

## Short communication

# Preservation and restoration of living plant collections on the example of the Buda Arboretum of Corvinus University, Budapest

Gábor Schmidt<sup>1</sup>, Magdolna Sütöri-Diószegi<sup>2</sup>

Department of Floriculture and Dendrology, Corvinus University of Budapest Faculty of Horticultural Sciences, 1118 Budapest, Villányi út 29-43, tel: +36 1/482 6461, Hungary,

<sup>1</sup>e-mail: gabor.schmidt@uni-corvinus.hu, <sup>2</sup>e-mail: magdolna.dioszegi@uni-corvinus.hu

### Abstract

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The Buda Arboretum was initiated in the winter of 1893/94. Now it covers 7.5 hectares and is surrounded by the constantly growing city of Budapest. At present, the Arboretum is under very strong urban effect. Within the framework of a EU-project “Preservation and Restoration of Living Plant Collections and Historical Gardens” the Buda Arboretum was profoundly reconstructed and developed between 2010–2012. There were reconstructed selected objects serving to special purposes, e.g.: 1. Special biotypes (garden pond and the surrounding wetland, rock-gardens, pergolas for the climbing plants; a retaining wall giving shelter for the Mediterranean collections; greenhouse as a biotope for tropical and subtropical plants), 2. The historic geometrical garden part (called Parade Square), 3. Ecological solutions for water supply, 4. Suppression of invasive species and development of *Laurocerasus*, *Malus*, *Potentilla*, *Prunus*, *Syringa* collections, wetland-perennials, collection of Hungarian bred woody ornamentals introduction and trial of new Mediterranean species, etc. After reconstruction, the plant material includes over 1,900 woody species and cultivars, more than 240 kinds of bulb-flowers, 500 different perennials, 250 annuals and round about 300 tropical and subtropical (greenhouse) taxa.

### Keywords

arboretum, Buda Arboretum of Corvinus University of Budapest, draught- and pollution-tolerance, global warming-up, heat-tolerance, woody ornamentals

### Introduction and review of literature

The Buda Arboretum is one of the richest plant collections in Hungary. It was initiated in the winter of 1893/94 on 3 hectares, on the premises of the Horticultural School (the predecessor of the present Faculty of Horticultural Sciences) (RÁDE, 1943). The other parts of the territory were utilized by orchards, vineyards, and glasshouses for ornamental plants and vegetables, according to the profile of the School. Later, the fruit- and vine-plantations and the glasshouses were moved to the outskirts of the city and the whole site was reverted to

an arboretum. The different steps of the process were described in works of SCHMIDT (1994), ZALAINÉ (2003), PROBOCSKAI (1994), HÁMORI and SCHMIDT (2003).

Now it covers 7.5 hectares and is surrounded by the constantly growing city of Budapest. The site is situated on the southern foothill of the 235 m high Hill of Gellért. The original vegetation was probably a mixed carstwood forest (*Ceraso mahaleb-Quercetum* and *Orno-Quercetum*), with some elements of mixed floodplain hardwood forest (*Fraxino pannonicarum-Ulmetum*) (FACSAR, 2008). At present, the Arboretum is under very strong urban effect: the summer is hot, the

winter is mild, the air is polluted. The Buda Arboretum has been protected by law as a natural reserve (living gene collection of woody plants) since 1974 and also as a historical garden since 2005 (CSEPELY-KNORR and SÁROSPATAKI, 2009).

The collections serve three main purposes: 1) education of students and public (a “living textbook”); 2) display of Hungarian-bred woody ornamental cultivars, and 3) testing, examination and trying out of plants of subtropical and Mediterranean origin in order to show the possible benefits of urban microclimate and also as potential plant materials for the case of global warming (SCHMIDT, 2008). In 2010, a considerable EU-fund was earned (Project No KMOP-3.2.1/B-09-2009-0003) for the reconstruction and the development of the Arboretum. The first publications reporting on the funding and the preliminary results were published in Hungarian language by SCHMIDT and SÜTÖRI-DIÓSZEGI, M., 2011; HONFI et al., 2012a; HONFI et al., 2012b; SCHMIDT and SÜTÖRI-DIÓSZEGI, 2010. The head of project management was prof. Károly Hrotkó, the head of the reconstruction and planting was prof. Gábor Schmidt, the coordinators were dr. Peter Honfi and dr. Magdolna Sütöri-Diószegei.

## Materials and methods

The reconstruction-project started on 1 June 2010 and ended on 31 March 2012.

The main parts (sub-projects) of the project were as follows:

1. Reconstruction of special biotypes
2. Reconstruction of a historical geometric part of the garden
3. Ecological solutions for heating and for water supply
4. Suppression of invasive species in the hardy plant collections.

Each of the mentioned elements needed different approach and methods. For the sake of simplicity, these methods will be described in the next chapter only.

## Results and discussion

The results (and also the lessons) of the reconstruction project are as follows (see also the Figs 1–6).

