of closure attribute of the setting on the users. The total points given to the photographs in all categories in the survey are presented in Fig 11.


1
PD9


2
PD12


3
PD2


4
PD10


5
PD14


6
PD8


7
PD11


8
PD6


9
PD3


10
PD13


11
PD1


12
PD15


13
PD5


14
PD4


15
PD16


16
PD7


17
PD17

Fig 11. The most preferred plant designs concerning different attribute descriptions

PD9 is the design receiving the highest score (total 2989). The rating list concerning the designs receiving the highest score is given in Fig 12.

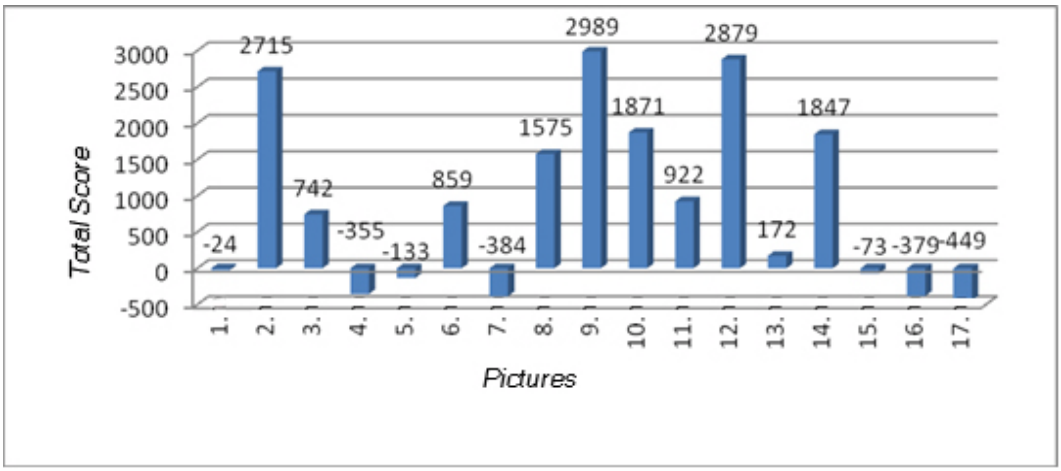

Fig 12. The graphic created based on the total score given to all questions by the participants

As seen, while pink flowers and *Malus hybrida* (PD9) are in the first row of the rating list, *Ulmus glabra* and *Fraxinus excelsior* (PD17) came last. According to the statistical findings, this stemmed from the fact that *Malus purpurea* received the highest score in color effect rating. The findings also revealed that though plants of single variety were preferred much more, using mixed varieties together created a negative impact. The plant design which was described as the least preferred, boring, lifeless, and oppressive involved *Ulmus glabra* and *Fraxinus excelsior* (PD17) varieties.

In previous studies, it was reported that trees with pyramid form had higher visual values and that trees with scattered form came second (Müderrisoğlu et al 2005). As we did not have appropriate pyramid shaped plants that could be used in street greening suitable for the city climate, they were not placed in the evaluation in this study. The plants with spherical form determined to be appropriate for street greening under the climatic conditions of the city were in the first row of the rating list as they received the highest score in the form base. The results of the survey indicated that they were more aesthetic and more perceivable. However, the plants with scattered form ranked in the second row of the scoring list contrary to the findings of (Müderrisoğlu et al. 2005). According to the findings of the survey, when the influence of closure sense in plant designs created with simulations on people's preferences was examined, it was observed that the highest score given to the simulated photographs were related with the best matching height and width proportion. The plants with spherical form receiving the highest score created visual axis and perspective. This led the interpretation that they created the effect of more comforting, more relaxing, more beautiful, more harmonious, and better sites which lessen the stress more. These principles bring the most beautiful, the most relaxing, the most attractive, the most emphatic, and the liveliest effects together. Another study in this field is by Yılmaz and Irmak (2004), which was carried out

in Sapporo city in Japan as pedestrian lane arrangement. In this study, flower parcels were handled as long strips and small short islets.

The D/H values of the designs composed of trees with spherical form (PD2, PD12, PD14) were 1, 1.3 and 1 respectively. When the setting sense was 1, complete closure was obtained and this helped set the balance (Fig 13). Contrary to this, PD5, PD17, PD15, PD1 were determined to have designs with low setting sense. Their D/H ratios were 0.3, 0.6, and 0.3 respectively. One of the most basic requisites of urban setting is that the mutual relations of restrictive elements should provide physical closure effect in a manner defining the setting adequately. That urban setting has closure effect helps perceive the setting easily and it brings the sense of "being surrounded" together, which embrace a person. In addition, the closure quality, which is among the factors making an urban setting an active and social location, bears a high value (Yıldız and Şener 2006). When the distance between the buildings in streets "D" equals the height of the buildings "H", in other words when proportion of distance to height equals 1 (D/H=1), complete closure is obtained and a balance between these two variables is set. As this rate increases, the closure effect decreases. As the rate decreases, urban setting forms a dense and cramped texture due to closure effect. When D/H rates are 1, 2 and 3 in the streets, this indicates applicable positive rates regarding closure effect. When this rate is over 3, the sense of setting is completely lost and therefore closure can not be provided. As this rate gets smaller than 1, it causes a density effect in the setting (Yıldız and Şener 2006).

