



VASCULAR PLANTS IN THE FORMER OLD TOWN EVANGELICAL CEMETERY  
IN WSCHOWA (THE WIELKOPOLSKA REGION)

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**ABSTRACT.** The paper contains a list of identified vascular plant species recorded in the former evangelical cemetery in the town of Wschowa. Species of interest found in this plot include *Galeobdolon montanum*, *Omphalodes scorpioides* and *Tulipa sylvestris*, while permanent cemetery species include *Eranthis hyemalis*, *Galanthus nivalis*, *Galeobdolon montanum*, *Hedera helix*, *Iris germanica*, *I. sibirica*, *Matteucia struthiopteris*, *Myosotis sylvestris*, *Narcissus poeticus*, *Ornithogalum nutans*, *O. umbellatum*, *Parthenocissus quinquefolia*, *Scilla sibirica*, *Syringa vulgaris*, *Tulipa sylvestris*, *Vinca minor* and *Viola odorata*. A total of 357 trees are growing in the analysed cemetery, of which 26 have the dimensions of monument trees.

**KEY WORDS:** Wielkopolska, Wschowa, evangelical cemetery, a collection of historical gravestones, vascular flora

INTRODUCTION

The former evangelical cemetery, located in the northern part of the town of Wschowa (the commune and county of Wschowa, the Lubuskie province), established on the initiative of Reverend Waleriusz Herberger in 1609, is a unique monument not only in Poland, but also on the European scale. In 1970 this oldest cemetery in the Wielkopolska region was entered into the register of historical monuments. The cemetery plot of almost 2 ha, trapezoid in shape, was divided into 11 sections of different sizes (Fig. 1). The cemetery is surrounded by a brick wall, approx. 2 m in height. Three gates lead to the cemetery. After 1945 the Old Town cemetery in Wschowa was becoming slowly degraded. First renovation works were conducted in the cemetery in the late 1970's. Several years later the cemetery was established as a division of the Museum of the Wschowa Region.

At present ornamental gravestones of burghers, dating back to the 17th and 18th centuries, are valuable historical monuments and their collection is one of the richest in Poland. The open-air collection comprises over 170 epitaph stones (Z DZIEJÓW LAPIDARIUM...). The open-air collection is of unique value not only for its historical gravestones, but also an interesting plant system. Plants, both those carved in stone and growing in the former cemetery, have rich symbolic connotations.

Due to a lack of current studies concerning the flora in the Wschowa former cemetery it was decided to investigate the vascular flora of this plot.

MATERIAL AND METHODS

Floristic studies on the former evangelical cemetery in Wschowa were conducted in the vegetative season of 2005 and in the spring of 2006, while dendroflora was inventoried in 2007.

In order to determine the frequency of species, a 5-point scale was applied: 1 – a very rare species (covering < 5% area of the cemetery), 2 – a rare species (5-25%), 3 – a moderately frequent species (25-50%), 4 – a frequent species (50-75%), 5 – a common species (75-100%). Geographic-historical status and socio-ecological groups are presented according to CHMIEL (1993), with slight modifications, while Raunkiaer's life forms are given following ZARZYCKI et AL. (2002). A list of permanent cemetery plants was prepared, comprising good ornamental plant material for contemporary cemeteries, parks and home gardens. A permanent cemetery plant is defined as a species, which had been planted on a grave and after it was no longer tended, has been growing in good condition up to the present or even has been spreading.

All trees were inventoried, determining their species and measuring their circumference at a height of 1.3 m. Trees were marked on the plan of the former cemetery. Based on the guidelines given by KASPRZAK (2005), monument specimens were distinguished among inventoried trees.

Nomenclature of species was adopted after MIREK et AL. (2002).

