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DENDROFLORA AND CURRENT STATE OF HISTORIC CEMETERIES OF THE KOŁO DISTRICT IN CENTRAL POLAND

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ABSTRACT. In 47 historic cemeteries in the area of 10 communes of the Koło District, an inventory of trees, shrubs and subshrubs was made in the period of 2003-2004. Breast height circumference of tree trunks was recorded if it exceeded 40 cm, while the smaller trees were only identified and counted. In the cemeteries, 46 species of trees and 28 species of shrubs of a total of 26 families were recorded. Gymnosperms were represented by 16 species (21% of the total number of species). Among the 2681 recorded trees, the most numerous were: false acacia (*Robinia pseudoacacia*, 24.13%), English oak (*Quercus robur*, 9.74%), common ash (*Fraxinus excelsior*, 7.91%), small-leaved lime (*Tilia cordata*, 7.57%), Norway spruce (*Picea abies*, 7.50%), and Scots pine (*Pinus sylvestris*, 6.94%). Contributions of other species did not exceed 5%. In many cemeteries, especially in neglected ones, a dense shrub layer has developed. It is usually dominated by the common lilac (*Syringa vulgaris*), snowberry (*Symphoricarpos albus*), and tree seedlings.

Key words: dendroflora, cemetery, the district of Koło

Introduction

Cemeteries located in villages, towns and cities are integral parts of the Polish landscape. They are treated as a space of silence, serious reflection, nostalgia, and religious cult.

Vegetation of those places, especially the trees and shrubs accompanying the cemetery architecture, shape the character and atmosphere of the given necropolis. Site conditions, natural forces, and interspecific competition (Siciński 1981/1982), as well as the mode of land use (Lisowska et al. 1994) are the major factors affecting floristic diversity in cemeteries.

Old trees in historic cemeteries are particularly valuable natural resources and deserve special care because they can be destroyed very easily (Siciński 1981/1982). They play many important functions, as they exert a positive influence on the environment and climate, and often diversify monotonous landscapes.

The lack of floristic information from cemeteries of the Koło District offered an incentive for initiating in 2003 the inventory of trees and shrubs presented in this paper.

Study area

The Koło District is located in the lowlands of central Poland. It is the easternmost district of the Wielkopolska Province. It borders with the Konin, Turek, Kutno, Włocławek, and Łęczyca Districts. Its landscape is of postglacial origin. The area lies in the catchment of the Warta River, whose course turns from meridional to equatorial near the town of Koło. A number of tributaries, such as Ner, Rgilewka, and Kielbaska, join the river there. The district covers an area of 101 103 ha and includes 10 communes: Babiak, Chodów, Dąbie, Grzegorzew, Kłodawa, Kościelec, Koło, Osiek Mały, Olszówka, and Przedecz (Toczyński 1998).

The inventory was conducted in 47 cemeteries included in the registry of historic buildings and monuments, or being under the care of the Provincial Conservation Officer. These cemeteries are generally termed historic cemeteries in this work. Among them, 24 are Roman Catholic (including two war cemeteries and 22 still used), 21 are Protestant (including two still used, the others neglected), and two are Jewish (without tombstones, only with plaques informing about their character).

Trees, shrubs and subshrubs were recorded and identified to species or lower level according to Seneta and Dolatowski (2000). Circumference of tree trunks was measured at breast height (1.3 m above ground).

The studied Roman Catholic cemeteries, denoted with Roman numerals I–XXIV, are situated in the following localities (Fig. 1): I – Babiak, II – Brdów, III – Dębno Proboszczowskie, IV – Lubotyń (cemeteries I–IV lie in the Babiak Commune), V – Dzierzbice, VI – Rdutów (cemeteries V–VI lie in Chodów Commune), VII – Chełmno, VIII – Chełmno (war cemetery), IX – Dąbie (in Dąbie Commune), X – Borysławice Kościelne, XI – Grzegorzew (in Grzegorzew Commune), XII – Bierzwienna Długa, XIII – Kłodawa, XIV – Rysiny Kolonia (in Kłodawa Commune), XV – Koło, XVI – Koło (war cemetery), XVII – Wrząca Wielka (in Koło Commune), XVIII – Białków, XIX – Dobrów, XX – Kościelec (in Kościelec Commune), XXI – Umień (in Olszówka Commune), XXII – Dęby Szlacheckie, XXIII – Osiek Wielki (in Osiek Mały Commune), XXIV – Przedecz (in Przedecz Commune).