### 1. Reconstruction of special biotypes

Because of the limited space, the present paper will concentrate mainly on the most important woody plant collections. The biotypes of herbaceous collection and those for minor woody collections will be shortly mentioned only, and illustrated by some photos. Such are: 1.1. Wetland biotypes (the garden pond and the surrounding artificial wetland, Fig. 1.); 1.2. Dry carstland-

and humid alpine biotypes (rock-gardens with collections from plants of dry native hills and also true alpine plants) were reconstructed on 1,400 m<sup>2</sup>; 1.3. Pergolas for the climbing plants were reconstructed on 240 m<sup>2</sup> (Fig. 2.); and 1.4. South-facing retaining wall as a biotope for the open-ground Mediterranean woody plant collections. A retaining wall giving shelter from the north, is extremely dry and warm and offers excellent conditions for true Mediterranean plants like cypresses (*Cupressuses*), *Yuccas*, pomegranates (*Punica granatum* L.), hardy cactuses (Cactaceae Ivss) and others. The *Albizia julibrissin* (Willd.) Durazz. tree brings a profusion of soft pink mimosa-like flowers from July through September. Also here grow specimens of the bead-tree (*Melia azedarach* L.) and the holly oak (*Quercus ilex* L.). Before reconstruction the wall was partially ruined and dangerous for life. After reconstruction it became safe and the area for Mediterranean collection increased by 600 m<sup>2</sup> (list of plants see later).



Fig. 1. Garden pond.



Fig. 2. Pergola for the climbing plants.

## 2. Reconstruction of the historical geometric garden – part called Parade Square.

The Buda Arboretum is maintained as a natural plant protection and also is registered and protected as a historical garden. The most characteristic part of it is the 3,000 m<sup>2</sup> large geometrical garden section called Parade Square. In the past, the square was fully planted with herbaceous flower-beds as well as with roses – hence the name. Now that park-maintenance became too costly, the former baroque style is just symbolised by two symmetrically arranged groups of arborvitae (*Thuja* spp.), the regular outlines of the lawn and by some adjacent bedding plants. The statue in the upper centre (in front of Building F) commemorates the famous fruit-breeder Máté Berczki (Fig. 3).



Fig. 3. Parade Square

## 3. Environmental-friendly solutions for heating and for water supply

### 3.1 Energy-saving solutions for heating and cooling

The Arboretum contains a relatively small glasshouse (110 m<sup>2</sup>) for the tropical and subtropical ornamental plants. The glasshouse is 20 years old and, before reconstruction, it was far outdated and in a very bad condition. The heating during the winter (with gas) needed a lot of energy and money, and the cooling in the summer was carried out with outdated heaters (pipes) and methods. Simply said, the air-conditioning was insufficient for the plants and yet, very expensive (Fig. 4).

### 3.2 Reutilization of run-off water from the roofs of the buildings

Several solutions were used for reutilization of run-off rainwater, the best of which are shown on Fig. 5.



Fig. 4. Greenhouse for tropical and subtropical plant collection.



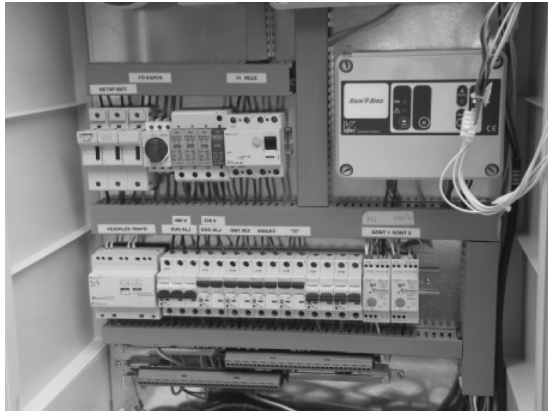


Fig. 5. Collection of run-off rainwater from the roofs of the buildings.

#### 4. Suppression of invasive species and development of hardy perennial and woody plant collections

##### 4.1 Suppression of invasive species

This work included the regional removing of herbaceous weed and also the moving woody species, first of all: *Ailanthus altissima* (Mill.) Swingle, *Acer negundo* L., *Clamatis vitalba* L., *Fraxinus pennsylvanica* Marsh., *Parthenocissus quinquefolia* (L.) Planch., *Cotoneaster multiflorus* Bunge, *Diospyros lotus* L.

##### 4.2 Development of hardy plant collections

###### 4.2.1 Woody plant collection

*Hibiscus* collection: 26 taxa (Fig. 6 a); *Malus* collection: 42 taxa (Fig. 6 b); *Potentilla* collection: 38 taxa; *Prunus*



Fig. 6a. *Hibiscus syriacus* 'Minerva'.

*laurocerasus* L. collection: 34, other *Prunus* collections include the following sub-genera: *Amygdalus*, *Cerasus*, *Padus*, *Prunus*: 74 taxa; *Syringa* collection: 46 taxa.



Fig 6b. *Malus* 'Professor Sprenger'.