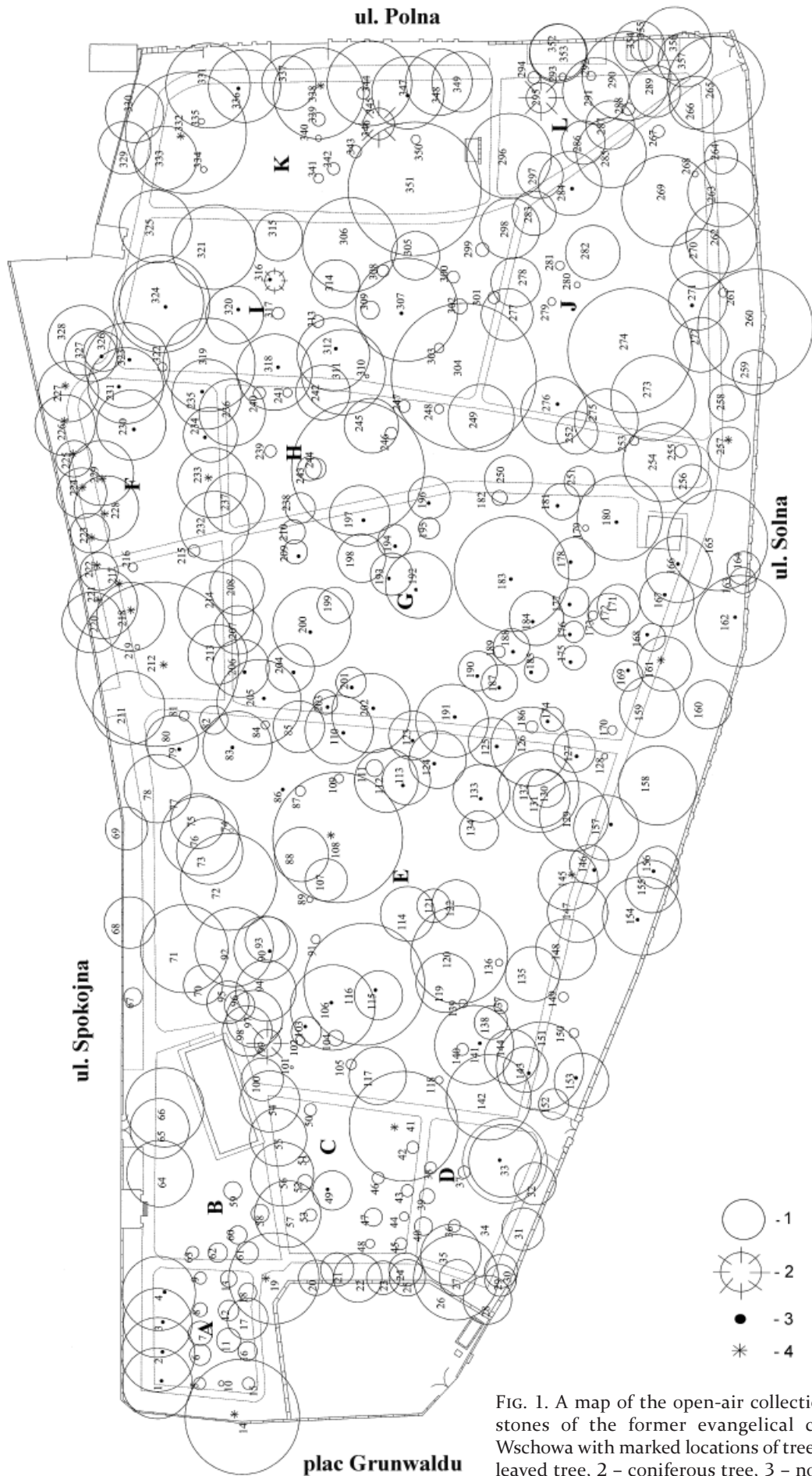


FIG. 1. A map of the open-air collection of gravestones of the former evangelical cemetery in Wschowa with marked locations of trees: 1 – broad-leaved tree, 2 – coniferous tree, 3 – non-flowering *Hedera helix*, 4 – flowering *Hedera helix* (Marta Jastrząb)

## RESULTS

A total of 100 species of vascular plants were identified in the evangelical cemetery in Wschowa (Table 1).

