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The health state of trees in green areas in the Opole town centre

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Abstract: The aim of this article was to analyse of health state of trees growing in green areas in south-western part of Opole town centre (capital of Opole province, south-western part of Poland). 4 green areas were subject to research. A scale proposed by J. Duda was used to evaluate the health state of the trees.

As a result of conducted analyses it was found that:

- in the group of examined trees there was found occurrence of 35 species. The most represented species were *Taxus baccata* and *Acer platanoides* and the least represented were *Acer pseudoplatanus*, *Betula pendula*, *Corylus avellana*, *Juglans regia*, *Prunus padus*, *Pyrus communis* and *Sambucus nigra*. There have been identified 23 native species and as many as 12 species exotic to our flora. The substantial majority constitute trees representing angiosperms. The greatest number of species grew in Wolności Sq. and in green area around Zamkowy Pond;
- among the examined objects the greatest share showed trees in good health. The best state of health represented trees growing in green areas at The Philharmonic and around Urząd Marszałkowski;
- 24 species were represented exclusively by trees in good health. The worst health represented *Sorbus aucuparia*, *Rhus typhina*, *Larix decidua*, *Prunus domestica* and *Prunus padus*.

Key Words: tree, green area, health state, town, Opole.

Introduction

According to ONZ forecasts, after 2025 more than 60% citizens of our globe are going to live in the city. City agglomerations are going to constitute the majority of human

living environment. Efforts therefore should be made, to help to improve the quality of living conditions in the city. The greenery is considered an essential element of urban environment. Thus, there is a need to raise social awareness about the roles that greenery serves in shaping urban atmosphere, its biological, social and educational, aesthetic and economic roles. Tree plants play a key role in this process (Łukasiewicz 2006).

Greenery with their flora will perform its comprehensive role as a basic environment-forming factor only when it has advantageous conditions for good development (Łukasiewicz 1989).

Notwithstanding climate that results from geographical location, the following factors have essential influence on development and life of plants in urban environment:

- specific microclimate, depending on size and character of agglomeration (temperature, light, moisture, wind);
- soil conditions;
- air pollution (gases, dust, aerosols);
- soil pollution (sole, city gas and natural gas, engine fuels and lubricants and their combustion products, herbicides);
- introduction of artificial turf;
- mechanical damage (above-ground and underground parts) (Łukasiewicz 1989).

In habitats such as: green areas, parks, gardens and town forests conditions are generally similar to natural conditions, specific for a given region. The possibility of biological circulation of water (rainwater percolation, absorption of rainwater by plants, transpiration) and the vicinity of other plants has a beneficial influence on moisture, soil and air conditions. As a result of mulch and withering of underground and above-ground parts of plants, there is a possibility of natural fertilization. The above-mentioned factors, as well as limited pollution created in these habitats, the most favourable conditions in the city for life and development of plants (Łukasiewicz 1989).

City parks and green areas with their style can distinguish cities or their suburbs. Designed in an original and interesting way areas could constitute some element of so-called place identity (Ziółkowska 2006).

Methods

Research area was in the south-western part of Opole town centre (capital of Opole province, south-western part of Poland). Analysis was conducted on all trees (287 objects) growing in 4 green areas:

- at J. Elsner Philharmonic (26 objects);
- at Wolności Sq. (81 objects);
- around Urząd Marszałkowski (71 objects);
- around Zamkowy Pond (109 objects).

To assess the trees health a scale proposed by Duda (table 1) was applied. According to the scale, the health of each tree is assessed in a 12-grade scale (good, if sum of points for trunk and crown does not exceed 3, poor if it is between 4 and 7 and very poor if it exceeds 7). A tree injury is defined as mechanical damage of a tree trunk in the form of bark and phloem stripping that reaches cambium and even deeper. Its width is measured perpendicularly to tree trunk axe in a place where right and left edges of callous tissue or injury are most separated (Wika and Włoch 1994).

The research was conducted in August, September and October 2006.

Table 1. Health state of trees (by J. Duda).

Degree of damage	Damage size		Note
	tree-stem (S)	tree-crown (K)	
0	Not damaged cambium and phellogen	No damage	Growth of a new wood grain and phloem in a whole girth of tree
1	Single injury or several injuries together up to 10 cm of girth	Up to 15% of tree crown, withered 1-2 branches or boughs, girth at base exceeding 5cm	Frost cracks, mechanical injuries, unscarred cork in a trunk up to10cm
2	Injuries of 10-25% of trunk girth	15-25%, more than 2 injured boughs	At least ¾ of trunk girth function as a conductor in wood and phloem
3	Injuries of 25-50% of trunk girth	25-50%	Cambium functions preserved in at least ½ of trunk girth
4	Injuries of 50-75% of trunk girth	50-75%	At least ¼ of trunk girth function as a conductor
5	Injuries more than 75% of trunk girth	More than 75%	Less than ¼ of trunk girth functions as a conductor

Source: S. Wika, W. Włoch (ed.), *Alej a Husarii Polskiej z alejami bocznymi na tle rezerwatu Łężczak w Kotlinie Raciborskiej*, Rudy Wielkie 1994, p. 44.

