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Floristic survey of dendrological parks in Săcuieni and Cadea (Bihor County, Transylvania, Romania)

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Abstract. The paper is dealing with the floristic inventory of two dendrological parks in Bihor County: Dendrological Park of Săcuieni (= Székelyhíd) and Dendrological Park of Cadea (= Nagykágya). Field surveys were carried out in 2009-2010. In Dendrological Park of Săcuieni 61 woody taxa have been identified: 44 trees, 12 shrubs and 5 lianas. In Dendrological Park of Cadea 43 woody taxa have been identified: 24 trees, 14 shrubs and 5 lianas. In this arboretum herbaceous layer have been also studied, 42 herbaceous plant species being inventoried.

Key Words. dendrological park, woody flora, secular trees, herbaceous species

Introduction

In Transylvania there are many dendrological parks (arboreta), most secular, established near castles, noble houses in the 18-20th centuries. Although they preserved woody taxa (species, subspecies and varieties) with pronounced biogeographic and/or ornamental importance, and served recreation, relaxation and aesthetic purposes, due to historical shifts, majority of them have reached a state of abandonment and are invaded by lianas, adventive herbaceous species and nitrophilous weeds, while most secular trees have been removed. There are

some dendrological parks that have been declared protected by local or regional authorities. However, many of these arboreta are also abandoned.

In the last two decades, some of these dendrological parks have been returned to their respective owners, and they have been partially or completely restored. Given the existing possibilities of restoration and conservation of arboreta even those still in public ownership, with financing from European funds, it is necessary to reintroduce theme in the recreational and educational circuit even, by setting up thematic (didactic) paths. Therefore, we consider important the floristic survey of these dendrological parks, especially woody taxa inventory, but also the herbaceous layer study where this is well developed and valuable. The results of these surveys basically serve as a database on the flora of the park, which can be the basis for its restoration. Also, these studies can lead to the design of thematic paths, serving an important educational role, and also contributing to the information and awareness on the need for conservation these dendrological parks.

The purpose of this study was to identify and inventory the flora of two dendrological parks in Bihor County: Dendrological Park of Săcuieni and Dendrological Park of Cadea.

Material and Methods

The surveys were conducted in 2009-2010. In Dendrological Park of Cadea the survey was made both for woody taxa (trees and shrubs) and for the herbaceous layer, while in Dendrological Park of Săcuieni only woody taxa have been inventoried. The plants were identified in the field, using Simon (2002) and Ciocârlan (2009); in cases when field identification was difficult (for polymorphic taxa, ornamental varieties and hybrids), the plant material was collected and determined using monographic works (Săvulescu, 1956-1976; Zanoschi *et al.*, 1996-2004). Plant taxa nomenclature follows Flora Europaea (Tutin *et al.* 1964-1980). The biogeographic area/statute in the Romanian flora for each woody taxon is given according to Popescu *et* Sanda (1998) and Ciocârlan (2009).

Study site

A. Dendrological Park of Săcuieni is very close to the center of Săcuieni town, located 40 km north of Oradea (in the north-west of Bihor County), on Ier River terraces at an altitude of 100-160 m a.s.l (GPS coordinates: N 47°21'; E 22°05'). Access is on the road E671 Oradea - Carei - Satu Mare, which crosses the locality.

The park was set up nearby an 18th century castle, known today as the Stubenberg Castle after its former owner, count Stubenberg József, who extended the building in 1906 in neoclassical architectural style (Nánási, 2003). The arboretum covers an area of 4 ha and it is included on the list of protected natural areas of Bihor County (Bihor County Council Decision no. 19/1995).

B. Dendrological Park of Cadea is located in Cadea village which is situated in the vicinity of Săcuieni town, on the left side of Ier River, in a contact area of plains and hills at an altitude of 100-160 m a.s.l (GPS coordinates: N 47°18'53.28"; E 22°03'51.84"). Access is on road E671 Oradea - Carei - Satu Mare, also. From administrative point of view, Cadea village belongs to Săcuieni town.