When analysing the frequency of species it needs to be stated that the most numerous group is represented by very rare species (1 in a 5-point frequency scale; column 2, Table 1). A total of 56 species were recorded,

TABLE 1. A list of vascular plant species in the open-air collection of gravestones in the formed evangelical cemetery in Wschowa

Species	Frequency class	GFŻ	GGH	GSE
1	2	3	4	5
Trees, shrubs and undershrubs				
<i>Acer negundo</i> L.	1	M	Ken	3
<i>Acer platanoides</i> L.	2	M	Ap	1
<i>Acer pseudoplatanus</i> L.	2	M	Ap	1
<i>Aesculus hippocastanum</i> L.	2	M	Ken	19
<i>Carpinus betulus</i> L.	1	M	Sp	1
<i>Fraxinus excelsior</i> L.	3	M	Ap	1
<i>Fraxinus excelsior</i> L. 'Pendula'	1	M	Ap	1
<i>Fraxinus pennsylvanica</i> Marshall	1	M	Ken	19
<i>Hedera helix</i> L.	3	Ch	Ap	1
<i>Magnolia</i> L. sp.	1	M	Dia	19
<i>Parthenocissus quinquefolia</i> (L.) Planch. in A. & C. DC.	1	N	Dia	19
<i>Picea abies</i> (L.) H. Karst.	1	M	Ken	2
<i>Pyrus pyraster</i> (L.) Burgsd.	1	M	Ap	1
<i>Quercus robur</i> L.	2	M	Sp	1
<i>Quercus rubra</i>	1	M	Ken	2
<i>Robinia pseudoacacia</i> L.	2	M	Ken	14
<i>Salix alba</i> L. f. <i>vitellina pendula</i> Rehd.	1	M	Ap	7
<i>Sambucus nigra</i> L.	1	N	Ap	3
<i>Syringa vulgaris</i> L.	1	N	Ken	19
<i>Taxus baccata</i> L.	1	N	Dia	19
<i>Tilia cordata</i> Mill.	4	M	Ap	1
<i>Tilia platyphyllos</i> Scop.	1	M	Ap	1
<i>Ulmus laevis</i> Pall.	3	M	Ap	1
<i>Vinca minor</i> L.	1	C	Dia	19
Herbaceous plants				
<i>Achillea millefolium</i> L. s.s.	1	G	Ap	9
<i>Aegopodium podagraria</i> L.	4	H	Ap	1
<i>Alliaria petiolata</i> (M. Bieb.) Cavara & Grande	2	T	Ap	3
<i>Allium vineale</i> L.	2	G	Ap	4
<i>Anemone nemorosa</i> L.	1	G	Sp	1
<i>Atriplex patula</i> L.	1	T	Ap	16
<i>Ballota nigra</i> L.	2	H	Arch	14
<i>Bromus sterilis</i> L.	1	T	Arch	3
<i>Campanula rapunculoides</i> L.	2	H	Ap	1
<i>Capella bursa-pastoris</i> (L.) Medik.	1	T	Arch	16
<i>Carex spicata</i> Huds.	2	H	Ap	2
<i>Cerastium holosteoides</i> Fr. emend. Hyl.	1	H	Ap	9
<i>Chaerophyllum temulum</i> L.	2	T	Ap	3
<i>Chelidonium majus</i> L.	3	H	Ap	3
<i>Cirsium arvense</i> (L.) Scop.	1	G	Ap	13
<i>Conyza canadensis</i> (L.) Cronquist	2	T	Ken	15

