THE OUTSTANDING VALUES OF OUR CITY: THE TREES

T. Kiss[1*], K. Ecseri[1] and E. Hoyk[2]

[1] Department of Horticulture, Faculty of Horticulture and Rural Development, John von Neumann University, Hungary
[2] Department of Agricultural Economics and Rural Development, Faculty of Horticulture and Rural Development, John von Neumann University, Hungary

Abstract

In our study, we evaluated the woody plants of the main square of Kecskemét and determined their age and value. In our survey included 250 trees and shrubs. The total value of these is HUF 1.4 billion. The average age of trees is 38 years, with the youngest trees being 4 years old and the oldest 96 years old.

1 Introduction

The trees in the cities improve our environment by increasing the humidity, absorbing dust, absorbing noise and reducing radiation through their shading effect [7]. These effects are explicated through the branch system, crown shape, and foliage of the trees. The value of open spaces in large cities can be measured by the mitigation of an urban heat island effect (UHI) and a visual / aesthetic effect. So it is difficult to estimate value, as a monetary amount has to be allocated to living resources (plants) that we do not actually use [12]. The environmental benefits of trees are obvious, as they have a positive effect on the microclimate of a given area, be it a park, a public area covered with trees or a road lined with trees. But if we want to express in actual terms how much are these trees worth, what values do we get? There are several methods available to perform this valuation (forestry, industrial, fuel value) [2], but perhaps the "ideological" (expressed in money) value of living trees best illustrates the importance of green resource in our public spaces. Methodologies for determining wood as an environmental value have also been developed in several countries (Australia, USA, UK, Germany), and with the help of these literature data, the Hungarian researchers prepared the valuation procedures we also used [11]. The calculated value is uniformly based on the size and health status of the active foliage [2].

In our study - with the help of these methods - we would like to quantify how much are the trees under which we go in the center of Kecskemét every day worth. We surveyed the woody plants in Szabadság and Kossuth Square. Kecskemét has retained its market town character, but the proportion of its green areas has decreased significantly in the recent period. Between 2009 and 2017, the decrease was more than 30%. The size of the green area that can be used as a public space per capita is low, 24.3 m^2 / person [3]. With this, the Bács-Kiskun county seat was behind Brussels, Munich and Milan in terms of this parameter of green spaces [1]. That is why we saw its importance in assessing and verifying with data the value of the nearly 250 trees in the studied area in the green surface system of our main square.

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* Corresponding author. Tel.: +36 76 517 655
  E-mail address: kiss.timea@kvk.uni-neumann.hu

2 Material and method

2.1 Measurements

In the first step, we determined the species and, if necessary, the variety of the woody plant. During the survey, each plant was given a unique identifier: abbreviation of scientific name and serial number obtained during the survey (Ex.: CO04 - *Celtis occidentalis* 4th in order). A total of 243 plants and 45 taxa were recorded. The species were determined according to Schmidt and Tóth [9] [13], and the taxonomic location of the plants was collected from the current cladistic database (APG IV) [10]. To determine the value, it is necessary to determine the age of the trees. This required knowledge of the trunk size of the trees, which was measured at one meter height from the ground surface. To determine the age of the trees, we calculated the trunk diameters from these data so that we could assign an approximate age to each taxon using the table of Radó [6].

2.2 Value determination

To determine the tree value, we used the plant evaluation method developed by Ildikó Jószainé Párkányi [4]. To determine the value of shrubs, we used the method of Erzsébet Jámborné dr. Benczúr and colleagues [5]. The daily nursery price was collected from the 2019-20 catalog of Juniperus Garden and the price list of Tahi Nursery Kft.

Based on these, the tree value is determined:

Tree value = daily nursery price × age multiplier × location coefficient × health status multiplier.

Shrub value = daily nursery price × individual multiplier × location coefficient × health condition multiplier.

The value of the woody plants of the main square of Kecskemét is given by the trees and the shrubs together.

