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PERCEPTION AND ASSESSMENT OF FRUIT TREES VISUAL QUALITY DURING SPRING IN PUBLIC GREEN SPACES AND PRIVATE GARDENS

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Abstract

Fruit trees are valuable components in the ecosystem, having both aesthetic and utilitarian functions. This study focuses on assessing the aesthetic aspects of fruit trees during spring, using the expert based paradigm and the perception based paradigm. The Scenic Beauty Estimation method is used to measure the visual quality, but also five landscape parameters: vitality, harmony, fascination, naturalness and colour diversity. Such studies are important for better urban planning, fruit trees proving to increase the visual quality in public green spaces and private gardens, through its decorative elements, such as flowers. The integration of fruit trees in the landscape it is a necessity in creating a sustainable landscape.

Key words*: fruit trees aesthetic, landscape aesthetic, visual quality, urban planning.*

INTRODUCTION

In a fast urbanization process and society development, public green spaces, but also private gardens offer opportunities for landscapers by designing recreational spaces, experiencing nature by planting trees (Ma et al. 2021). The first step in creating a sustainable urban ecosystem is to establish harmony relations between design and the environment around us (Bulut et al., 2010). Landscape visual quality appreciation involves the inventory and evaluation of various visible attributes, with the aim of planning, designing and managing the landscape (Palmer & Hoffman, 2001). Urban vegetation reduces heat absorption, increases sun protection, acts as a barrier against pollution, improves air quality, masks the noise (Semeraro et al., 2021; Roy et al., 2012), thus having a positive impact on the quality of human life. In the urban ecosystem dynamic, fruit trees contribute to the diversity of the landscape, but also to the development of urban horticulture concept, having both an aesthetic and a utility function, through fruit production (Melinescu & Cosmulescu, 2021). The aim of the study is to determine the visual effect that fruit trees can generate in the landscape, during spring season, by their presence and absence, in order to improve urban planning.

MATERIALS AND METHODS

Based on both the expert paradigm and the perception-based paradigm (Daniel, 2001; Asur et al., 2020; Gungor & Polat, 2018), in order to achieve the aim, a series of 10 photographs with fruit trees from public green spaces, as well as from private gardens, were taken in Craiova, a city located in the southwest of Romania (44°19'0.01"N, 23°48'0.00"E).
The photos were taken during spring season. The 10 landscapes with fruit trees were coded as follows: LFS1 - LFS10, and the other 10 landscapes without fruit trees as follows: LWFS1 - LWFS10. The visual effect analysis of the fruit trees was performed through a questionnaire that focused both on the evaluation of the landscape with fruit trees and on the evaluation of the landscape without fruit trees. Adobe Photoshop CC 2018 was used to remove the fruit trees from the 10 original photos. In the questionnaire, participants were asked to rate the landscape according to their visual preference, but also according to 5 descriptive parameters: vitality, harmony,

fascination, naturalness and color diversity. The evaluation was performed using the Likert scale from 1 to 7, 1 representing the lowest value and 7 the highest value (Bulut et al., 2010). The determination of the visual quality index (VCI) was performed using the Scenic Beauty Estimation - SBE method (Daniel & Boster, 1976), one of the most popular methods in such studies. SBE has three components: descriptive - simply shows the characteristics of the environment, assessment - measures the quality of landscapes and preference - shows the subjective preference of those who observe the landscape (Mo et al., 2021). The questionnaire was completed by 84 people, including 49 specialists in landscaping, horticulture, environment and 35 students in the same fields.

The statistical data were analyzed in IBM SPSS Statistics 28.0.

RESULTS AND DISCUSSIONS

The mean visual quality index was determined for each landscape, both with and without fruit trees. No significant differences were observed between the visual quality index resulting from the expert paradigm and the one resulting from the perception-based paradigm, which shows that the visual perception is unitary, so the total visual quality index was calculated, compared to the 84 respondents. (Table 1 and Table 2).