1	2	3	4	5
<i>Dactylis glomerata</i> L.	1	H	Ap	9
<i>Dryopteris filix-mas</i> (L.) Schott	1	H	Sp	2
<i>Epilobium adnatum</i> Griseb.	1	H	Ap	19
<i>Eranthis hyemalis</i> (L.) Salisb.	1	G	Dia	19
<i>Erigeron annuus</i> (L.) Pers.	1	T	Ken	13
<i>Euphorbia peplus</i> L.	1	T	Arch	16
<i>Festuca rubra</i> L.	1	H	Ap	9
<i>Ficaria verna</i> Huds.	4	G	Sp	1
<i>Gagea lutea</i> (L.) Ker Gawl.	3	G	Sp	1
<i>Galanthus nivalis</i> L.	3	G	Dia	19
<i>Galeobdolon montanum</i> Pers.	2	H	Sp	1
<i>Galeopsis tetrahit</i> L. / <i>G. bifida</i> Boenn.	1	T	Ap	2
<i>Galium aparine</i> L.	1	T	Ap	3
<i>Galium mollugo</i> L. s.s.	1	H	Ap	9
<i>Geranium pusillum</i> Burm. f. ex L.	2	T	Arch	16
<i>Geranium robertianum</i> L.	3	T	Sp	3
<i>Geum urbanum</i> L.	1	H	Ap	3
<i>Glechoma hederacea</i> L.	2	H	Ap	3
<i>Hypericum perforatum</i> L.	1	H	Ap	2
<i>Impatiens parviflora</i> DC.	2	T	Ken	3
<i>Iris germanica</i> L.	2	G	Dia	19
<i>Iris sibirica</i> L.	1	H	Sp	8
<i>Lamium purpureum</i> L.	3	T	Arch	16
<i>Lapsana communis</i> L.	2	T	Ap	3
<i>Leontodon autumnalis</i> L.	1	H	Ap	10
<i>Lolium perenne</i> L.	2	H	Ap	10
<i>Lysimachia nummularia</i> L.	1	C	Sp	1
<i>Matteucia struthiopteris</i> (L.) Tod.	2	H	Sp	19
<i>Melandrium album</i> (Mill.) Garcke	1	H	Ap	14
<i>Moehringia trinervia</i> (L.) Clairv.	2	H	Sp	2
<i>Myosotis sylvatica</i> Ehrh. ex Hoffm.	1	T	Dia	19
<i>Narcissus poëticus</i> L.	1	G	Dia	19
<i>Omphalodes scorpioides</i> (Haenke) Schrank	1	T	Ap	3
<i>Ornithogalum nutans</i> L.	1	G	Dia	19
<i>Ornithogalum umbellatum</i> L.	2	G	Ken	19
<i>Oxalis fontana</i> Bunge	1	G	Ken	16
<i>Plantago major</i> L. s.s.	1	H	Ap	10
<i>Poa annua</i> L.	1	T	Ap	10
<i>Poa pratensis</i> L. s.s.	2	H	Ap	9
<i>Poa trivialis</i> L.	1	H	Ap	12
<i>Polygonum aviculare</i> L.	2	T	Ap	10
<i>Potentilla reptans</i> L.	1	H	Ap	10
<i>Ranunculus auricomus</i> L.	3	H	Sp	1
<i>Ranunculus repens</i> L.	1	H	Ap	10
<i>Rumex crispus</i> L.	1	H	Ap	10
<i>Rumex thyrsoiflorus</i> Fingerh.	1	H	Ap	14
<i>Scilla sibirica</i> Haw.	3	G	Dia	19
<i>Sonchus oleraceus</i> L.	1	T	Arch	16
<i>Stellaria media</i> (L.) Vill.	2	T	Ap	16
<i>Stellaria pallida</i> (Dumort.) Piré	2	T	Ap	14
<i>Taraxacum officinale</i> Web.	3	H	Ap	9
<i>Trifolium repens</i> L.	2	H	Ap	10

1	2	3	4	5
<i>Tulipa fosterana</i> W. Irving	1	G	Dia	19
<i>Tulipa sylvestris</i> L.	5	G	Dia	19
<i>Tussilago farfara</i> L.	1	G	Ap	10
<i>Urtica dioica</i> L.	1	H	Ap	3
<i>Veronica chamaedrys</i> L.	2	C	Ap	9
<i>Veronica hederifolia</i> L. s.s.	1	T	Arch	17
<i>Veronica sublobata</i> M.A. Fisch.	4	T	Ap	3
<i>Vicia hirsuta</i> (L.) Gray	1	T	Arch	17
<i>Viola odorata</i> L.	3	H	Ken	3

