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PRESERVATION AND RESTORATION OF GREENERY IN HISTORICAL CEMETERIES IN SLOVAKIA

KONSERWACJA I REWALORYZACJA ZIELENI HISTORYCZNYCH CMENTARZY SŁOWACJI

Abstract

The largest development in sepulchral culture came at the time of the Enlightenment, when an architectural type of cemetery was created. This type of burial grounds often currently constitutes significant areas of historical greenery in our cities. The quantity and quality of the greenery in cemeteries, however, have decreased significantly in recent decades. The maintenance of these historical cemeteries requires in particular the protection and restoration of the paths. The article is focused on an evaluation of the greenery in the two eldest cemeteries in the town of Nitra. On the basis of the results of this evaluation, we have proposed principles for a framework methodology for restoring greenery and maintaining woody plant management in historical cemeteries.

Keywords: cemetery, greenery, alleys, woody plants, preservation

Streszczenie

Największy rozwój kultury sepulkralnej nastąpił w epoce oświecenia, kiedy to stworzony został architektoniczny typ cmentarza. Ten rodzaj terenów grzebalnych stanowi w naszych miastach często znaczące tereny zieleni historycznej. Jednak ilość i jakość zieleni cmentarnej w ostatnich dekadach znacząco spadła. Dlatego też utrzymanie historycznych cmentarzy wymaga przede wszystkim ochrony oraz rewaloryzacji istniejących na nich alei. Niniejszy artykuł skupiać się będzie na ewaluacji zieleni na dwóch najstarszych cmentarzach w Nitrze. Na podstawie wyników badań zaproponowane zostały ramowe zasady metodologii dla rewaloryzacji zieleni i zarządzania utrzymaniem roślin drzewiastych w historycznych przestrzeniach sepulkralnych

Słowa kluczowe: cmentarze, zieleni, aleje, roślinność leśna, ochrona

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1. INTRODUCTION

Cemetery areas represent a significant proportion of urban greenery and an interesting part of the city's history. Greenery as an element of cemetery landscape composition integrates burial grounds into the country or city, improves visitor orientation in the area of the cemetery, creates an appropriate pious atmosphere, and has a positive effect on the human psyche [5]. Cemetery greenery has aesthetic, ecological and climatic functions, and provides an opportunity for peaceful recreation [4]. The greenery of burial places and tombs has mainly symbolic significance, and in the past identified the location of a tomb. Later, the significance of greenery is mainly as a composition element related to the type of burial place, i.e. architect, park or forest cemeteries. In this perspective, architectural cemeteries are the prevailing type in Slovakia.

2. THE AIM OF RESEARCH

The aim of this study was to conduct a dendrological evaluation of the current state of greenery, and proposals for restoration and maintenance management of greenery in two historical cemeteries in Nitra in Slovakia.

3. THE PRESENT STATE OF RESEARCH

The older architectonic burial places where the greenery is diminished on tree-lined paths because of spatial limitations represent the most widespread type of cemetery in Slovak towns. At present, this type of cemetery is confronted with the problems of surrounding urbanisation, [6] and they are disproportionately overcrowded with graves. The existence of woody plants in these conditions is affected by various negative factors such as lack of maintenance of the vegetation, lack of plant disease control, and damage to trees by the cemetery service, which result in decreasing vitality and a poor aesthetic standard of woody plants in burial places. At present, however, professional care and protection of woody plants in cemeteries in Slovakia is not assured. Therefore it is necessary to establish the principles of restoration and care of woody plants in cemeteries, especially those of historical significance.

4. THE DESCRIPTION OF RESEARCH

Research materials

The evaluation of the current state of greenery, and proposals for restoration and maintenance management of greenery were drawn up for the Main Municipal Cemetery in Nitra (3.64 hectares, 5800 graves) and the Cemetery in Nitra – Chrenova (1.5 hectares, 1600 graves). These are burial grounds of the architectural type with regular geometric segmentation of the burial fields which are defined by tree avenues.