Results

In the group of examined trees there was found occurrence of 35 species. These were the following: *Acer campestre* (1.4%), *Acer platanoides* (12.2%), *Acer pseudoplatanus* (0.4%), *Acer saccharinum* (0.7%), *Aesculus hippocastanum* (4.9%), *Betula pendula* (0.4%), *Carpinus betulus* (1.4%), *Corylus avellana* (0.4%), *Crataegus monogyna* (6.3%), *Fraxinus excelsior* (1.6%), *Juglans regia* (0.4%), *Larix decidua* (1.0%), *Malus baccata* (1.4%), *Picea abies* (3.8%), *Pinus sylvestris* (5.2%), *Platanus ×hispanica* 'Acerifolia' (1.4%), *Prunus domestica* (3.8%), *Prunus padus* (0.4%), *Pyrus communis* (0.4%), *Quercus petraea* (1.4%), *Quercus robur* (1.6%), *Quercus rubra* (0.7%), *Rhus typhina* (3.5%), *Robinia pseudoacacia* (2.1%), *Salix ×sepulcralis* 'Chrysocoma' (1.4%), *Sambucus nigra* (0.4%), *Sorbus aria* (0.7%), *Sorbus aucuparia* (2.4%), *Sorbus intermedia* (0.7%), *Taxus baccata* (15.0%), *Thuja occidentalis* (9.0%), *Tilia cordata* (4.9%), *Tilia platyphyllos* (3.8%), *Ulmus laevis* (4.2%), *Ulmus minor* (0.7%).

The most represented species were *Taxus baccata* - 15.0% and *Acer platanoides* - 12.2% and the least represented were *Acer pseudoplatanus*, *Betula pendula*, *Corylus avellana*, *Juglans regia*, *Prunus padus*, *Pyrus communis* and *Sambucus nigra* - each 0.4%.

There have been identified 23 native species and as many as 12 species exotic to our flora (tree share respectively 70.3% and 29.7%).

The substantial majority constitute trees representing angiosperms (66.0%) - 30 species. Other trees (gymnosperms) constitute 34.0% - 5 species.

The majority of species grew at Wolności Sq. and in green area around Zamkowy Pond.

Among the examined objects the greatest share - 91.6% (figure 1) showed trees in good health. Objects identified to be in a poor and very poor state were respectively 7.7% and 0.7%.

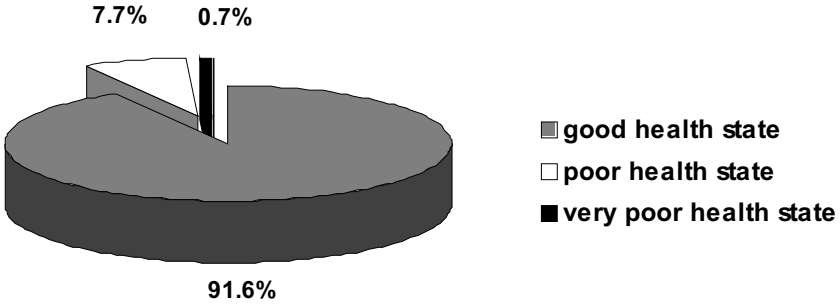

Figure 1. The health state of trees in green areas in south-western part of Opole town centre.

Table 2. The health state of trees in given green areas in south-western part of Opole town centre.

Green area	Health state (by J. Duda)		
	good	poor	very poor
at J. Elsner Philharmonic	96.2%	3.8%	-
in Wolności Sq.	86.4%	13.6%	-
around Urząd Marszałkowski	95.8%	4.2%	-
around Zamkowy Pond	91.8%	6.4%	1.8%

Data in table 2 shows that trees growing in green areas at The Philharmonic and around Urząd Marszałkowski were found to be in the best health. The greatest majority of objects in poor and very poor health were found in Wolności Sq. (poor - 13.6%) and around Zamkowy Pond (poor - 6.4% and very poor 1.8%).

Table 3. The health state of trees in green areas in south-western part of Opole town centre listed by species.