The arboretum was founded in the 19th century in the style of an English garden-park, nearby the Pongrácz family castle. This is a very old Hungarian noble family, rooted in 12-13th centuries (Erdei, 2006). The castle was built in 1820, then modified and extended in 1895. During the same period (1820-1900) it was arranged the garden-park of the castle, being used native woody taxa, but also ornamental plants originating from other continents (Kiss, 1983; Erdei, 2006). Currently, the arboretum covers an area of 6 ha and it is listed on the list of protected natural areas of Bihor County (Bihor County Council Decision no. 19/1995).

Results and Discussion

A. Woody flora of Dendrological Park Săcuieni

There have been identified 61 taxa, including 44 trees, 12 shrubs and 5 lianas (Table 1). From all of these taxa, 26 are spontaneous (indigenous, native taxa, which are found in the Romanian flora), European or Eurasian biogeographical elements, 31 are cultivated (originating in North America or Asia). Among the cultivated there are sub-spontaneous taxa, which penetrated into the spontaneous flora, managing to reproduce naturally. Also, there are invasive species (*Ailanthus altissima*, *Robinia pseudacacia*), which has a strong vegetative growth and spread rapidly to the detriment of native species. The lianas *Parthenocissus tricuspidata* and *Parthenocissus quinquefolia* are also considered invasive species. Of all identified plants, red pine (*Pinus sylvestris*) and yew (*Taxus baccata*) are included on the national red lists being considered rare species (Boşcaiu *et al.*, 1994; Oltean *et al.*, 1994).

Secular trees (age estimated at approx. 100-150 years) are: *Aesculus hippocastanum*, *Fraxinus excelsior*, *Gymnocladus dioica*, *Liriodendron tulipifera*, *Populus alba*, *Quercus robur*, *Quercus rubra*, *Sophora japonica*.

Table 1. Woody taxa identified in Dendrological Park Săcuieni

No.	Taxon	Biological form*	Biogeographic area/statute in the Romanian flora
1	<i>Abies alba</i>	T	Central-European/spontaneous
2	<i>Abies nordmanniana</i>	T	Southeastern Asia/cultivated
3	<i>Acer campestre</i>	T, sh	European/spontaneous
4	<i>Acer platanoides</i>	T	European/spontaneous
5	<i>Acer pseudoplatanus</i>	T	Central-European/spontaneous
6	<i>Aesculus hippocastanum</i>	T	Balkanic/cultivated
7	<i>Ailanthus altissima</i>	T	China/cultivated/sub-spontaneous/invasive
8	<i>Berberis vulgaris</i>	T	European-Mediterranean/spontaneous
9	<i>Betula pendula</i>	T	Eusiberian/spontaneous
10	<i>Buxus sempervirens</i>	T, sh	Mediterranean/cultivated
11	<i>Campsis radicans</i>	I	North America/cultivated
12	<i>Carpinus betulus</i>	T	Central-European/spontaneous
13	<i>Castanea sativa</i>	T	Submediterranean/cultivated/sub-spontaneous
14	<i>Catalpa bignonioides</i>	T	North America/cultivated
15	<i>Celtis occidentalis</i>	T	North America/cultivated/sub-spontaneous
16	<i>Cerasus vulgaris</i>	T	Eurasian-Submediterranean/cultivated
17	<i>Cercis siliquastrum</i>	T	Mediterranean/cultivated
18	<i>Clematis vitalba</i>	I	Central-European/spontaneous
19	<i>Cornus sanguinea</i>	sh	Central-European/spontaneous
20	<i>Crataegus monogyna</i>	sh	Eurasian/spontaneous
21	<i>Deutzia scabra</i>	sh	China, Japan/cultivated/sub-spontaneous
22	<i>Euonymus europaeus</i>	sh	European/spontaneous
23	<i>Ficus carica</i>	sh	Mediterranean/cultivated
24	<i>Fraxinus excelsior</i>	T	European/spontaneous
25	<i>Fraxinus excelsior</i> var. <i>pendula</i>	T	European/cultivated
26	<i>Gymnocladus dioica</i>	T	North America/cultivated
27	<i>Hedera helix</i>	I	Atlantic-Mediterranean/spontaneous
28	<i>Juglans nigra</i>	T	North-America/cultivated
29	<i>Juglans regia</i>	T	European-Balkanic-Caucasian/cultivated/sub-spontaneous
30	<i>Juniperus virginiana</i>	T	North America/cultivated
31	<i>Laburnum anagyroides</i>	T	Central-European-Balkanic/cultivated
32	<i>Liriodendron tulipifera</i>	T	North America/cultivated
33	<i>Magnolia obovata</i>	T	Eastern Asia/cultivated
34	<i>Malus</i> sp.	T	European/spontaneous
35	<i>Morus alba</i>	T	China/cultivated
36	<i>Morus nigra</i>	T	Mediterranean/cultivated
37	<i>Parthenocissus tricuspidata</i>	I	China and Japan/sub-spontaneous/invasive

