Thaiszia - J. Bot., Košice, 22 (2): 201-210, 2012
http://www.bz.upjs.sk/thaiszia

THAISZIA
JOURNAL OF
BOTANY

Introduced tree species survey and their representation in the park objects of Levice district

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Benčať T., Kováčová I., Modranský J. & Daniš D. (2012): Introduced tree species survey and their representation in the park objects of Levice district. – Thaiszia – J. Bot. 22 (2): 201-210. – ISSN 1210-0420.

Abstract: The park and non-park objects in 90 settlements of Levice district were searched. Together 70 objects situated in 48 settlements (villages or towns) were found during inventory of woody species in May – September 2011. The results showed that in 90 settlements of Levice district there are situated 70 park and non-park objects. The total number of woody species fluctuated between 4 and 111 pieces, in Čajkov park and Levice city park, respectively. The percentage of introduced, autochthonous, broadleaves and coniferous woody taxa was also determined. In the studied objects there dominated mostly introduced woody taxa and broadleaves..

Keywords: introduced tree species, park objects, Levice, inventory

Introduction

All forms of greenery have positive influence on people and his environment. In the past and also nowadays, introduced tree species have been used within greenery design because of their significant aesthetic and hygienic aspect and colour variegation.

Introduced tree species have been planted in Slovakia because of the fact that our autochthonous dendroflora is quite poor in many aesthetic elements that are in foreign dendrofloras quite common. In terms of shapes, in Slovakia there are not woody species with exactly closed, strictly conical shapes (*Thuja sp., Chamaecyparis sp.*). Limits are also within colours. Significant red autumn

colours of tree leaves are in our woody species rather exceptional (exceptions are *Sorbus sp., Acer platanoides, Popolus tremula* ect.). Another aspect is that tree species in urban environment have challenging conditions for growth, both soil and climatic. Time showed that some of introduced tree species are more adaptable to the negative town conditions than our autochthonous woody species (PAGAN, 1999).

Aim of our research was to find out the presence of park and non-park objects in Levice district and throughout the field research to detect the representation of introduced tree species in existing objects.

Study area

Levice district is situated in the south-eastern part of Nitra region. It is created from one part by historical region Tekov and from the other part by region Hont. Most of the district area is created by the Danube Lowland.

Material and methods

First information about the presence of park and non-park objects in Levice district we gained through recognoscation research of the area to find out what types of objects there are. We also used method of questionnaire survey. As we have received very few answers from village/town offices, in the paper we mainly use the results of our own research. In the paper we processed data about all 90 cadastres that are situated in Levice district. Some values that are mentioned in Tab. 1 were taken from diploma thesis by VRŤOVÁ (2009).

After park and non-park objects finding, we evaluated their present state and classified them to the categories by PUTROVÁ (2001) modified by MODRANSKÝ (2012).

MODRANSKÝ (2012) considers as a *park* an object with woody species vegetation that is larger than 20000 m^2 and has social and environmental functions.

As a *small park* he considers an object with woody species vegetation that is smaller than 20000 m^2, but larger than 1000 m^2 and has also other functions than environmental and aesthetic.

Park belt is an object with woody species vegetation large at least 1000 m^2, whose longitude is at least 10 times larger than width and its occurrence is connected with the line element of a village (cadastre), e.g. communication, watercourse or the line has historical origin.

Monastery garden is a selected object with woody species vegetation and also herb vegetation that at least partly has production function and is a part of a monastery.

Private garden with park design is a selected object with woody species vegetation large at least 1000 m^2, that is at least 100 years old or has very high architectural value or there are very rare taxa.

Remnant of historical object is an object that is or in the past was definable as a park, small park, park belt, monastery garden or private garden with park design, but nowadays it is a lot smaller. It represents a significant object because

of its historical value or there are significant woody species. At the moment it does not have to be a park object.

Public place with woody species vegetation is a non-park object because it is quite small (has less than 1000 m^2) or does not have other than environmental and aesthetic functions.

After recognoscation research there followed inventory, i.e. record of woody species occurring in the park object having regard to the introduced tree species. Field research was performed during May – September 2011. A part of inventory of woody species was also data collection of dendrometric values of individual woody species (trunk perimeter [cm], height [m]). A detailed inventory was performed concretely in those park objects that are in the category *park*. The names of taxa are given in terms of MARHOLD and HINDÁK (1998).