The inventory included also Protestant cemeteries: XXV – Babiak, XXVI – Kiejsze (in Babiak Commune), XXVII – Baranowiec, XXVIII – Dąbie, XXIX – Grabina Wielka, XXX – Holendry, XXXI – Łusie, XXXII – Majdany, XXXIII – Sobótka (in Dąbie Commune), XXXIV – Dębina, XXXV – Rysiny Kolonia (in Kłodawa Commune), XXXVI – Kaczyniec, XXXVII – Koło (in Koło Commune), XXXVIII – Daniszew, XXXIX – Tury (in Kościelec Commune), XL – Zawadka Nowa (in Olszówka Commune), XLI – Borecznia Wielka, XLII – Lipiny, XLIII – Młynek, XLIV – Nowa Wieś, XLV – Plebanki (in Osiek Mały Commune). Moreover, two Jewish cemeteries were investigated: XLVI – Koło, and XLVII – Przedecz.

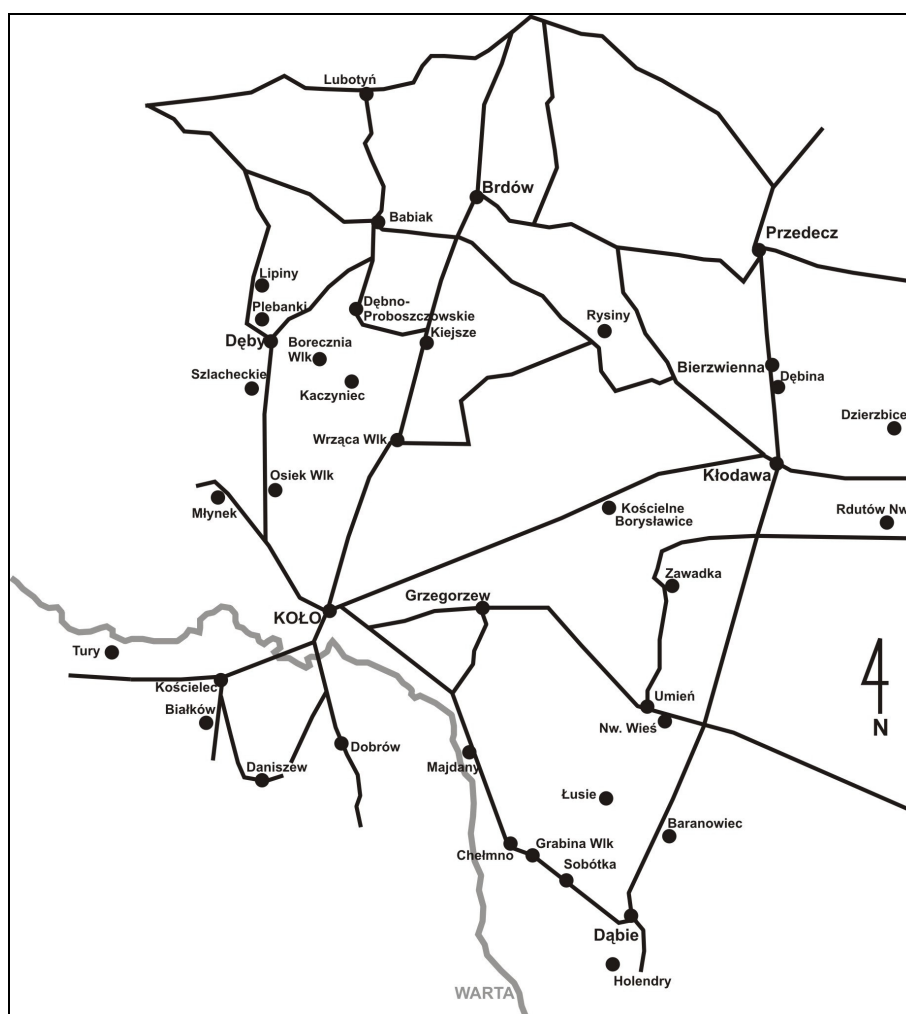


Fig. 1. Locations of places with the examined cemeteries
Ryc. 1. Rozmieszczenie miejscowości z badanymi cmentarzami

In the list of recorded tree taxa, Roman numerals denote cemeteries, while Arabic numerals denote numbers of individuals of the species in size classes based on trunk circumference: A – < 0.41 m, B – 0.41-0.60 m, C – 0.61-0.80 m, D – 0.81-1.00 m, E – 1.01-1.20 m, F – 1.21-1.40 m, G – 1.41-1.60 m, H – 1.61-1.80 m, I – 1.81-2.00 m, J – 2.01-2.20 m, K – 2.21-2.40 m, L – 2.41-2.60 m, Ł – 2.61-2.80 m, M – 2.81-3.00 m, N – > 3.00 m.

In the list of monumental trees, Arabic numerals denote trunk circumference at breast height.

Results

In the studied cemeteries, 47 taxa of trees and 28 of shrubs of a total of 26 families were found. Gymnosperms were represented by 16 species. Among the 2681 recorded trees, the most numerous species included: false acacia (*Robinia pseudoacacia*, 24.13%), English oak (*Quercus robur*, 9.74%), common ash (*Fraxinus excelsior*, 7.91%), small-leaved lime (*Tilia cordata*, 7.57%), Norway spruce (*Picea abies*, 7.50%) and Scots pine (*Pinus sylvestris*, 6.94%). Contributions of other species did not exceed 5%.