38	<i>Parthenocissus quinquefolia</i>	I	North America/sub-spontaneous/invasive
39	<i>Picea abies</i>	T	European/spontaneous
40	<i>Pinus nigra</i>	T	Central-European/cultivated
41	<i>Pinus sylvestris</i>	T	Eurasian/spontaneous/cultivated
42	<i>Populus alba</i>	T	Eurasian/cultivated/sub-spontaneous
43	<i>Prunus cerasifera</i>	T	Ponto-Balkan/cultivated/sub-spontaneous
44	<i>Prunus cerasifera</i> var. <i>pissardi</i>	T	Ponto-Balkan/cultivated
45	<i>Prunus spinosa</i>	sh	European-Mediterranean/spontaneous
46	<i>Quercus robur</i>	T	European-Mediterranean/spontaneous
47	<i>Quercus rubra</i>	T	North America/cultivated
48	<i>Robinia pseudacacia</i>	T, sh	North America/cultivated/sub-spontaneous/invasive
49	<i>Rosa canina</i>	sh	European-Mediterranean/spontaneous
50	<i>Rosa spinosissima</i>	sh	Eurasian/spontaneous
51	<i>Sambucus nigra</i>	sh	European-Mediterranean/spontaneous
52	<i>Sophora japonica</i>	T	Eastern Asia/cultivated
53	<i>Spiraea x vanhouttei</i>	sh	cultivated hybrid
54	<i>Staphylea pinnata</i>	sh	Central-European-Mediterranean/spontaneous
55	<i>Syringa vulgaris</i>	sh	European-Mediterranean-Balkan/cultivated/sub-spontaneous
56	<i>Taxus baccata</i>	T	Central-European-Mediterranean/spontaneous
57	<i>Thuja orientalis</i>	T	China/cultivated
58	<i>Tilia cordata</i>	T	European/spontaneous
59	<i>Tilia platyphyllos</i>	T	Central-European-Mediterranean/spontaneous
60	<i>Tilia tomentosa</i>	T	Balkan-Pannonic/spontaneous
61	<i>Ulmus minor</i>	T	Central-European-Mediterranean/spontaneous

*T- tree, sh- shrub, I- liana

B. Woody flora of Dendrological Park Cadea

There have been identified 43 taxa, including 24 trees, 14 shrubs and 5 lianas (Table 2). Of the total woody taxa, 25 are spontaneous, European or Eurasian biogeographical elements, and 15 are cultivated (originating in North America or Asia). Among the cultivated, there are also sub-spontaneous taxa. The invasive species are *Ailanthus altissima*, *Amorpha fruticosa*, *Robinia pseudacacia*, *Parthenocissus tricuspidata*, *Parthenocissus quinquefolia*. Of all identified plants only *Larix decidua* is included on the national red lists being considered rare (Boşcaiu et al., 1994; Oltean et al., 1994).