The methodology for the inventory and evaluation of woody plants

Following the method of Machovec (1987) [3], data were collected on the basis of dendrometric values (height, canopy width, trunk circumference, and age) and using non-measurable values for woody plants, their landscape value was determined using a 5-point classification. For the assessment of the greenery condition in the cemetery, plant vitality (lifetime) and plant health status using Juhássová's method (2003) were selected. The inventory was developed in 2012 and its results were compared with the results of the inventory of both cemeteries from 2002 [1, 2]. Various measures were adopted for greenery maintenance, such as the felling of woody plants, treatment of plants, special maintenance of trees, elaboration of expertise, and new tree planting. **Special maintenance** was proposed as a set of measures that would result in improvement or preservation of the landscape value of the woody plants, their health, stability and security. This set of measures is proposed for those woody plants with a higher landscape value that we want to keep in the cemetery for as long as possible, especially for compositional reasons, regardless of their health status, age or degree of damage. Expert examination was recommended especially for those woody plants for which phytopathological expertise or tree stability expertise is necessary.

5. RESEARCH RESULTS

Representation of woody plant species and landscape composition

The results of the representation of woody plant species in the Main Municipal Cemetery show that there are totally 366 woody plants at the burial ground representing 37 species of trees and shrubs. The species composition of woody plants is poor, and the three most abundant tree species together represent 73% of the burial ground. The conifers *Thuja occidentalis* L. and *Thuja orientalis* L. represent more than half of the trees (55%). Deciduous trees are mainly represented by avenue trees such as *Tilia cordata* Mill. (18%), *Aesculus hippocastanum* L. (5%) and *Acer platanoides* L. (3%), making a total of only 26% of woody plants in the cemetery. Poor species diversity represents a high risk in the case of possible damage by disease or pests. Based on a comparison of the inventory results with the last survey of tree condition at the cemetery in 2002 [2], it was found that the number of woody plants had decreased from 565 (2002) [1] to 366 (2012). This means 199 plants were removed, which is 35.2% of the total plants. The number of avenue trees decreased in the case of *Tilia cordata* Mill. from 90 (2002) to 65 (2012) and for *Aesculus hippocastanum* L. (Ill. 1) from 23 (2002) to 18 (2012). New tree planting and avenue restoration at the cemetery have not yet taken place. We assume that this intensity of tree removal will result in the total elimination of avenue trees.

The analysis of woody plants species in the Cemetery in Nitra – Chrenova shows that there are a total of 267 woody plants representing 32 species of trees and shrubs. The most abundant tree species are *Thuja orientalis* (26%), *Thuja occidentalis* (21%) and *Tilia cordata* (17%). In comparing the inventory results with those of the last survey at the cemetery in 2002 [1], it was found that the number of woody plants had not decreased significantly, and the number of avenue trees had decreased in the case of *Tilia cordata* Mill (only 1).

In terms of **landscaping composition**, the avenue deciduous trees in particular are very valuable as they form the main compositional axis of the cemetery, help to organise space, and improve visitor orientation. We consider the individual planting of conifers, especially non-native plants of the genus *Thuja*, inside the grave fields to be a negative landscape composition factor. These woody plants have been introduced and they cause problems with cemetery maintenance, but also with visitor orientation and safety.

Results of woody plant landscape evaluation

The results of the analysis of landscape value for woody plants indicate that those with average and below-average landscape value together form 94.1% of all the trees in the Main Municipal Cemetery and 88.2% in the Cemetery in Nitra – Chrenova. The landscape value of woody plants is reduced mainly due to their minimal or unprofessional maintenance, which is significantly reflected in the health and appearance of these trees. In the case of avenue trees, in spite of their worse health, their landscape value is still considered to be average because they are a very valuable element of the landscape composition. In view of the small number of avenue trees in the burial ground, they should be maintained as much as possible, even if this requires the higher cost of demanding professional maintenance.