Only one of the trees recorded in this study has been registered as a monument of nature (*Quercus robur* L. in Kościelec), but 37 other trees should be also registered because they meet the trunk circumference thresholds for monumental trees suggested by Kasprzak (1992).

List of species, cultivars and hybrids of trees and shrubs

Gymnospermae

Juniperus communis L.: XIX – 1 (1 C);

Larix decidua Mill.: I – 4 (4 B), III – 1 (1 D), IV – 2 (1 F, 1 I), XV – 1 (1 F), XVII – 3 (1 C, 1 D, 1 G), XIX – 2 (1 C, 1 D), XX – 1 (1 J), XXII – 3 (1 D, 1 E, 1 F), XXIV – 40 (11 B, 9 C, 7 D, 13 E), XXXVII – 1 (1 G);

Picea abies (L.) H. Karst.: I – 8 (2 C, 3 D, 3 E), II – 10 (6 D, 4 F), III – 2 (2 F), IV – 31 (7 B, 18 C, 4 D, 2 E), V – 1 (1 E), IX – 2 (1 C, 1 E), X – 3 (2 B, 1 F), XI – 12 (3 C, 2 D, 4 E, 3 G), XII – 2 (2 E), XIII – 4 (4 F), XV – 54 (5 B, 11 C, 22 D, 8 E, 6 F, 1 G, 1 I), XVII – 22 (16 A, 2 B, 2 E, 2 F), XIX – 2 (1 A, 1 B), XXII – 44 (28 A, 16 B, 2 C), XXIV – 2 (1 B, 1 H), XXV – 2 (1 D, 1 F);

Picea pungens 'Glauca' (f. *glauca* Beissn.): III – 1 (1 B), XXIV – 2 (1 E, 1 F);

Picea pungens Engelm.: VI – 1 (1 C);

Pinus sylvestris L.: III – 4 (2 E, 2 G), XII – 23 (1 C, 6 D, 11 E, 5 F), XV – 12 (2 E, 5 F, 2 G, 1 H, 1 J, 1 K), XIX – 6 (1 B, 2 C, 3 G), XXI – 1 (1 E), XXIII – 3 (2 F, 1 H), XXIV – 16 (1 E, 4 F, 5 G, 5 H, 1 I), XXV – 40 (5 B, 11 C, 23 D, 1 E), XXIX – 20 (4 C, 2 D, 3 E, 3 F, 8 G), XXXVII – 19 (1 D, 1 E, 7 F, 6 G, 2 H, 1 I, 1 K), XLIII – 7 (5 A, 2 B), XLIV – 10 (3 A, 5 B, 2 C), XLV – 9 (5 A, 4 B), XLVI – 16 (1 F, 4 G, 2 H, 5 I, 2 J, 1 K, 1 L);

Platycladus orientalis (L.) Franco: I – 5 (5 B), VIII – 3 (2 C, 1 D);

Thuja occidentalis L.: I – 10 (3 A, 6 B, 1 C), II – 5 (5 A), III – 2 (1 B, 1 D), IV – 4 (3 A, 1 B), VII – 10 (10 A), IX – 15 (2 A, 5 B, 3 C, 4 D, 1 F), X – 5 (5 A), XII – 27 (6 A, 17 B, 4 C), XIII – 5 (1 B, 1 C, 2 D, 1 E), XV – 16 (9 A, 6 B, 1 C), XVII – 14 (8 A, 5 B, 1 C), XVIII – 3 (2 B, 1 D), XIX – 2 (2 B), XXII – 2 (1 C, 1 D), XXXVII – 1 (1 C).

Angiospermae

Acer campestre L.: XI – 1 (1 M), XXIV – 5 (2 E, 1 F, 1 G, 1 L), XLV – 1 (1 E);

Acer negundo L.: III – 1 (1 A), VI – 1 (1 F), IX – 7 (1 C, 1 D, 3 E, 2 N), XV – 2 (1 E, 1 J), XXI – 4 (2 E, 2 G);

Acer platanoides L.: I – 12 (4 E, 1 F, 2 G, 3 H, 1 I, 1 J), II – 2 (2 G), XI – 25 (12 A, 1 C, 1 F, 3 G, 2 H, 2 I, 2 J, 2 L), XV – 16 (1 C, 3 F, 7 G, 4 H, 1 K), XVI – 7 (1 C, 3 E, 1 F, 1 H, 1 J), XVIII – 2 (1 H, 1 I), XXIV – 7 (1 B, 1 C, 4 D, 1 I), XXVIII – 1 (1 H);