Species	Health state (by J. Duda)		
	good	poor	very poor
Acer campestre	100.0%	-	-
Acer platanoides	97.1%	2.9%	-
Acer pseudoplatanus	One object in good health		
Acer saccharinum	100.0%	-	-
Aesculus hippocastanum	100.0%	-	-
Betula pendula	One object in good health		
Carpinus betulus	100.0%	-	-
Corylus avellana	One object in good health		
Crataegus monogyna	88.8%	5.6%	5.6%
Fraxinus excelsior	80.0%	20.0%	-
Juglans regia	One object in good health		

Larix decidua	66.7%	33.3%	-
Malus baccata	100.0%	-	-
Picea abies	100.0%	-	-
Pinus sylvestris	100.0%	-	-
Platanus ×hispanica 'Acerifolia'	100.0%	-	-
Prunus domestica	72.7%	27.3%	-
Prunus padus	One object in poor health		
Pyrus communis	One object in good health		
Quercus petraea	100.0%	-	-
Quercus robur	100.0%	-	-
Quercus rubra	100.0%	-	-
Rhus typhina	50.0%	50.0%	-
Robinia pseudoacacia	100.0%	-	-
Salix ×sepulcralis 'Chrysocoma'	100.0%	-	-
Sambucus nigra	One object in good health		
Sorbus aria	100.0%	-	-
Sorbus aucuparia	42.9%	57.1%	-
Sorbus intermedia	100.0%	-	-
Taxus baccata	100.0%	-	-
Thuja occidentalis	88.5%	11.5%	-
Tilia cordata	92.9%	7.1%	-
Tilia platyphyllos	100.0%	-	-
Ulmus laevis	83.4%	8,3%	8.3%
Ulmus minor	100.0%	-	-

Data in table 3 shows that 24 species were represented exclusively by trees in good health. Objects in a very poor health state existed only among *Ulmus laevis* (8.3%) and *Crataegus monogyna* (5.6%). The worst health represented *Sorbus aucuparia*, *Rhus typhina*, *Larix decidua*, *Prunus domestica* and *Prunus padus*.

Conclusions

In the group of examined trees there was found occurrence of 35 species. The most represented species were *Taxus baccata* and *Acer platanoides* and the least represented were *Acer pseudoplatanus*, *Betula pendula*, *Corylus avellana*, *Juglans regia*, *Prunus padus*, *Pyrus communis* and *Sambucus nigra*. There have been identified 23 native species and as many as 12 species exotic to our flora. The substantial majority constitute trees representing angiosperms. The greatest number of species were found at Wolności Sq. and at the green area around Zamkowy Pond.

Among the examined objects the greatest percentage showed trees in good health. Trees growing in green areas at the Philharmonic and around Urząd Marszałkowski were found in the best health.

24 species were represented exclusively by trees in good health. The worst health represented *Sorbus aucuparia*, *Rhus typhina*, *Larix decidua*, *Prunus domestica* and *Prunus padus*.

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Streszczenie

Stan zdrowotny drzew na zieleńcach w centrum miasta Opola

W artykule zaprezentowano analizę stanu zdrowotnego drzew rosnących na terenie zieleńców w południowo-zachodniej części centrum miasta Opola (stolica województwa opolskiego, południowo-zachodnia część Polski). Badaniami objęto 4 zieleńce. Do oceny zdrowotności wykorzystano skalę zaproponowaną przez J. Dudę.

W efekcie przeprowadzonych analiz stwierdzono, iż:

- w grupie badanych drzew występowało 35 gatunków. Najliczniej reprezentowane były *Taxus baccata* i *Acer platanoides* a najsłabiej *Acer pseudoplatanus*, *Betula pendula*, *Corylus avellana*, *Juglans regia*, *Prunus padus*, *Pyrus communis* oraz *Sambucus nigra*. Wyróżniono 23 gatunki rodzime oraz 12 obcych naszej florze. Większość stanowiły drzewa reprezentujące gromadę okrytozalążkowe. Najwięcej gatunków występowało na placu Wolności i na zieleńcu wokół Stawu Zamkowego;
- wśród badanych obiektów zdecydowanie największy udział miały drzewa w dobrej kondycji zdrowotnej. W najlepszym stanie zdrowotnym były egzemplarze rosnące na zieleńcach przy filharmonii i wokół Urzędu Marszałkowskiego;
- 24 gatunki reprezentowane były wyłącznie przez drzewa w dobrym stanie zdrowotnym. Najgorszą zdrowotnością charakteryzowały się *Sorbus aucuparia*, *Rhus typhina*, *Larix decidua*, *Prunus domestica* i *Prunus padus*.