Frequency classes: 1 – very rare (covering < 5% area of the cemetery), 2 – rare (5-25%), 3 – moderately frequent (25-50%), 4 – frequent (50-75%), 5 – very frequent (75-100%);

GFŽ (Life forms): C – non-woody chamaephytes, Ch – woody chamaephytes, G – geophytes, H – hemicryptophytes, M – megaphanerophytes, N – nanophanerophytes, T – therophytes;

GGH (Geographic-historical status): Ap – apophytes, Arch – archaeophytes, Dia – diaphytes, Ken – kenophytes, Sp – spontaneophytes;

GSE (Socio-ecological groups): 1 – fertile broad-leaved forests and shrub communities (*Fagetalia*, *Prunetalia*), 2 – acidophilous or xerothermic oak forests, mixed coniferous forests and their substitute shrub, herb or grassland communities (*Quercion robori-petraeae*, *Quercion petraeae*, *Epilobion*, *Nardetalia*), 3 – nitrophilous shrub or herb communities (*Sambuco-Salicion*, *Alliarion*), 4 – xerothermic herb or grassland communities (*Trifolio-Geranietae*, *Festuco-Brometea*), 5 – pine forests or sandy grassland (*Dicrano-Pinion*, *Sedo-Scleranthetea*, *Corynephoretea*), 6 – swamp alder forests, woodless fens, bogs and intermediate mires (*Alnion*, *Magnocaricion*, *Caricetalia fuscae*, *Sphagnion fusci*), 7 – riparian forests and thickets, reeds and aquatic vegetation (*Salicion*, *Phragmition*, *Glycerio-Sparganion*, *Potamogetonetea*, *Lemnetea*, *Utricularietea*), 8 – humid meadows and tall herb communities (*Molinietalia*), 9 – fresh and moderately humid meadows (*Arrhenatheretalia*), 10 – nitrophilous floodplains and treaded communities (*Plantaginetea*), 11 – salt marshes and halophilous grasslands (*Thero-Salicornietea*, *Asteretea trifolium*), 12 – therophyte communities on wet and humid sites (*Bidentetea*, *Nanocyperion*), 13 – mesophilous communities of tall perennials (*Arction*), 14 – xerothermic, perennial ruderal communities (*Onopordon*), 15 – short-term, pioneer ruderal communities (*Sisymbriion*, *Eragrostion*), 16 – weed communities of gardens and root crop fields (*Polygono-Chenopodietalia*), 17 – weed communities of cereal fields (*Aperetalia*), 18 – epilithic communities (*Asplenietea*), 19 – species of unknown phytosociological affiliation.

which account for 56% total flora, while the least numerous were very frequent and frequent species, jointly represented by five species: *Aegopodium podagraria*, *Ficaria verna*, *Tilia cordata*, *Tulipa sylvestris* and *Veronica sublobata* (Table 2).

TABLE 2. Percentages of species in individual frequency classes in the open-air collection of gravestones in the former evangelical cemetery in Wschowa

Frequency class	Number of species	Percentage
Very rare	56	56
Rare	28	28
Moderately frequent	11	11
Frequent	4	4
Very frequent	1	1
Total	100	100

Species recorded in the Wschowa cemetery constitute a full spectrum of Raunkiaer's life forms for this type of site. The most numerous group is represented by hemicryptophytes (33 species, 33% total flora). Moreover, considerable percentages of therophytes (25 species, 25%) and megaphanerophytes (17 species, 17%) were also reported. Woody and non-woody chamaephytes were least numerous (Table 3). The share of geophytes was interesting and relatively high (17 species, 17%). These include mainly spring bulbous plants, such as

*Gagea lutea*, *Galanthus nivalis*, *Narcissus poëticus*, *Ornithogalum nutans*, *Scilla sibirica*, *Tulipa fosterana* and *T. sylvestris*, in places forming dense patches.