Results and discussion

Within the research of Levice district area we investigated all the ninety villages. In the area we recorded 70 objects totally situated in 48 villages. It was also found out that in 42 villages there is no park or non-park object.

From the total number of 70 park and non-park objects, we put 21 to the category *park*, 17 to the category *small park*, 2 to the category *park belt*, 3 to the category *private garden with park design*. We also explored 27 objects that were put to the category *public place with woody species vegetation*, that is, to the objects that are not park objects within the method. A detailed review about multiplicity of the park and non-park objects in individual cadastres of explored area is recorded in Tab. 1.

In more detail we examined the park objects belonging to the category *park*. Inventory was performed in 16 of them. In 3 objects of the category *park* inventory was not performed because of the fact that the object was not freely available to the public.

In terms of representation of alochthonous and autochthonous woody species in the researched objects we may state that within the Levice district area in the park and non-park objects dominated introduced tree species. This fact is stated in Tab. 1 as a percentage of alochthonous and autochthonous taxa. However, it is necessary to emphasize the fact that Tab. 1 mentions representation of individual species and not the number of individual trees.

Among the most occurring introduced broadleaves in the searched objects we include: *Ailanthus altissima* (Mill) Swingle*, Deutzia scabra* Thunb.*, Robinia pseudoacacia* L.*, Tilia euchlora* C. Koch*, Viburnum rhytidophyllum* Hemsl.*, Lycium barbarum* L.*, Forsythia x intermedia* Zabel*, Sophora japonica* L., *Berberis julianae* C. K. Schneid.*, Berberis thunbergii* DC.*, Buxus sempevirens* L., *Spiraea japonica* 'Goldflame', *Spiraea x vanhouttei* (Briot) Zabel, *Syringa vulgaris* L., *Aesculus hippocastanum* L., *Cerasus serrulata* (Lindl.) G. Don, *Euonymus fortunei* (Turcz.), *Juglans regia* L., *Lonicera nitida* E. H. Wilson , *Negundo aceroides* Moench, *Gleditschia triacanthos* L., *Symphoricarpos albus* (L.) S. F. Blake , *Philadelphus coronarius* L., *Cotoneaster* ssp., *Physocarpus opulifolius* (L.) Maxim., *Swida alba* (L.) Opiz in Bercht. & Opiz, *Catalpa bignonioides* Walt., *Castanea sativa* Mill.

Tab. 1 Recognoscation results and taxa representation in the park and non-park objects of Levice district.

	Village/ town	Type of object	Taxa				
			total number (pcs)	alochthonous	autochthonous	coniferous	broadleaves
				(%)			
1	Bajka	public place	7	71	29	14	86
2	Beša	-	-	-	-	-	-
3	Bátovce	-	-	-	-	-	-
4	Bielovce	-	-	-	-	-	-
5	Bohunice	park	38	40	60	32	68
6	Bory	public place	6	100	0	33	67
7	Brhlovce	1.park	5	60	40	0	100
		2. public place	5	40	60	40	60
8	Čajkov	park	4	75	25	50	50
9	Čaka	-	-	-	-	-	-
10	Čata	-	-	-	-	-	-
11	Demandice	-	-	-	-	-	-
12	Devičany	small park	17	30	70	6	94
13	Dolná Seč	-	-	-	-	-	-
14	Dolné Semerovce	-	-	-	-	-	-
15	Dolný Pial	small park	24	33	77	21	79
16	Domadice	-	-	-	-	-	-
17	Drženice(Kmeťovce)	small park	53	62	38	32	68
18	Farná	-	-	-	-	-	-
19	Hokovce	park	8	50	50	12,5	87,5
20	Hontianska Vrbica	-	-	-	-	-	-
21	Hontianske Trsťany	-	-	-	-	-	-
22	Horná Seč	public place	33	55	45	36	64
23	Horné Semerovce	1. park	39	49	51	28	72
		2. park	29	41	59	0	100
24	Horné Turovce	private garden with park design (2x)	-	-	-	-	-
25	Horný Pial	small park	22	45	55	14	86
26	Hrkovce	-	-	-	-	-	-
27	Hronovce	1. small park	38	74	26	47	53
		2. park	27	67	33	19	81
28	Hronské Kľačany	park	35	62	38	20	80
29	Hronské Kosihy	public place	30	63	37	43	57
30	Iňa	-	-	-	-	-	-
31	Ipeľské Úľany	-	-	-	-	-	-
32	Ipeľský Sokolec	small park	11	36	64	27	73
33	Jabloňovce	-	-	-	-	-	-
34	Jesenské	-	-	-	-	-	-

Tab.1. – cont.