The question of relating the sizes of urban setting with human scales forms another important subject of urban setting. The use of humane scale in urban setting influences the relation people associate with the setting in a positive way by providing one-to-one relation between the setting and the people, making the people feel themselves belonging to the setting and causing people to become closer to the setting. This stems from the fact that people adopt settings complementing their dimensions (Yıldız and Şener 2006).

It was found out that the participants of the survey mostly preferred the trees which have ½ proportional lengths between the building and plant height among the pictures simulated. This is thought to have resulted from an approach in human scale.

The statistical results on color preferences of the subjects indicated that flowery fruit trees, especially *Malus purpurea* with pink color, were the most preferred. This is thought to have a connection with the time period the survey was carried out. Erzurum has an altitude of 2000 meters. It is often covered with snow from November to May in average. This causes people to see white color around for a very long time. As the survey was carried out in February, it can be considered that people preferred this color due to their longing for a different color.

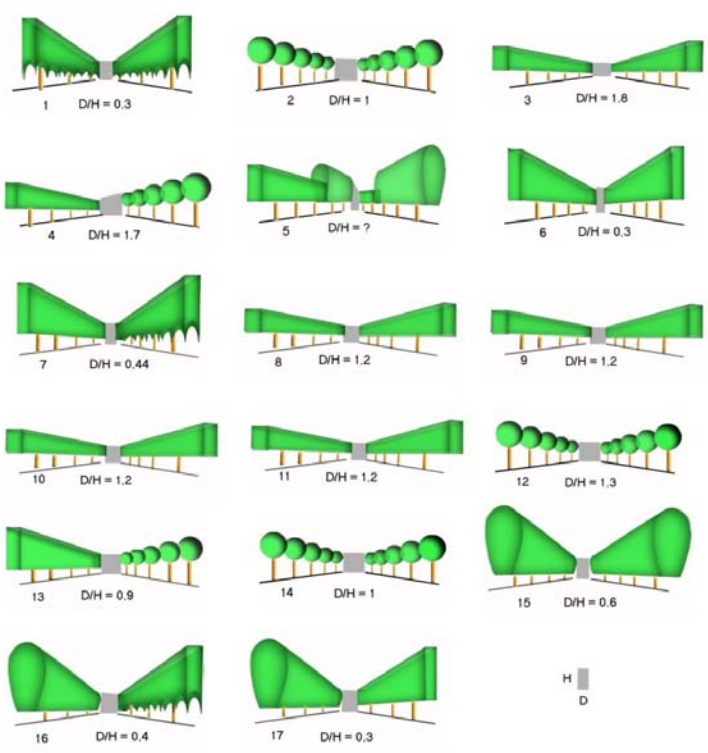

Fig 13. The spatial closure characteristics of the plants used in plant designs

When the result of survey is examined, we see that plants with slight texture are much more preferred with respect to setting harmony (more interesting 0.92, interesting 1.07, and lively 0.90). However, the results of the survey revealed a contradictory preference. This preference is thought to have been made so that the shopping centers on the street can easily be perceived.

In conclusion:

Using green objects to decrease the structural density of the city reduces the physical pressures. In addition, using plants suitable for the environmental characteristics also has positive influence on the socio-cultural structure of people.

Arrangements considering the comprehensibility of form, size, texture, and color aspects of the plants in living areas create more positive effects.

Building-plant compositions can not be used arbitrarily in the spatial settings. Especially, the closure effect is important and in parallel with this effect different compositions create different effects on people.

It has been found out that the plant compositions based on physical, social and cultural factors can contribute to the visual living quality.

People prefer arrangements suitable for their socio-cultural structure in the area they live in. In this study, it is emphasized

once again that it is important to take user requests into account when setting up plant preferences. In addition, random distribution of compositions composed during greening studies of streets and avenues causes problems in people's perception and usually introduces boring, lifeless, and tiresome products. Collective work contributed by public besides local administrations is needed in plant designs of interior city so that a suitable planning can be realized. In addition, by presenting local administrations the plant material proposed for the "Cumhuriyet Street", which will be recreated at the end of this study, arrangements will be made both in a scientific manner and in a style anticipated by the social structure of the city.

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