TABLE 3. Percentages of life forms in the open-air collection of gravestones in the former evangelical cemetery in Wschowa

Life form	Number of species	Percentage
Megaphanerophytes	17	17
Nanophanerophytes	4	4
Non-woody chamaephytes	3	3
Woody chamaephytes	1	1
Hemicryptophytes	33	33
Geophytes	17	17
Therophytes	25	25
Total	100	100

When analysing the percentages of individual vascular plant species in the investigated plot in terms of the geographic-historical classification it is clear that the most numerous group was composed of native species, i.e. apophytes and spontaneophytes, represented jointly by 65 species, which accounted for 65% total flora. The other three groups included foreign species, with each group accounting for approx. 10-13% total flora (Table 4). Some native herbaceous species were brought intentionally or accidentally from natural sites

and planted in the cemetery, where they developed or even spread. These species included *Anemone nemorosa*, *Dryopteris filix-mas*, *Ficaria verna*, *Gagea lutea*, *Galeobdolon montanum*, *Lysimachia nummularia*, *Omphalodes scorpioides* and *Ranunculus auricomus*. Some species, such as e.g. *Matteucia struthiopteris* or *Iris sibirica*, are national components of native flora; however, in the analysed cemetery they are rather synanthropic in character, thus they should be treated as diaphytes. One specimen of *Erigeron annuus* was found. This North-American species is frequently found in cemeteries under use (GALERA et AL. 1993, CZARNA 2005, CZARNA and PISKORZ 2005, CZARNA et AL. 2006) and its presence here needs to be connected with the currently used cemetery located near the surveyed open-air collection of gravestones.

TABLE 4. Percentages of geographic-historical status groups in the open-air collection of gravestones in the former evangelical cemetery in Wschowa

Geographic-historical status	Number of species	Percentage
Apophytes	52	52
Spontaneophytes	12	12
Archaeophytes	9	9
Kenophytes	13	13
Diaphytes	14	14
Total	100	100

Vegetation of the analysed object comes from 15 syngenetic groups of plant communities (Table 5). The biggest number, i.e. 20 species, prefer communities of fertile broad-leaved forest communities and shrub communities. A relatively large group (15%) is also composed of species growing typically in nitrophilous shrub and roadside communities, in treaded communities (10%)

TABLE 5. Percentages of socio-ecological groups in the open-air collection of gravestones in the former evangelical cemetery in Wschowa

Socio-ecological group	Number of species	Percentage
1	19	19
2	6	6
3	16	16
4	1	1
5	0	0
6	0	0
7	1	1
8	1	1
9	8	8
10	10	10
11	0	0
12	1	1
13	2	2
14	5	5
15	1	1
16	8	8
17	2	2
18	0	0
19	19	19
Total	100	100

Legend as in Table 1.

as well as species with an unknown phytosociological affiliation (19%).

The evangelical cemetery in Wschowa is characterized by a large proportion of woody species. These include the weeping form of *Fraxinus excelsior* and *Salix alba*. In terms of frequency native species predominate. Dendroflora is comprised, among other things, from four primary species of broad-leaved forests, i.e. *Acer platanoides*, *Tilia cordata*, *Quercus robur* and *Ulmus laevis*. Foreign tree species in this object include *Acer negundo*, *Aesculus hippocastanum*, *Magnolia* sp., *Quercus rubra* and *Robinia pseudoacacia*.

In the total number of 357 inventoried trees (Fig. 1) the following were represented by the biggest numbers of specimens: *Tilia cordata* (30.8%), *Ulmus laevis* (17.4%) and *Fraxinus excelsior* (15.1%). The percentages of other species did not exceed 10%. Recently the plot of the open-air gravestone collection has been enriched with the following species: *Acer negundo*, *A. pseudoplatanus*, *Carpinus betulus*, *Fraxinus pennsylvanica*, *Magnolia* sp. and *Quercus rubra*.