Table 2. Woody taxa identified in Dendrologic Park Cadea

No.	Taxon	Biological form*	Biogeographic area/statute in the Romanian flora
1	<i>Acer campestre</i>	T, sh	European/spontaneous
2	<i>Acer negundo</i>	T	North America/sub-spontaneous/cultivated
3	<i>Acer platanoides</i>	T	European/spontaneous
4	<i>Aesculus hippocastanum</i>	T	Balkanica/cultivated
5	<i>Ailanthus altissima</i>	T	China, cultivated/sub-spontaneous/invasive
6	<i>Amorpha fruticosa</i>	sh	North America/sub-spontaneous/invasive
7	<i>Berberis vulgaris</i>	sh	European-Mediterranean/spontaneous
8	<i>Celtis occidentalis</i>	T	North America/cultivated/sub-spontaneous
9	<i>Clematis vitalba</i>	l	Central-European/spontaneous
10	<i>Cornus sanguinea</i>	sh	Central-European/spontaneous
11	<i>Corylus avellana</i>	sh	European/spontaneous
12	<i>Crataegus monogyna</i>	sh	Eurasian/spontaneous
13	<i>Euonymus europaeus</i>	sh	European/spontaneous
14	<i>Frangula alnus</i>	sh	Eurasian/spontaneous
15	<i>Fraxinus excelsior</i>	T	European/spontaneous
16	<i>Gymnocladus dioica</i>	T	North America/cultivated
17	<i>Hedera helix</i>	l	Atlantic-Mediterranean/spontaneous
18	<i>Juglans regia</i>	T	European-Balkanica-Caucasian/cultivated/sub-spontaneous
19	<i>Larix decidua</i>	T	Central-European/spontaneous
20	<i>Morus alba</i>	T	China/cultivated
21	<i>Parthenocissus quinquefolia</i>	l	North America/sub-spontaneous/invasive
22	<i>Parthenocissus tricuspidata</i>	l	China and Japan/sub-spontaneous/invasive
23	<i>Pinus nigra</i>	T	Mediterranean/cultivated
24	<i>Platanus x acerifolia</i>	T	Controversal hybride origin/cultivated
25	<i>Populus alba</i>	T	Eurasian/cultivated/sub-spontaneous
26	<i>Populus nigra</i> ssp. <i>pyramidalis</i>	T	Eurasian/cultivated
27	<i>Prunus padus</i>	T	Eurasian/cultivated/sub-spontaneous
28	<i>Prunus spinosa</i>	sh	European-Mediterranean/spontaneous
29	<i>Quercus petraea</i>	T	European/spontaneous
30	<i>Quercus robur</i>	T	European-Mediterranean/spontaneous
31	<i>Quercus rubra</i>	T	North America/cultivated
32	<i>Robinia pseudacacia</i>	T, sh	North America/cultivated/sub-spontaneous/invasive
33	<i>Rosa canina</i>	sh	European-Mediterranean/spontaneous
34	<i>Salix fragilis</i>	T, sh	Eurasian/spontaneous
35	<i>Sambucus nigra</i>	sh	European-Mediterranean/spontaneous
36	<i>Sorbus torminalis</i>	sh	Central-European/spontaneous

37	<i>Syringa vulgaris</i>	sh	European-Mediterranean-Balkan/cultivated/ sub-spontaneous
38	<i>Tilia cordata</i>	T	European/spontaneous
39	<i>Tilia platyphyllos</i>	T	Central-European-Mediterranean/spontaneous
40	<i>Tilia tomentosa</i>	T	Balkan/Pannonic/spontaneous
41	<i>Viburnum lantana</i>	sh	Central-European/spontaneous
42	<i>Viburnum opulus</i>	sh	Circumpolar/spontaneous
43	<i>Vitis sylvestris</i>	l	Ponto-Mediterranean/spontaneous

*T- tree, sh- shrub, l- liana

Secular trees (age estimated at approx. 100-150 years) are: *Aesculus hippocastanum*, *Fraxinus excelsior*, *Larix decidua*, *Pinus nigra*, *Platanus x acerifolia*, *Populus alba*, *Populus nigra* ssp. *pyramidalis*, *Quercus robur*, *Quercus rubra*, *Tilia tomentosa*.