– Collection of Hungarian bred woody ornamentals: 74 taxa: *Betula pendula* Roth cv. Karaca, *Buxus microphylla* Sieb. et Zucc. cv. Betlér, *Campsis* × *tagliabuana* (Vis.) Rehd. cv. Galen Select, *Campsis radicans* (L.) Seem. ex Bureau cv. Barack, *Chamaecyparis lawsoniana* (A. Murray) Parl. cv. Tekeres, *Cotoneaster salicifolius* Franch. cv. Rózsaszín Füzér × *Cupressocyparis notabilis* (A. F. Mitchell.) Farjon cv. Márta, *Hedera helix* L. cvs. Arács, Balkon, Blue Star, Börzsöny, Csocosozsan, Duna, Krokó, Marble, Negro, Perint and Zebegény, *Juniperus* × *media* Van Melle cv. Mint Julep Tarka, *Juniperus chinensis* L. cvs. Eldorado, Favorit, Gold Rush, *Juniperus communis* L. cv. Fancsika, *Juniperus conferta* Parl. cv. Sláger, *Juniperus sabina* L. cvs. Báránd, Szőke Tisza and Tarka, *Juniperus virginiana* L. cvs. Golden Rain and Little Mityu, *Picea pungens* Engelm. cv. Edith, *Pinus sylvestris* L. cv. Sé, *Prunus cerasifera* Ehrh. cv. Colos, *Prunus laurocerasus* L. cvs. Ani, Antonius, Cipora, Cleopátra, Gabi, Hagar, Leander, Parviflora and Zita, *Prunus padus* L. cvs. 1/a sz. klón, 6 sz. klón, Aurora, Piros Oszlop (13. sz. klón) and Rózsaszín Május, *Prunus persica* cv. Orlóci Kiméra, *Pyrus pyraeaster* cv. Bihar, *Rosa* hybrids: cvs. Arany János, Bethlen Gábor, Házsongárd, Hild József, Máramaros, Nagyhagymás, Nyitra, Regéc, Szent Imre and Szent Margit, *Salix matsudana* Koidz. cv. Tarkabarka, *Sorbus bakonyensis* Jáv., *S. borbasii* Jáv. cv. Herkulesfürdő, *S. borosiana* Kárp. cv. Alba Regia, *S.*

cv. Hainburg, *Taxus baccata* cv. Zöld, *Thuja occidentalis* L. cvs. Miki, Romantika, Szöllősi Klón (Malonyana Aurea), *Thuja orientalis* cvs. Dundi, Hunor, Jászkiséri, Lakatos and *Thuja orientalis* L. cv. Telihold, *Tilia platyphyllos* Scop. cv. Favorit, *Tilia platyphyllos* Scop. cv. Pannonia.

– Introduction and trial of new Mediterranean species: 61 taxa. In 2011–12, the following new tender species and cultivars were planted and tried: *Acca sellowiana* (O. Berg) Burret, *Albizia julibrissin* Durazz. cv. Summer Chocolate, *Berberis darwini* Hook.; *Caesalpinia gilliesii* (Wallich ex Hook.) Wallich ex D. Dietr.; *Callistemon citrinus* (Curtis) Skeels; *Ceanothus delilianus* Spach. cv. Gloire de Versailles; cv. Henri Defossé; *Ceanothus pallidus* Lindl. cvs. Marie Simon; Perle Rose, *Cistus corbariensis* Pourr.; *C. pulverulentus* Pourr. cv. Sunset; *C. purpureus* Lamn.; *Cistus purpureus* Lamn. cv. Alan Frad; *Cordyline australis* (Forst. f.) Hook. f.; *Cotoneaster lacteus* W.W.Sm.; *Elaeagnus × ebbingei* Boom ex Doorenb. cvs. Clône Erigé, Compacta, Eleador, Gilt Edge, Limelight; *Escallonia* cvs. Apple Blossom, Crimson Spire, Donard Seedling; *Eucalyptus gunnii* Hook f., *Hebe* arts; *Itea virginica* L. cv. Little Henry, *Jasminum officinale* L., *Lagestroemia* hybrids: cvs. Appalache, Hopi, Nivea, Pecos, Petite Pink, Rosea Nova, Rouge, Togo, Tonto, *Lavandula angustifolia* cvs. Hidcote, Munstead, Rosea; *Lavandula × intermedia* Loisel. cvs. Abrial, Chamallow, Edelweiss, Grosso, Imperial Gem; *Leycesteria formosa* Wall., *Mahonia japonica* Thunb.; *Nandina domestica* Thunb. cvs. Firepower, Richmond and Wood's Dwarf; *Osmanthus heterophyllus* (G. Don) P. S. Green cvs. Goshiki, Purpureus, *Phormium tenax* J. R. Forst. & G. Forst.; *Photinia × fraseri* Dress cvs. Camilvy, Nana, Pink Marble; *Prunus lusitanica* L.; *Punica granatum* L. cvs. Chico; Maxima Rubra, *Teucrium fruticans* L.; *Viburnum tinus* L. cvs. Eve Price and Gwenlian.

#### 4.2.2 Perennial plant collections

Dryland perennials: from 60 to 75 taxa, wetland-perennials: from 20 to 70 taxa, alpine perennials: from 40 to 110 taxa.

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