- Acer pseudoplatanus* L.: I – 9 (1 E, 2 F, 4 G, 1 H, 1 L), IV – 3 (1 H, 1 I, 1 J), V – 2 (2 C), XI – 13 (9 A, 2 C, 1 D, 1 F), XVI – 6 (5 A, 1 G), XX – 3 (1 F, 1 H, 1 L), XXIII – 1 (1 L);
- Acer saccharinum* L.: XII – 9 (2 K, 4 L, 1 Ł, 1 M, 1 N), XIII – 2 (2 N), XXIV – 2 (1 J, 1 N);
- Aesculus hippocastanum* L.: IV – 10 (1 I, 4 J, 3 L, 2 Ł), V – 5 (2 H, 1 I, 1 J, 1 L), VII – 5 (2 F, 2 G, 1 J), IX – 5 (4 C, 1 H), XIII – 8 (2 I, 3 J, 3 K), XV – 12 (5 E, 4 F, 1 G, 2 H), XVI – 3 (1 J, 1 L, 1 Ł), XVII – 1 (1 J), XVIII – 10 (2 F, 4 G, 2 H, 1 I, 1 J), XX – 6 (3 G, 2 H, 1 I), XXI – 2 (1 D, 1 E), XXIII – 1 (1 J), XXV – 7 (1 D, 2 E, 2 F, 1 G, 1 I), XXXVI – 1 (1 G), XXXVII – 20 (4 D, 4 E, 3 F, 4 G, 5 H);
- Betula pendula* Roth: I – 2 (2 F), III – 7 (4 F, 3 G), V – 2 (1 D, 1 H), X – 9 (1 D, 2 F, 5 G, 1 H), XII – 8 (2 C, 1 D, 2 F, 2 G, 1 H), XIII – 8 (3 D, 2 E, 1 F, 2 G), XV – 12 (1 D, 4 E, 2 F, 5 H), XVII – 9 (6 B, 2 D, 1 E), XIX – 19 (9 A), XX – 4 (1 E, 1 G, 2 H), XXXIII – 5 (1 D, 2 E, 2 F), XXVII – 1 (1 C), XXXI – 7 (4 A, 1 D, 2 F), XXXII – 4 (4 A), XLIII – 12 (7 A, 5 B), XLIV – 9 (8 A, 1 B);
- Betula pubescens* Ehrh.: XXII – 13 (6 D, 6 E, 1 H);
- Caragana arborescens* ‘Pendula’: XXII – 1 (1 A);
- Carpinus betulus* L.: IX – 1 (1 F), XVI – 2 (2 H), XXIV – 6 (1 D, 1 E, 1 F, 1 G, 1 I, 1 J), XXXV – 6 (3 A, 3 B);
- Crataegus ×media* ‘Rubra Plena’: IX – 4 (1 D, 1 E, 1 F, 1 G), XV – 5 (1 A, 1 C, 2 D, 1 E);
- Crataegus monogyna* Jacq.: I – 1 (1 D), XI – 3 (1 B, 2 D), XVI – 15 (15 A), XXXV – 2 (2 A), XXXVIII – 5, (5 A);
- Fagus sylvatica* L.: XXIII – 10 (1 I, 2 J, 1 K, 4 L, 2 Ł);
- Fraxinus exelsior* ‘Pendula’: XXII – 1 (1 E);
- Fraxinus exelsior* L.: I – 1 (1 E), II – 3 (1 G, 1 H, 1 Ł), IV – 2 (1 I, 1 J), V – 18 (2 D, 2 F, 7 G, 2 H, 2 I, 2 J, 1 K), VI – 1 (1 E), IX – 3 (1 B, 1 C, 1 I), XI – 2 (2 G), XII – 5 (1 I, 2 J, 2 K), XIII – 17 (3 G, 6 H, 2 I, 3 J, 1 K, 1 L, 1 Ł), XV – 5 (1 E, 2 F, 1 G, 1 H), XVI – 25 (5 C, 11 D, 3 E, 1 F, 1 G, 1 H, 1 J, 2 L), XVII – 13 (4 G, 2 H, 3 I, 3 J, 1 K), XVIII – 7 (3 H, 2 I, 2 K), XX – 17 (1 D, 7 F, 4 G, 4 H, 1 I), XXI – 1 (1 B), XXII – 2 (1 H, 1 J), XXIII – 1 (1 H), XXIV – 3 (1 F, 1 G, 1 Ł), XXVIII – 57 (6 D, 8 E, 9 F, 12 G, 17 H, 5 I), XXXI – 2 (2 C), XXXVI – 4 (1 B, 2 F, 1 G), XXXVII – 23 (1 A, 1 B, 2 C, 7 D, 5 E, 5 F, 2 G);
- Juglans regia* L.: VIII – 4 (1 E, 2 F, 1 G);
- Malus sylvestris* Mill.: XXXIII – 3 (1 E, 1 F, 1 H);
- Morus alba* L.: XLVI – 2 (1 A, 1 C);
- Populus alba* L.: XI – 1 (1 N), XVI – 9 (7 A, 2 N), XV – 1 (1 M), XXIV – 2 (1 J, 1 K);
- Populus nigra* ‘Italica’: XXIV – 2 (1 K, 1 Ł);
- Populus nigra* L.: XII – 4 (1 G, 2 H, 1 M), XV – 1 (1 J), XXIV – 1 (1 N), XXXV – 10 (1 H, 4 I, 5 J), XXXVIII – 5 (3 C, 2 D);
- Populus tremula* L.: XIX – 7 (4 A, 3 B), XXV – 2 (1 C, 1 D), XXIX – 4 (4 C), XXXVI – 25 (8 B, 10 C, 7 D), XXXVIII – 4 (4 B), XLII – 21 (11 A, 7 B, 3 C), XLVII – 63 (21 A, 25 B, 17 C);
- Prunus cerasus* L.: XXXV – 3 (3 A);
- Prunus serotina* Ehrh.: XLVI – 10 (10 A);
- Pyrus pyraeaster* (L.) Burgsd.: XVI – 1 (1 H), XXXII – 7 (5 A, 1 B, 1 C), XXXIII – 10 (1 C, 3 E, 5 F, 1 G), XXXIV – 1 (1 I), XXXV – 6 (1 B, 3 C, 2 D), XXXVIII – 3 (3 B), XLVI – 7 (4 A, 3 B), XL – 3 (1 C, 1 D, 1 E), XLVII – 7 (1 H, 2 I, 1 J, 1 K, 1 L, 1 M);