Table 1. The visual quality index of the landscape with fruit trees in the spring season

Landscape variant	**The visual quality index resulting from the expert paradigm**		**The visual quality index resulting from the perception-based paradigm**		**Visual quality index total**	
	VCI Mean	SD	VCI Mean	SD	**VCI Mean**	**SD**
LFS1	5.55	1.40	4.91	1.97	**5.28**	**1.68**
LFS2	5.16	1.63	4.60	2.25	**4.92**	**1.92**
LFS3	5.67	1.42	5.28	1.56	**5.51**	**1.48**
LFS4	5.79	1.48	5.14	1.97	**5.52**	**1.72**
LFS5	5.08	1.70	5.00	2.04	**5.04**	**1.84**
LFS6	4.79	1.70	4.71	2.03	**4.76**	**1.84**
LFS7	5.06	1.76	4.71	2.16	**4.91**	**1.93**
LFS8	5.73	1.44	5.51	1.72	**5.64**	**1.55**
LFS9	6.08	1.23	5.97	1.44	**6.03**	**1.32**
LFS10	5.34	1.53	5.14	1.81	**5.26**	**1.65**
	N: 49		N: 35		**N: 84**	

In the case of the original landscape, with fruit trees, the highest value was recorded by LFS9, VCI = 6.03, a landscape that, in addition to fruit trees, also benefits from a decorative element - a Japanese kiosk, followed by LFS8, VCI = 5.64, a landscape in which fruit trees are grouped (Figure 1), both belonging in the category of public green spaces. The lowest value was recorded by LFS6, VCI = 4.76 (Table 1), a landscape from a private garden with a small size fruit tree, which shows that the size of the fruit tree is a factor in determining visual quality.

Table 2. The visual quality index of the landscape without fruit trees in the spring season

Landscape variant	**The visual quality index resulting from the expert paradigm**		**The visual quality index resulting from the perception-based paradigm**		**Visual quality index total**	
	VCI Mean	SD	VCI Mean	SD	**VCI Mean**	**SD**
LWFS1	4.30	1.89	4.74	1.73	**4.48**	**1.83**
LWFS2	3.40	1.81	3.22	1.88	**3.33**	**1.83**
LWFS3	4.38	1.93	4.85	1.61	**4.58**	**1.81**
LWFS4	4.04	1.95	3.97	1.74	**4.01**	**1.85**
LWFS5	2.20	1.69	2.00	1.49	**2.11**	**1.60**
LWFS6	3.02	1.82	2.80	1.34	**2.92**	**1.63**
LWFS7	1.81	1.49	1.65	1.23	**1.75**	**1.38**
LWFS8	3.20	1.83	3.05	1.79	**3.14**	**1.81**
LWFS9	4.34	1.77	4.94	1.62	**4.59**	**1.72**
LWFS10	3.61	1.81	3.80	1.67	**3.69**	**1.74**
	N: 49		N: 35		**N: 84**	

The most significant value, in the case of the landscape without fruit trees, was LWFS9, VCI: 4.59 (Table 2), thus, even in the absence of fruit trees, it remains the preferred landscape in terms of visual quality, hence the importance of landscape elements and how they are integrated into the landscape. A high value was also recorded in the case of LWFS3, VCI: 4.58. The lowest values of the landscape without fruit trees, were recorded in the case of LWFS7, VCI: 1.75, LWFS5, VCI: 2.11 and LWFS6, VCI: 2.92 (Table 2), landscapes from private gardens, showing that once the fruit trees disappear, the fence and unsightly surroundings can be seen, we can affirm that fruit trees, by their size, through the decorative elements, blur the unsightly landscape around even when they are solitary place.

LFS1 (VCI: 5.28)

LWFS1 (VCI: 4.48)

LFS2 (VCI: 4.92)

LWFS2 (VCI: 3.33)

LFS3 (VCI: 5.51)

LWFS3 (VCI: 4.58)

LFS4 (VCI: 5.52)

LWFS4 (VCI: 4.01)


LFS5 (VCI: **5.04**) **LWFS5 (VCI: 2.11)**


LFS6 (VCI: **4.76**) **LWFS6 (VCI: 2.92)**


LFS7 (VCI: **4.91**) **LWFS7 (VCI: 1.75)**


LFS8 (VCI: **5.64**) **LWFS8 (VCI: 3.14)**


LFS9 (VCI: **6.03**) **LWFS9 (VCI: 4.59)**


LFS10 (VCI: **5.26**) **LWFS10 (VCI: 3.69)**

Figure 1. Original landscape with fruit trees (left) and edited landscape without fruit trees (right)

There are significant differences between the two types of landscapes, which show that fruit trees have a positive effect on improving the visual quality of the landscape. Similar studies (Lisandru et al., 2016; Bulut et al., 2010) indicate the same effect of fruit species in the landscape. The fruit trees, in spring, decorate through flowers, completing the landscape, so the visual perception is stimulated by their diverse color, complementing the rest of the surrounding vegetation, as well as architectural elements.