	Village/ town	Type of object	Taxa				
			total number (pcs)	alochthonous	autochthonous	coniferous	broadleaves
			(%)				
35	Jur nad Hronom	-	-	-	-	-	-
36	Kalinčiakovo	private garden with park design	9	100	0	44	56
37	Kalná nad Hronom	1. small park	21	81	19	24	76
		2. public place	31	74	26	36	64
38	Keť	-	-	-	-	-	-
39	Kozárovce	1. public place	14	85	15	57	43
		2. public place	33	76	24	21	79
		3. public place	10	70	30	20	80
		4. public place	28	75	25	50	50
40	Krškany	1. park (closed)	-	-	-	-	-
		2. public place	6	66	34	17	83
41	Kubáňovo	-	-	-	-	-	-
42	Kukučínov	-	-	-	-	-	-
43	Kuraľany	1. public place	11	82	18	18	82
		2. public place	31	71	29	19	81
44	Levice	1. castle park	48	52	48	21	79
		2. city park	111	59	41	22	78
		3. public place	10	50	50	50	50
45	Lok	-	-	-	-	-	-
46	Lontov	park (closed)	-	-	-	-	-
47	Lula	-	-	-	-	-	-
48	Málaš	-	-	-	-	-	-
49	Malé Kozmálovce	-	-	-	-	-	-
50	Malé Ludince	-	-	-	-	-	-
51	Mýtne Ludany	1. small park	27	63	37	37	63
		2. small park	28	61	39	29	71
52	Nová Dedina						
	A. Tek. Nová Ves	park belt	35	77	23	20	80
	B. Opatová	public place	44	61	39	30	70
	C. Gondová	small park	14	64	36	36	64
53	Nový Tekov	small park	32	75	25	25	75
54	Nýrovce	public place	13	69	31	23	77
55	Ondrejovce	1. small park	45	71	29	27	73
		2. park	52	50	50	14	86
56	Pastovce	-	-	-	-	-	-
57	Pečenice	park	24	46	54	33	67
58	Plášťovce	small park	8	63	37	0	100
59	Plavé Vozokany	-	-	-	-	-	-

Tab.1. – cont.

	Village/ town	Type of object	Taxa				
			total number (pcs)	alochthonous	autochthonous	coniferous	broadleaves
					(%)		
60	Podlužany	public place	24	71	29	29	71
61	Pohronský Ruskov	-	-	-	-	-	-
62	Pukanec	1. public place	24	75	25	21	79
		2. small park	5	80	20	80	20
63	Rybník	small park	18	66	34	44	56
64	Santovka	park	13	62	38	15	85
65	Sazdice	-	-	-	-	-	-
66	Sikenica	-	-	-	-	-	-
67	Slatina	-	-	-	-	-	-
68	Starý Hrádok	-	-	-	-	-	-
69	Starý Tekov	-	-	-	-	-	-
70	Šahy	public place	17	53	47	29	71
71	Šalov	-	-	-	-	-	-
72	Šarovce	1. small park	33	58	42	21	79
		2. park	41	61	39	37	63
73	Tehla	public place	16	38	62	31	69
74	Tekovské Lužany	1. public place	14	71	29	14	86
		2. park	24	58	42	25	75
		3. public place	9	78	22	33	67
75	Tekovský Hrádok	public place	23	70	30	17	83
76	Tlmače(Lipník)	park	90	69	31	34	66
77	Tupá	-	-	-	-	-	-
78	Turá	-	-	-	-	-	-
79	Uhliská	-	-	-	-	-	-
80	Veľké Kozmálovce	public place	22	68	32	91	9
81	Veľké Ludince	1. park belt	2	100	0	0	100
		2. public place	3	67	33	0	100
82	Veľké Turovce	public place	30	30	70	7	93
83	Veľký Ďur	-	-	-	-	-	-
84	Vyškovce nad Ipľom	small park	7	50	50	14	86
85	Vyšné nad Hronom	-	-	-	-	-	-
86	Zalaba	-	-	-	-	-	-
87	Zbrojníky	public place	18	72	28	55	45
88	Želiezovce	park	98	55	45	20	80
89	Žemberovce	park (mansion - closed)	-	-	-	-	-
90	Žemliare	-	-	-	-	-	-