- Quercus petraea* (Matt.) Liebl.: XXV – 1 (1 L), XL – 2 (1 G, 1 K), XLI – 5 (2 C, 3 D);
Quercus robur L.: I – 1 (1 K), II – 1 (1 J), IV – 1 (1 M), V – 1 (1 M), IX – 1 (1 D), XIII – 1 (1 M), XV – 24 (1 F, 3 G, 5 H, 5 I, 2 J, 6 K, 1 L, 1 N), XIX – 44 (4 A, 1 D, 2 E, 8 F, 11 G, 9 H, 7 I, 2 K), XX – 5 (1 H, 1 I, 1 J, 1 M, 1 N), XXII – 10 (2 H, 3 I, 3 K, 1 L, 1 N), XXIV – 14 (3 A, 5 E, 1 F, 1 J, 1 K, 3 L), XXV – 9 (1 E, 2 H, 1 I, 3 J, 1 K, 1 L), XXVI – 18 (2 F, 5 G, 5 H, 1 I, 5 J), XXIX – 9 (3 C, 3 D, 1 E, 1 F, 1 G), XXX – 45 (6 B, 16 C, 10 D, 7 E, 1 F, 3 G, 1 J, 1 K), XXXI – 18 (3 B, 1 C, 1 D, 5 E, F 5, 1 G, 1 H, 1 I), XXXIV – 35 (1 B, 2 C, 7 D, 7 E, 6 F, 6 G, 2 H, 2 J 2 J), XXXVII – 1 (1 L), XXXIX – 1 (1 L), XL – 1 (1 J), XLIV – 4 (4 A), XLV – 17 (7 A, 5 B, 5 D);
Rhus typhina L.: III – 3 (3 A), X – 3 (3 A);
Robinia pseudoacacia L.: I – 16 (1 C, 3 F, 3 G, 3 H, 3 I, 2 J, 1 K), VI – 5 (1 B, 1 C, 3 E), VII – 22 (5 B, 3 C, 3 D, 4 E, 3 F, 1 H, 3 J), IX – 4 (1 E, 2 H, 1 I), XI – 82 (5 D, 6 E, 16 F, 18 G, 10 H, 10 I, 5 J, 6 K, 1 L, 2 L, 3 M), XIII – 5 (1 G, 1 I, 2 K, 1 L), XV – 135 (1 C, 1 D, 4 E, 11 F, 23 G, 23 H, 25 I, 13 J, 17 K, 4 L, 2 L, 1 M), XVI – 17 (4 J, 8 K, 3 L, 2 L), XVIII – 15 (1 H, 4 I, 6 J, 2 K, 2 L), XIX – 26 (10 A, 2 E, 3 F, 3 G, 3 H, 3 I, 2 J), XX – 24 (1 E, 1 F, 4 G, 2 H, 5 I, 4 J, 4 K, 2 L, 1 M), XXI – 125 (9 D, 31 E, 41 F, 29 G, 8 H, 4 I, 3 J), XXIII – 5 (1 G, 1 H, 1 I, 1 J, 1 K), XXIV – 14 (1 F, 1 G, 4 H, 6 I, 2 J), XXV – 11 (1 B, 1 C, 1 D, 4 E, 1 F, 1 G, 1 H, 1 I), XXVII – 7 (1 C, 4 D, 2 E), XXVIII – 1 (1 C), XXXI – 9 (2 A, 2 C, 3 D, 2 E), XXXVII – 49 (5 B, 7 C, 3 D, 12 E, 7 F, 6 G, 4 H, 1 I, 3 J, 1 K), XXXIX – 16 (14 A, 1 F, 1 J), XL – 10 (2 C, 5 D, 2 E, 1 H), XLIV – 10 (10 A), XLV – 17 (10 A, 7B), XLVI – 22 (10 A, 12 B);
Salix fragilis L.: XXXIII – 2 (1 G, 1 H);
Sambucus nigra L.: XLVI – 3 (1 A, 2 B);
Sorbus aria (L.) Crantz: XI – 1 (1 D);
Sorbus aucuparia L., IV – 2 (2 A), VI – 19 (17 A, 2 B), IX – 2 (2 B), XIX – 4 (4 A), XXII – 3 (3 A), XXXVIII – 6 (6 A);
Sorbus intermedia (Ehrh.) Pers.: VI – 6 (2 A, 3 B, 1 C), XII – 8 (4 A, 3 B, 1 C);
Syringa vulgaris L.: XXXII – 2 (2 A);
Tilia cordata Mill.: II – 13 (4 G, 2 H, 6 I, 1 K), V – 4 (1 C, 1 E, 1 J, 1 K), VI – 21 (2 E, 6 F, 4 G, 2 H, 1 I, 2 J, 2 K, 2 L), VII – 34 (2 D, 8 E, 13 F, 2 G, 2 H, 2 I, 4 J, 1 L), XII – 33 (1 D, 1 E, 3 F, 9 G, 10 H, 4 I, 2 J, 1 K, 1 L, 1 N), XIII – 6 (1 F, 1 G, 1 H, 2 J, 1 K), XV – 5 (2 C, 1 E, 1 F, 1 H), XX – 30 (1 E, 8 F, 6 G, 5 H, 4 I, 2 J, 1 K, 2 L, 1 L), XXII – 1 (1 I), XXIV – 54 (3 A, 4 C, 4 D, 7 E, 14 F, 9 G, 7 H, 1 I, 2 J, 1 L, 1 M, 1 N), XXXIV – 2 (1 H, 1 I);
Tilia platyphyllos Scop.: XI – 10 (2 D, 2 E, 1 F, 1 G, 3 H, 1 I), XII – 10 (5 H, 3 I, 2 J), XIII – 6 (1 E, 1 G, 2 H, 1 I, 1 K), XVII – 1 (1 I), XXIV – 2 (1 E, 1 I), XXXVII – 1 (1 E);
Ulmus glabra Huds.: XXIV – 1 (1 E);
Ulmus laevis Pall.: XI – 8 (1 E, 3 G, 1 H, 1 I, 2 J), XV – 6 (1 H, 2 J, 1 K, 1 L, 1 M).
- Shrubs were represented by the following species: *Buxus sempervirens* L., *Caragana arborescens* Lam., *Chamaecyparis lawsoniana* (A. Murray) Parl., *C. pisifera* (Siebold et Zucc.) Endl., *Corylus avellana* L., *Cotoneaster horizontalis* Decne., *Euonymus europaeus* L., *E. fortunei* (Turcz.) Hand.-Mazz., *Forsythia ×intermedia* Zabel, *Hedera helix* L., *Juniperus communis* L., *J. horizontalis* Moench, *J. sabina* L., *J. virginiana* L., *Mahonia aquifolium* (Pursh) Nutt., *Prunus padus* L., *P. serotina* Ehrh., *Rhamnus catharticus* L., *Rhus typhina* L., *Rosa canina* L., *R. rugosa* Thunb., *Rubus caesius* L., *R. plicatus* Weihe et Nees, *Sambucus nigra* L., *Symphoricarpos albus* (L.) S.F. Blake, *Syringa vulgaris* L., *Taxus baccata* L., *Vaccinium myrtillus* L.