C. Herbaceous flora of Dendrological Park Cadea

Because of its location close to semi-natural habitats (grasslands, forests), into the structure of this arboretum herbaceous species have been installed from the above mentioned habitats, forming a well-developed and rich herbaceous layer. Due to washing the soil rich in organic material by meteoric waters on slopes (also cultivated by crops) and their accumulation in the arboretum area, into the herbaceous layer nitrophilous weeds have been also installed. The development of weeds was favored by the long-term abandonment of the park. On the lower areas in the arboretum, meteoric water accumulation and persistence of soil moisture favored the growth of a few hygrophilous and meso-hygrophilous species. Thus, this dendrological park structure has become very close to a semi-natural forest under anthropogenic influence.

There have been identified 42 herbaceous plant species: *Allium ursinum*, *Anthriscus sylvestris*, *Arum maculatum*, *Athyrium filix-femina*, *Ballota nigra*, *Calystegia sepium*, *Carex brizoides*, *Chelidonium majus*, *Cirsium arvense*, *Clematis vitalba*, *Conium maculatum*, *Dactylis polygama*, *Conyza canadensis*, *Eupatorium cannabinum*, *Euphorbia amygdaloides*, *Fragaria vesca*, *Fumaria schleicheri*, *Galium mollugo*, *Glyceria nemoralis*, *Hedera helix*, *Heracleum sphondylium*, *Isopyrum thalictroides*, *Lactuca serriola*, *Lysimachia nummularia*, *Onopordon acanthium*, *Phragmites australis*, *Polygonatum latifolium*, *Polygonatum multiflorum*, *Polygonum aviculare*, *Pulmonaria officinalis*, *Ranunculus repens*, *Reynoutria japonica*, *Rubus caesius*, *Sambucus ebulus*, *Sanicula europaea*,

Stachys sylvestris, *Symphytum officinale*, *Telekia speciosa*, *Thypha latifolia*, *Urtica dioica*, *Vinca herbacea*, *Vinca minor*.

There are characteristic forest species like *Allium ursinum*, *Arum maculatum*, *Athyrium filix-femina*, *Dactylis polygama*, *Euphorbia amygdaloides*, *Fragaria vesca*, *Isopyrum thalictroides*, *Polygonatum latifolium*, *Polygonatum multiflorum*, *Sanicula europaea*, *Stachys sylvestris*, etc. The hygrophilous and meso-hygrophilous species are represented by *Glyceria nemoralis*, *Phragmites australis*, *Thypha latifolia*. One invasive species have been identified (*Reynoutria japonica*), having a luxuriant growth on the eastern, south-eastern and southern edges of the arboretum. Must be noticed the interesting presence of *Telekia speciosa*; we consider this carpathian-balkan species, which growth along mountain rivers, that was introduced in the arboretum with ornamental purposes.

Recommendations

Cleaning and sanitation works (Negruțiu, 1980; Mateescu, 2002) are recommended to be done within the studied arboreta, followed by restoration of these parks. Trees, especially secular ones, should be allowed to develop freely and naturally, in order to fulfill their decorative function. The restoration plans of the parks should be developed in accordance with the owners' strategic objectives and the future functions which are going to fulfill these dendrological parks. The cleaning and sanitation works must take into consideration the restoration plans of the parks. For Dendrological Park of Cadea, where the herbaceous layer is dominated by native forest species, it is recommended to keep this semi-natural structure of the arboretum, by eliminating only the weeds and invasive species.

Also, we recommend a thematic path for both arboreta with informative and educational value, in order to attract visitors and raise the attention on conservation of these arboreta and on nature conservation in general.

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