Results of woody plant health assessment and degree of damage

Based on the assessment of the health of woody plants conducted in the Main Municipal Cemetery, it was found that almost half of the woody plants at the burial ground are healthy (47.4%). In the Cemetery in Nitra – Chrenova 76.5% of woody plants are healthy, with no sign of disease. Trees with a degree of damage of 3 and 4 represent 11.4% of all the woody plants in the Main Municipal Cemetery and only 0.6% in the Nitra – Chrenova Cemetery. The cemeteries have no trees with the highest damage rating (degree 5), as a consequence of intensive and regular tree felling. The most common kinds of damage to avenue trees are unprofessional cutting, tree trunk cavities, or damage to tree roots during burials and construction work.

Results of the vitality evaluation of woody plants

A tree vitality (lifetime) of 40 years or over is estimated at only 3.1% of woody plants in both cemeteries. For almost half of the woody plants in the burial grounds we assume lifetime of up to 30 years. For the other woody plants, 50.1% in the Main Municipal Cemetery and 45% in the Cemetery in Nitra – Chrenova, there is an estimated lifetime of only 10 to 20 years if burial continues in the area of the tree root.

Proposal for cultivation measures and treatment of woody plants

The felling of woody plants is mostly proposed for trees inside the grave fields, namely *Thuja orientalis* L., because of the risk of grave damage. Of the deciduous plants it has only been proposed to fell trees in the avenue because of their poor state of health and the danger to visitors. There was further proposed the felling of a few seeding trees. Plants with low vitality which do not endanger the safety of visitors are recommended to be kept.

Treatment of woody plants includes proposals for different kinds of tree cut back, removal of seeding trees, cavity treatment, and chemical spraying. Most of these measures have been proposed for avenue trees. It is also recommended to observe the expansion of the vine *Hedera helix* L. and ensure its removal from avenue trees.

Special maintenance has been proposed for 23.5% of woody plants in the Main Municipal Cemetery and for 15.3% in the Cemetery in Nitra – Chrenova, mostly for the species *Tilia cordata* Mill. and *Aesculus hippocastanum* L. located in the tree avenue.

Expert examination has been proposed for woody plants which need phytopathological assessment or analyses of tree stability before expert systems of measures for improving and maintaining their health is carried out.

Planting of new woody plants is proposed for the reconstruction of avenues. We propose 39 *Tilia cordata* Mill. in the Main Municipal Cemetery and 18 *Tilia cordata* and *Tilia platyhyllus* Scop. in the Nitra – Chrenova Cemetery. Reconstruction of avenues is problematic mostly because of the lack of space for new planting.

6. CONCLUSION

The evaluation results enable us to propose the following methodology for restoring landscape composition in cemeteries, which can be used to restore greenery in old cemeteries:

- restoration of original landscaping compositions in cemeteries by avoiding inappropriate individual planting of woody plants inside the grave fields,
- implementation of substitute planting of avenue trees at the original site by using milled tree stumps, or in other locations after the abolition of graves,
- preventing root damage by abolishing graves, removing paved road surfaces, building unpaved roads, or narrowing roads,
- improving the health of existing avenue trees by regular maintenance carried out by arborists and by protection from disease and pests,
- management of tree maintenance requires the introduction of special maintenance represented by a set of measures leading to the maintenance and improvement of the most valuable trees,
- the cemetery operator should hold insurance against damage caused by woody plants under special maintenance (damage to tombstones, personal injury claims).



- III. 1. Current state of the *Aesculus hippocastanum* L. avenue in the Main Municipal Cemetery in Nitra (photo by D. Halajová, 2012)
- II. 1. Stan obecny alei kasztanowców (*Aesculus hippocastanum* L.) na głównym cmentarzu miejskim w Nitrze (fot. D. Halajová, 2012)

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