List of trees with monumental dimensions

Acer negundo L.: IX – 3.05 m, 3.13 m;
Acer pseudoplatanus L.: XX – 2.55 m, XXIII – 2.45 m;
Acer saccharinum L.: XII – 3.40 m, XIII – 3.37 m, 4.05 m, XXIV – 3.10 m;
Carpinus betulus L.: XXIV – 2.03 m;
Crataegus media Bechst. ‘Rubra Plena’: XV – 1.05 m;
Crataegus monogyna Jacq.: IX – 1.06 m, 1.38 m, 1.54 m;
Fraxinus excelsior L.: II – 2.61 m, XIII – 2.77 m, XVIII – 2.55 m, XXIV – 2.77 m;
Pinus sylvestris L.: XLVI – 2.50 m;
Populus alba L.: XVI – 4.02 m;
Pyrus pyraster (L.) Burgsd.: XLVII – 2.01 m, 2.25 m, 2.44 m, 3.00 m;
Quercus robur L.: XV – 3.10 m, XXII – 3.30 m;
Thuja occidentalis L.: IX – 1.35 m, XIII – 1.05 m;
Tilia cordata Mill.: XII – 3.06 m, XXIV – 3.10 m;
Ulmus laevis Pall.: XI – 2.03 m, 2.13 m, XV – 2.02 m, 2.13 m, 2.27 m, 2.60 m, 2.87 m,
 XVIII – 2.58 m.