3 Results

The composition of the tested herd is shown in Table 1. Examining the list of taxa, it can be stated that *Celtis occidentalis* and *Styphnolobium japonicum* species are the most numerous. In addition, more than 10 specimens were observed for *Corylus colurna, Tilia cordata* and *Tilia tomentosa.* More than 1 species could be observed in the genus *Acer, Fraxinus, Picea, Prunus, Quercus,* and *Tilia.* The genus on the list can be divided into 23 families, most of which are genus (5) from the *Rosaceae* family. *Cupressaceae* and *Pinaceae* families are also significant. Examining the number of individuals, it can be observed that most of the specimens in the main square of Kecskemét belong to the *Cannabaceae* family, but the number of *Malvaceae* and *Fabaceae* taxa is also significant. The number of woody plants with shrub habitus (or branched from the base) is low (27 individuals of 9 taxa) compared to the plants with stems (216 specimens of 36 taxa). The surveyed area has a high number of taxa (20), of which only one specimen was planted. The needle and scaly leaf plant can be observed in Table 1 in 8 cases (26 individuals), while the deciduous evergreen can be observed in 4 cases (13 specimens). Among the bred taxa, weeping *(Morus alba 'Pendula', Styphnolobium japonicum 'Pendula')* and columnar *(Populus nigra 'Italica', Prunus serrulata 'Amanogawa')* varieties can also be found in the main square of Kecskemét. In terms of flower colors, yellow and white are predominant. The main decorative value of the applied species and varieties is found mainly in the habitus of the plants as well as in their vegetative traits (leaf morphology, foliage color). Thirteen of the 45 taxa are found to be poisonous if ingested, but only 3 of these can cause severe or life-threatening effects [8] entering the intestinal tract *(Juniperus virginiana 'Grey Owl', Taxus baccata, Platycladus orientalis).*

Table 1: Name and number of woody taxa surveyed

NAME OF TAXA	Piece	NAME OF TAXA	Piece
Acer platanoides	1	*Picea abies*	2
Acer pseudoplatanus	2	*Picea pungens*	9
Acer saccharinum	1	*Platanus orientalis*	1
Betula pendula	3	*Populus nigra* 'Italica'	2
Cedrus atlantica	1	*Prunus cerasifera* 'Atropurpurea'	2
Celtis occidentalis	70	*Prunus avium*	1
Cornus sanguinea	1	*Prunus serrulata* 'Amanogawa'	1
Corylus colurna	15	*Pyracantha coccinea*	1
Cotinus coggygria	2	*Quercus robur*	7
Crataegus × media 'Paul's Scarlet'	1	*Quercus robur* 'Fastigiata'	2
Fraxinus angustifolia subsp. *pannonica*	1	*Quercus × turneri* 'Pseudoturneri'	1
Fraxinus excelsior	2	*Styphnolobium japonicum*	26
Fraxinus pennsylvanica	1	*Styphnolobium japonicum* 'Pendula'	1
Ginkgo biloba	3	*Sorbus aria* 'Magnifica'	1
Ilex aquifolium	9	*Sorbaria sorbifolia*	1
Juniperus virginiana 'Grey Owl'	1	*Taxus baccata*	9
Larix decidua	1	*Platycladus orientalis*	1
Liquidambar styraciflua	2	*Tilia cordata*	11
Liriodendron tulipifera	10	*Tilia tomentosa*	16
Metasequoia glyptostroboides	2	*Tilia platyphyllos*	1
Morus alba 'Macrophylla'	5	*Ulmus × hollandica*	3
Morus alba 'Pendula'	7	*Viburnum rhytidophyllum*	2
Paulownia tomentosa	1	**ALTOGETHER:**	**243**

Figure 1 shows the 21 most significant taxa of the woody plants in the Main Square. Shrubs and plants, of which only 1 was found in the surveyed area, were omitted from the figure. From the data, an average was calculated for each taxon, and then an aggregate average was calculated from these results for the 21 taxa shown. Thus, 1.0 (100%) means HUF 4,990,768 for the value of plants (gray columns) and 32 years for age (green columns).