Among the most occurring introduced coniferous woody taxa in the searched objects we include: *Pseudotsuga menziesii* (Mirb.) Franco*, Juniperus x media* 'Pfitzeriana'*, Juniperus virginiana* L., *Juniperus chinensis* 'Pfitzeriana Aurea', *Juniperus squamata* 'Blue Star', *Picea pungens* Engelm.*, Thuja occidentalis* L.*, Thuja orientalis* L., *Thuja plicata* Donn ex D.Don, *Chamaecyparis lawsoniana* (A. Murray) Parl., *Pinus strobus* L., *Abies nordmanniana* (Stev.) Spach ., *Abies concolor* (Gord.) Hopes., *Taxodium distichum* (L.) Rich.

Some of the detected woody species may under certain circumstances become problematic. These are so called invasive species that create a lot of easily wind-movable seeds and are successfully able to settle areas with very different environmental conditions (BAZZAZ 1986). In the new localities they penetrate to the native plant communities, displace the native communities, cause their gradual disappearing and this way they endanger natural ecosystem existence.

Following invasive neophytes grow in Levice district area: *Robinia pseudoacacia* L., *Negundo aceroides* Moench, *Ailanthus altissima* (Mill.) Swingle and *Lycium barbarum* L. Among potentional (regional) invasive species from Levice district we include: *Elaeagnus angustifolia* L., *Mahonia aquifolium* (Pursh) Nutt., *Parthenocissus quinqefolia* (L.) Planch., *Rhus typhina* L. Frequently escaping species are: *Aesculus hippocastanum* L., *Cotoneaster horizontalis* Decne, *Gleditsia triacanthos* L., *Juglans nigra* L., *Pyracantha coccinea* M. Roem., *Quercus rubra* L. and *Syringa vulgaris* L.

In the park and non-park objects of searched area we are able to state that in terms of representation of broadleaves and coniferous woody species, clearly dominated broadleaved taxa. Percentage evaluation according to individual villages is mentioned in Tab. 1.

In Levice district area it is also possible to find valuable individuals of introduced tree species that are significant by their dendrometric variables. Based on current research, as dendrometric valuable we may consider following trees: *Negundo aceroides* Moench, *Gymnocladus dioicus* (L.) K. Koch, *Robinia pseudoacacia* L.*, Taxodium distichum* (L.) Rich, and *Maclura pomifera* (Raf.) Schneid. From these individuals, one of them is situated out of the park object: *Maclura pomifera* (Raf.) Schneid. Dendrometric variables review of these species together with their locality, trunk perimeter and height is given in Tab. 2.

Robust individual of introduced woody species *Robinia pseudoacacia* L. we found in Levice city park, with trunk perimeter 255 cm and height 22 m. The Black Locust is a thermophilous woody plant (BENČAŤ 1989). It was brought from the U.S.A. to Europe as one of the first forest tree species in 1601 (GEYER, BRESNAN 1992). BENČAŤ and TOMAŠKO (1965) mention the mightiest and probably the oldest Black Locust in Slovakia with trunk perimeter 559 cm in Klasov park (Nitra district). They also state that the second mightiest tree with trunk perimeter 377 cm grows in Oponice park (Topoľčany district). Other interesting tree individual with height 17 m and age about 140 years old they mention in Tajná park (Nitra district) and the other one in Krušovce park (Topoľčany district).

Tab. 2 Significant introduced tree species individuals found in Levice district.