A series of relationships were established between visual preference and 5 landscape descriptive parameters: vitality, harmony, fascination, naturalness and color diversity, both in the landscape with fruit trees (Table 3) and in the landscape without fruit trees (Table 4). The results of the Pearson correlation demonstrate a relationship between all these elements. In the case of the landscape with fruit trees, we notice a strong significance between the visual preference and landscape vitality and fascination (0.903), but also between the harmony and fascination (0.940) and harmony and naturalness (0.912). Harmony can be described as the way in which the elements of the landscape integrate, while the vitality of the landscape is generated by light and color, and the naturalness of the landscape implies a more sustainable planning and a limited human intervention on vegetation.

Table 3. The relationship between visual preference and the 5 descriptive parameters of the landscape with fruit trees

	Visual preference	Landscape vitality	Landscape harmony	Landscape fascination	Landscape naturalness
Landscape vitality	0.903**				
Landscape harmony	0.900**	0.904**			
Landscape fascination	0.903**	0.890**	0.940**		
Landscape naturalness	0.876**	0.878**	0.912**	0.897**	
Color diversity	0.810**	0.843**	0.852**	0.868**	0.842**

**Correlation is significant at the 0.01 level (2-tailed).

Table 4. The relationship between visual preference and the 5 descriptive parameters of the landscape without fruit trees

	Visual preference	Landscape vitality	Landscape harmony	Landscape fascination	Landscape naturalness
Landscape vitality	0.935**				
Landscape harmony	0.936**	0.948**			
Landscape fascination	0.926**	0.935**	0.949**		
Landscape naturalness	0.898**	0.912**	0.918**	0.898**	
Color diversity	0.860**	0.855**	0.858**	0.896**	0.820**

**Correlation is significant at the 0.01 level (2-tailed).

In the case of the landscape without fruit trees, we find also a positive relationship between landscape harmony and fascination (0.949), as well as between the visual preference and landscape vitality (0.935) and harmony (0.936). We notice a small increase in the significance of the descriptive parameters in relation to the visual perception of the landscape without fruit trees. The human eye tries to better identify the characteristics of the landscape, thus outlining a clear visual perception. The fruit trees, through the decorative elements, visually stimulate the viewer, so the descriptive parameters can be identified more easily. The landscape fascination can be described as the attractiveness that the viewer perceives (Liu, et al., 2021), thus it is recommended to collaborate with a landscaper in creating a landscape as attractive as possible, especially for private gardens, but also for public green spaces. Visual preference also has a significant relationship with color diversity. During the spring, the fruit trees decorate with white, red, dark or light pink flowers, colors that influence the visual perception, but also the mood. The pink color balances the green color and has a calming effect on the viewer, generating clarity, while the white color generates the effect of light distribution, being preferred in landscapes placed in areas with high temperatures (Ender et al., 2016), these can be assets of the fruit trees, the color of the flowers, white, recommending them in areas with high temperatures. The color red is the most easily distinguished by humans, due to the human sight structure (Li et al., 2017), so we can

create an element of impact in the landscape by using fruit trees with red foliage, such as *Prunus cerasifera nigra*.

Fruit trees positively contribute at the improvement of the landscape, increasing the visual quality, out of the 10 landscapes, both in public green spaces and private gardens, in 9 of them fruit trees have made a very significant contribution at improving the landscape, only a single landscape recorded a significant contribution, LFS1 - LWFS1, 0.235 (Table 3). Fruit trees are among the first to enter in vegetation, thus masking the unsightly crown of trees which have not yet entered in the vegetation stage, increasing the quality of the landscape.

CONCLUSIONS

The study creates an overview of the landscape visual quality influenced by the presence or absence of fruit trees in spring, thus fruit trees generate a more attractive landscape, both in public green spaces and in private gardens, they can be used in groups or solitary. There is a wide range of fruit species, but also a multitude of ways to integrate them into the landscape, with many crown types, different types of habitus, but also a complex decorative power throughout the entire year. In the process of landscape design, human perception must be taken into account, both to improve the visual quality of the landscape, but also to improve the lives of residents, the vegetation has the power to generate a number of mental and physical benefits. Fruit trees not only contribute to breaking the monotony of the landscape, but, through their utilitarian function, fruit production, they generate economic benefits, so in terms of creating an ecological landscape, the integration of fruit is a necessity.

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