Among the 21 species and cultivars described, there are 4 gymnosperm trees, two of which (*Gingko biloba* and *Metasequoia glyptostroboides*) are deciduous. The number of native taxa is 8, the rest are of exotic origin. In terms of their place in succession, it can be observed that few climax taxa are found in the city center (*Quercus robur* and *Picea abies*) while progenitor species and their varieties dominate in plant association. Of the taxonomic categories under the species, 5 species can be observed in Figure 1. These varieties represent the lower size category among the trees (*Morus alba* varieties and *Prunus cerasifera* 'Atropurpurea'). In addition, a species hybrid (*Ulmus × hollandica*) is represented in the study area.
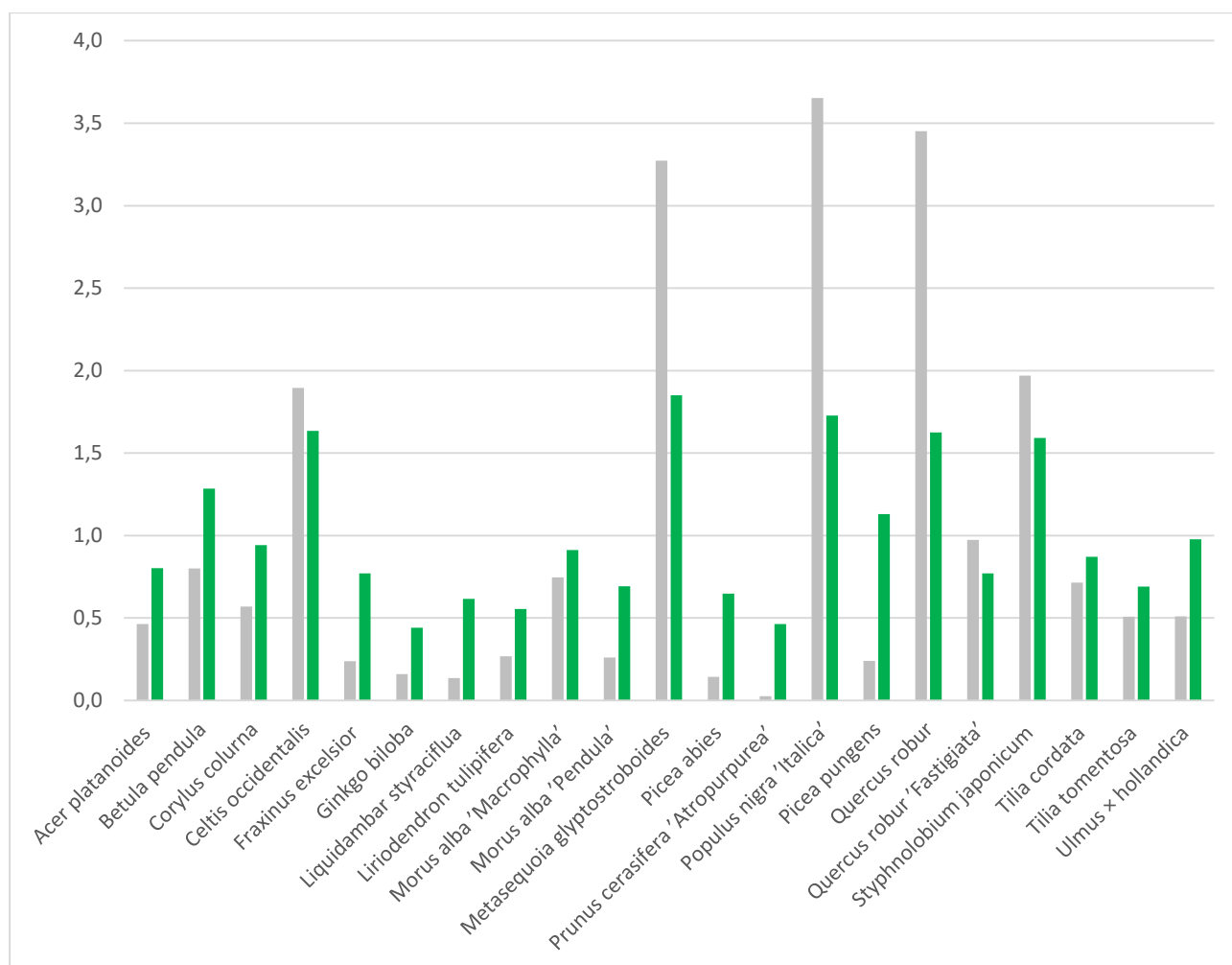
Figure 1. The ratios of the average tree value and the average age of the 21 major taxa
Note: the value of 1.0 means HUF 4,990,768 for tree values, while it means 32 years for the age of trees.