Current state of the studied cemeteries

The studied cemeteries can be divided into two major groups:

- Devastated, neglected, left without any care

This group includes most of the Protestant cemeteries that are no longer used for burying. They are not fenced; their limits are often demarcated by stacked stones (e.g. in Grabina Wielka), an elevation, or remnants of fencing (e.g. Sobótka). Their area can be approximately determined on the basis of plants that used to be planted in cemeteries (e.g. *Syringa vulgaris*, *Hedera helix*, *Vinca minor*, *Symphoricarpos albus*). They are covered by dense vegetation, so their penetration in summer is very difficult.

- Properly maintained cemeteries

This group includes mainly Catholic cemeteries. Their current state indicates that they are constantly cared for: trees and shrubs are pruned or removed when necessary, rubbish is collected regularly. They are fenced and still used for burying, so they are not prone to devastation. Most of them are included in the registry of historic buildings and monuments, so they are inspected by the Provincial Conservation Officer.

Also two war cemeteries in Koło and Chełmno are properly maintained. The one in Chełmno is private and in 2003 some conservation work was conducted there.

Among Protestant cemeteries, only two are still used for burying and cared for. The one in Dąbie is fenced but to a large extent overgrown by shrubs and self-sown tree seedlings. The one in Koło belongs to the local Evangelical parish. It is regularly cleaned and expansive shrubs are removed, while trees are pruned when necessary.

The liquidated Jewish cemeteries in Przedecz and Koło are commemorated by plaques informing about them. They are located in towns and their areas are ordered.

Discussion

Floristic papers on Polish cemeteries are usually inventories of trees and shrubs (e.g. **Stypiński** 1978, **Siciński** 1981/1982, **Dorda** 1995, **Żurkowska** 1999 a, b) or descriptions of their vascular flora (e.g. **Celka** and **Żywicka** 2004, **Czarna** 2004, **Czarna** and **Piskorz** 2005).

In this study, 47 tree taxa and 28 shrub species were recorded. Among trees, broad-leaved species dominated, e.g. *Robinia pseudoacacia*, *Quercus robur*, *Fraxinus excelsior*, *Tilia cordata*. Conifers accounted for 21% of the total number of taxa, and were represented mainly by *Picea abies*, *Pinus sylvestris*, *Thuja occidentalis* and *Larix europaea*.

Siciński (1981/1982), who made dendrological inventories in cemeteries in Wrocław, recorded 42 species of trees and 16 of shrubs. Broad-leaved taxa dominated among them (*Betula pendula*, *Robinia pseudoacacia*, *Rhus typhina*, *Aesculus hippocastanum*, *Fraxinus excelsior*), while conifers accounted for only 33% (*Thuja occidentalis*, *Thuja orientalis*, *Picea abies*). He reported that broad-leaved species are particularly expansive in cemeteries. The pioneer species are characterized by a great vitality, are self-sown, or produce suckers.

Conifers are often planted in cemeteries because of their negligible leaf fall and poor root systems, which do not destroy the foundations of tombstones.

Similar research was carried out by **Stypiński** (1978) in Olsztyn. In 11 municipal cemeteries, he found 105 taxa of trees and shrubs. Again the majority (86.7%) were broad-leaved species, e.g. *Acer pseudoplatanus*, *Tilia cordata*, *Acer negundo*, and *Q. robur*.

Żurkowska (1999 b) analysed the dendroflora of neglected mid-forest Protestant cemeteries. She noted that they were often planted with ornamental alien species, such as *Symphoricarpos albus*, *Sorbaria sorbifolia*, *Hedera helix*, *Vinca minor*, *Thuja occidentalis*, or *Pseudotsuga menziesii*.

Occurrence of some species in cemeteries can be related to tree symbolism, as its elements are still present in many cultures and beliefs. Planting of a tree on a farm, in a cemetery, or near a church was usually associated with some deeper meaning, not only with aesthetic reasons.

Kolbuszewski (1996) reminds the distant Slavonic tradition, whose elements have survived for a long time. During the burial ceremony, trees were carried along and next planted at the burial site. The dead person's soul was believed to enter the tree or seat on it in the form of a bird. In this way, **Kolbuszewski** (1996) explains the ban on removal of woody vegetation from burial sites. Destruction of the tree was considered equivalent to annihilation of the soul's resting site.