Taxa name	Village/town	Trunk perimeter (cm)	Height (m)
Negundo aceroides Moench	Levice – city park	197	10
Gymnocladus dioicus (L.) K. Koch	Želiezovce – park	275	26.5
Maclura pomifera (Raf.) Schneid.	Kamenec	62	8
Robinia pseudoacacia L.	Levice – city park	255	22
Taxodium distichum (L.) Rich	Želiezovce – park	387	23

Very special individual of woody species *Negundo aceroides* Moench was found in Levice city park as well. Trunk perimeter of the tree was 197 cm and height was 10 m. The Box Elder represents one of the most spreading introduced American woody species (BENČAŤ 1989). It is well adapted on wet soils, floods and nowadays it is equable dispersed mainly in river areas (BENČAŤ et al. 1984). Its vegetative reproduction ability and juvenile growth is very high (KOWARIK, BÖCKER 1984). The wood of the Box Elder is sometimes used for the interior completing of houses and for wooden ware (BENČAŤ 1990). BENČAŤ and TOMAŠKO (1965) mention robust individuals of the species in Hadovce park and Bohatá park (Komárno district). In the second mentioned park object *Negundo aceroides* Moench is 18 m high and about 200 years old. MODRANSKÝ (2012) presents in his work significant tree individual with trunk perimeter 324 cm in Jenkovce park (Sobrance district).

Further example of valuable tree species individual is *Gymnocladus dioicus* (L.) K. Koch that we found in Želiezovce city park, with trunk perimeter 275 cm and height 26.5 m. BENČAŤ and TOMAŠKO (1965) mention robust individual of the species with the trunk perimeter 223 cm, height 18 m and age about 150 years old in Mojmírovce park (Nitra district). Another interesting tree they mention in park in Hajná Nová Ves (Topoľčany district). They also state that the mightiest individual of the species in western Slovakia with trunk perimeter 314 cm grows in Nitrianska Streda park (Topoľčany district as well).

Another interesting tree species individual found in Želiezovce city park was *Taxodium distichum* (L.) Rich. It is the highest and the oldest protected bald cypress tree in Slovakia with height of 23 m and trunk perimeter 387 cm. The tree is about 200 years old. BENČAŤ and TOMAŠKO (1965) mention 2 robust individuals of the species with trunk perimeter 314 cm in Hubice park (Dunajská Streda district). Other interesting individual with trunk perimeter 220 cm and age about 100 years old they mention in the park in Nová Ves nad Žitavou (Nitra district) and also in Továrniky park (Topoľčany district). PÚPAVOVÁ (2010) presents in her work robust tree of this species with trunk perimeter 386 cm and height 19 m located in Krupina park (Krupina district).

Out of the park object, in Kamenec (village in Levice district), was found woody species individual *Maclura pomifera* (Raf.) Schneid., significant by its dendrometric variables. Its trunk perimeter was 62 cm and height was 8 m. The species originally comes from northern America and in Slovakia it is especially park tree. BENČAŤ (1982) mentions in his work occurrence of significant individual

of the species with trunk perimeter 195 cm, height 15 m and age about 110 years old in Hadovce Park (Komárno district). *Maclura pomifera* (Raf.) Schneid. is also mentioned by MODRANSKÝ (2012) in Biel park (Trebišov district). Trunk perimeter of the tree is 167 cm.

Conclusion

During the months May – September 2011 we performed recognoscation research of Levice district area. We explored all the ninety cadastres belonging to the mentioned district. In the searched area we recorded the presence of 70 park and non-park objects. From this number in terms of selected categorization we put 21 to the category *park*, 17 to the category *small park*, 2 to the category *park belt*, 3 to the category *private garden with park design*. We also explored 27 objects that were put to the category *public place with woody species vegetation*, that is, to the objects that are not park objects within the method.

Representation of introduced and autochthonous tree species was determined and results were evaluated in percent in tables. It may be stated that alochthonous species taxa are significant components of park vegetation of Levice district. Levice district is because of positive climatic conditions a very suitable place for the growth of many tree species and in the future it will be very probable to find there another dendrometric interesting trees. The taxa that tend to spread to the new territories should be controlled permanently.

Acknowledgement

The work was supported by project of VEGA Slovakia No. 1/0551/11.

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Received: December 13th 2012
Revised: December 19th 2012
Accepted: December 31st 2012