Based on Figure 1, it can be seen that the average monetary value of the stock is exceeded by 5 taxa: *Celtis occidentalis, Metasequoia glyptostroboides, Populus nigra* 'Italica'*, Quercus robur* and *Styphnolobium japonicum.* Among these taxa, lombardy poplar also have the highest average value (HUF 16,338,000). Pedunculate oak specimens and dawn redwood also have an average value of over HUF 15,000,000. The value of japanese pagoda tree and common hackberry is also outstanding. 16 taxa of the trees shown in Figure 1 represent a value of less than HUF 5 million. The stock of *Prunus cerasifera* 'Atropurpurea' has the lowest monetary average value (HUF 126,000). Data below HUF 1 million can also be observed for *Liquidambar styraciflua* (HUF 680,000), *Picea abies* (HUF 718,650) and *Ginkgo biloba* (HUF 801,000). The average value of the other taxa is between HUF 1 and 5 million.

Observing the age data, a picture of a young herd is drawn in Figure 1. The standard deviation of the average age data is much more moderate than that of the value data: the oldest taxon does not reach twice the average of the total stand, and the youngest tree makes up 44% of the average. Taxa above the mean age of 32 years (1.0 value) in this parameter are: *Betula pendula* (42 years), *Celtis occidentalis* (53 years), *Metasequoia glyptostroboides* (60 years), *Populus nigra* 'Italica' (56 years), *Picea pungens* (37 years), *Quercus robur* (53 years) and *Styphnolobium japonicum* (52 years). *Gingko biloba* (14 years) and *Prunus cerasifera* 'Atropurpurea' (15 years) have the lowest average age.

Comparing the two average value columns for each taxon, it can be seen that the monetary value of plants with a value above 150% is higher than their age expressed in %, while for trees below 150%, this ratio is just the opposite. The only exception to this is the *Quercus robur* 'Fastigiata'

variety. The difference between the two columns is also greatest for valuable and aged individuals *(Metasequoia, Populus,* and *Quercus)*. The smallest differences were found for *Morus alba* 'Marcophylla'*, Tilia cordata* and *Tilia tomentosa* (17, 16 and 18%, respectively).

4 Conclusions

The results of the dendrological survey showed a high average value of the stock on the Main Square (nearly HUF 5 million). This is due to the location of the plants (densely built-up area - poor in wood) and good health. In addition, taxa representing a high value achieved above-average results due to the high individual multiplier. Of these taxa, the 2 *Metasequoia glyptostroboides* next to the fountain can also be considered a curiosity dendrologically. Low-value taxa lagged behind the average mainly due to their low individual multiplier (low age).

Looking at the age of the stand, the vegetation in the Kecskemét Main Square can be considered young. This statement is based on data from Schmidt, 2003, who provides tabular information on the onset of aging of each taxon in an urban setting [8]. Comparing this information with our estimated ages, it can be concluded that only 5 pioneers in the herd have reached old age: *Acer saccharinum*, as well as 2-2 *Betula pendula* and *Populus nigra* 'Italica'. The maintainer must pay close attention to the maintenance and rejuvenation pruning (and, if necessary, replacement) of these trees, as can be seen in the case of the two *Populus nigra* 'Italica'. At the same time, it is important to mention that the age calculated from the trunk size and the data of the value estimation derived from it only serve as an informative value of the green areas to be expressed in numbers. The growth (strain thickening) of each taxon depends on a number of environmental parameters and may vary from site to site and from individual to individual.

5 Summary

In addition, the woody stock used in the main square can be said to be a well-thought-out and - compared to the current possibilities - a green area rich in taxa. In addition to time, the correctness of plant selection is also confirmed by the current good health status of the individuals. There are several specifically urban-tolerant trees *(Fraxinus, Gingko, Styphnolobium, Celtis)*. Representatives of the latter two genera make up 30% of the individuals in the total surveyed area. In only 1-2 cases can we talk about specimens to be replaced due to environmental or plant protection problems (e.g. *Liquidambar styraciflua,* or *Ulmus × hollandica*). The herd can generally be said to be very resistant to abiotic stress, but at the same time it is the duty of the maintainer and the citizens to preserve and protect this immense value for posterity.

Acknowledgment

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