Symbolism can also explain the planting of false acacia in cemeteries. As a thorny tree, when planted near the grave, it was believed to prevent the dead from leaving the grave. Simultaneously, it was a symbol of immortality and purity (**Ziółkowska** 1988). According to pagan beliefs, also hawthorn growing on a grave did not allow the dead to leave the grave. Weeping willows and birches reminded streams of tears. Weeping forms of common ash were planted near graves of rich burghers. This tree species symbolizes time and immortality, and its tall crown and roots are supposed to link heaven and earth – the world of the living and the dead. Lilacs, frequently found in Protestant cemeteries, symbolize love because of the heart-shaped leaves (**Knaflewska** 2003).

Lime trees were also considered holy trees, preferred by good deities. It is frequently planted in cemeteries, near churches and monasteries (**Knaflewska** 2003). There are many local legends about revelation of the Virgin Mary on a lime tree. In the Baroque period, horse chestnuts and limes were considered as the most beautiful trees, planted for the glory of God. The predilection for chestnuts was long-lasting (**Ziółkowska** 1988).

Evergreen plants, like ivy (*Hedera helix*), lesser periwinkle (*Vinca minor*), and mahonia (*Mahonia aquifolium*), symbolized eternity and the hope of resurrection (**Knaflewska** 2003). Ivy, because of its evergreen leaves, was also associated with faithful love and friendship. Christians noticed that the plant climbs also on dead trees, so they made it a symbol of the soul that survives after the death of the body.

Later on, cemetery vegetation started to be conditioned mainly by sanitary and aesthetic factors, and finally only by aesthetic ones. Most people do not realize that the tree initially was the sign identifying the grave; now the cross plays this role in our country (**Kolbuszewski** 1996).

Conclusions

1. Trees with monumental dimensions should start to be protected as monuments of nature as soon as possible.

2. The neglected Protestant cemeteries are in need of extensive restoration. The recommended steps include: fencing, removal of rubbish, sanitary thinning of trees and shrubs. The thinning should consist in removal of wind-thrown, dead and weak trees, and in partial elimination of expansive shrubs (e.g. lilacs). To preserve the unique character of the cemeteries, their areas should not be cleared of woody plants completely. It is also important to protect the remaining tombstones, crosses, fragments of gateways and fencing against further degradation and devastation.

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DENDROFLORA I STAN ZACHOWANIA ZABYTKOWYCH CMENARZY POWIATU KOLSKIEGO

Streszczenie

Warunki siedliskowe, siły przyrody oraz konkurencja międzygatunkowa, a także sposób użytkowania terenu są najważniejszymi czynnikami kształtującymi skład florystyczny cmentarzy.

Badania przeprowadzono na 47 zabytkowych cmentarzach zlokalizowanych na terenie 10 gmin powiatu kolskiego.

Inwentaryzowano drzewa, krzewy i krzewinki badanych obiektów, oznaczając gatunki i dokonując pomiaru obwodu na wysokości 1,3 m wszystkich drzew grubszych od 40 cm. Okazy o obwodzie poniżej 40 cm zostały tylko rozpoznane i policzone.

Na terenie zinwentaryzowanych obiektów stwierdzono występowanie 46 gatunków drzew i 28 gatunków krzewów należących do 26 rodzin. 16 gatunków reprezentowało gromadę nagozłazkowych (21% ogólnej liczby gatunków). Na ogólną liczbę 2695 zinwentaryzowanych drzew najliczniejszą grupę stanowiły: robinia akacjowa (*Robinia pseudoacacia*, 24,0%), dąb szypułkowy (*Quercus robur*, 9,4%), jesion wyniosły (*Fraxinus excelsior*, 7,9%), lipa drobnolistna (*Tilia cordata*, 7,6%), świerk pospolity (*Picea abies*, 7,5%) oraz sosna pospolita (*Pinus sylvestris*, 6,9%). Pozostałe gatunki nie przekroczyły 5% udziału.

Na wielu cmentarzach, zwłaszcza opuszczonych, bardzo silnie rozwinęła się warstwa krzewiasta, w której dominują: lilak zwyczajny (*Syringa vulgaris*), śnieguliczka biała (*Symphoricarpos albus*) i podrost drzew.

Na terenie badań znajduje się jeden pomnik przyrody oraz rosną 33 drzewa o wymiarach pomnikowych: osiem wiązów szypułkowych (*Ulmus laevis*), cztery grusze pospolite (*Pyrus pyra-ster*), cztery głogi jednoszyjkowe (*Crataegus monogyna*), trzy jesiony wyniosłe (*Fraxinus excelsior*), trzy klony srebrzyste (*Acer saccharinum*), dwa klony jawory (*Acer pseudoplatanus*), dwa klony jesionolistne (*Acer negundo*), dwa żywotniki zachodnie (*Thuja occidentalis*), dwa dęby szypułkowe, jedna topola biała (*Populus alba*), jedna lipa drobnolistna, jedna sosna pospolita.

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