A list of trees is given below (legend: the first digit or number denotes the tree number, the next is circumference in cm, \* – non-flowering specimen of *Hedera helix*, \*\* – flowering specimen of *Hedera helix*, ! – monument tree). Numbers from the list correspond to numbers from the map (Fig. 1):

***Acer negundo***: section A: tree no. 6/circumference 16 cm, 7/13, 8/10, 11/17, 12/15; section E: 105/8, 140/8; ***Acer platanoides***: section E: 68/120, 71/260, 73/89, 80/90, 83\*/85, 92/187, 116/285, 120/217, 129/117, 135/100, 136/2; section F: 230\*/85; section G: 163/85, 164/70, 168\*/57; section I: 328/118; section K: 329/97, 330/93; ***Acer pseudoplatanus***: section A: 5/10, 9/10, 10/10, 13/16, 15/17, 16/23, 18/17; section B: 59/16, 60/13, 61/16, 62/20, 63/12; section C: 50/7, 53/11; section E: 111/15, 139/7; section G: 209\*/29; section H: 239/5, 243/5, 244/6; section I: 299/8, 302/10, 303/5 i 6, 309/8, 313/6; section K: 340/9, 341/5, 343/16, 345/7 i 10, 350/6; ***Aesculus hippocastanum***: section A: 1\*/226, 2\*/166, 3\*/222, 4\*/177, 14\*\*/254; section B: 64/192, 65/222, 66/222; section D: 33\*/217; section E: 119/193, 151/270, 152/50, 158/255; section I: 312\*/210, 314/193, 321/198; section L: 290/188; ***Carpinus betulus***: section E: 81/4; ***Fraxinus excelsior***: section A: 119\*\*/270; section B: 58/14; section C: 21/65, 23/97, 24/76, 25/98, !41\*\*/367, 42/9, 43/10, 44/4, 45/10, 46/8, 47/11, 48/9, 49\*/190, 52/10; section D: 36/13, 37/8, 38/13, 39/15, 40/13; section E: 67/80, 69/90, 70/74, 75/110, 76/100, 79\*/117, 93/55, 94/64, 95/80, 96/75, 106\*/220, 112/82, 114/75, 115\*/75, 118/6, 121/68, 122/75, 124\*/83, 132/105, 133\*/83, 137/18, 138/56, 149/10, 150/7; section G: 185\*/102, 193\*/90, 203\*/60; section H: 254/163; section I: 306/233, 326\*/86, 327/78; section K: !338\*\*/357; ***Fraxinus excelsior*** 'Pendula': section A: 17/154; ***Fraxinus pennsylvanica***: section E: 104/6; ***Magnolia*** sp.: section C: 51/2; ***Picea abies***: section E: 99/90; section I: 316\*/92; section L: 295/82; ***Pyrus pyrastrer***: section E: !154\*/221; ***Quercus robur***: section E: 87/10, 89/5, 90\*/177, 91/10, 102/10, !108\*\*/393, 109/10; section G: 173/4, 179/2, !180\*/303, !183\*/396, 189/5, 195/6, !212\*\*/322; section I: 300/5, !304/376, 308/6, 317/7; section J: !274/312, 279/9, 281/4, 282/92; section K: 332\*\*/249; ***Quercus rubra***:

section J: 280/8; *Robinia pseudoacacia*: section D: 26/130, 27/110, 28/150, 29/150, 30/125, 31/116, 32/45; section E: 145\*/135; 156\*/129, section G: 160/140; section J: 269/264; section L: 352/118 i 156, 353/152, 354/73, 355/135, 356/156; *Salix alba* f. *vitellina pendula*: section D: 34/260; *Salix* sp.: section E: 86\*/291; *Taxus baccata*: section K: 346/52; *Tilia cordata*: section C: 54/188, 55/150, 56/183, 57/145; section D: 35/162; section E: 72/235, 82/123/ 85/145, 98/120, 100/12, 101/6, 110\*/145, 117/125, 123\*/167, 125\*/102, 126/227, 127\*/132, 128/11, 141\*/120, 142/200, 146\*/144, 147/204, 148/173, 157\*/221; section F: 231\*/233, 232/150, 233\*\*/220, 234\*/143; section G: 159/246, 161\*\*/225, 165/377, 166\*/160, 167\*/153, 170/6, 181\*/108, 182/5, 186/6, 191\*/236, 192\*/240, 196\*/105, 197\*/166, 200\*/271, 202\*/145, 204\*/165, 205\*/230, 206\*/157, 207/208, 208/170, 210/20, 213/139, 214/188; section H: 236/183, 237/175, 238/150, 240/3, 241/2, 242/213, 246/4, 247/4, 248/3, 249/190, 250/130, 251/107, 252/144, 253/4, 255/6, 256/161, 257/230; section I: 298/166, 307\*/310, 310/7, 311/158, 318\*/146, 319/221, 322/8, 323\*/186, 324\*/331; section J: 258/155, 260/390, 261/3, 262/155, 263/211, 264/125, 265/248, 266/162, 267/11, 268/2 i 2, 270/198, 271/183, 272/117, 275/133, 276\*/162, 277/202, 278/135, 283/169, 285/133, section K: 333/207, 344/159, 347\*/169, 348/156, 349/153; section L: 286/147, 287/180, 288/11, 289/179, 292/8, 293/9, 294/9, 297/127, 357/200; *Tilia platyphyllos*: section F: 235\*/140; section J: 284\*/177; section K: 331/166, 336\*/216, 337/127, 351/116 i 193 i 367; section L: 291/259, 296/298; *Ulmus laevis*: section C: 20/76, 22/142; section E: 74/50, 78/287, 84/7, 88/56, 97/127, 103\*/90, 107/56, 113\*/100, 130/80, 131/94, 134/60, 143\*/88, 144/92, 153\*/140, 155/121; section F: 1223\*\*/251, 224\*\*/190, 225\*\*/166, 1226\*\*/250, 1227\*\*/230, 228\*\*/183, 1229\*\*/300; section G: 162\*/380, 169\*/60, 171/60, 172/60, 174\*/87, 175\*/59, 176\*/60, 177\*/63, 178\*/190, 184\*/103, 187\*/110, 188\*/119, 190\*/95, 194\*/60, 198/120, 199/195, 201\*/53, 211/262, 215/10, 216/8, 217\*\*/120, 218\*\*/186, 219/5, 220/276, 221\*\*/268, 222\*\*/212; section H: 245/115, 259/266; section I: 301/8, 305\*/108, 315/105, 320\*/133, 325/110; section J: 273/343; section K: 334/2, 335/2, 339/7, 342/14, as well as a dead, unidentified tree 77/100.

There are 26 trees growing in the cemetery, which have dimensions of monument trees, among which *Ulmus laevis* is represented by 11 trees, *Quercus robur* – six trees, *Tilia cordata* – four trees, *Fraxinus excelsior* – three trees, *Pyrus pyraister* – one tree and *Tilia platyphyllos* – one tree. The thickest monument tree is one called Lipa Pastora Hebergera [Reverend Heberger's lime] (no. 351 – *Tilia platyphyllos*) with a circumference of 453 cm. The base of the stem was divided into a thicker part of 367 cm and two thinner parts of 192 and 116 cm, respectively.

In the analysed object there were six species of shrubs and undershrubs. Species foreign for the flora of the analysed area predominate here. Due to the considerable shading of the cemetery they come here in the vegetative form and do not expand their occupied area.

Flowering specimens of *Hedera helix* were found on 20 trees, mainly on trees the size of nature monuments. Non-flowering specimens of *Hedera helix* were found on 77 trees.

## DISCUSSION

Ornamental plants are no longer planted in the evangelical cemetery in Wschowa. A lack of cultivation measures resulted in a situation when some species, previously planted and cultivated, died, while others survived or even spread. Among species previously planted for ornamental purposes, those represented by biggest numbers of specimens include *Galanthus nivalis*, *Hedera helix*, *Ornithogalum umbellatum*, *Scilla sibirica*, *Tulipa sylvestris* and *Viola odorata*.

When analysing the frequency of species in the analysed cemetery a similar percentage distribution for individual classes was found as that in the old, not longer used Catholic cemetery in the city district of Świerczewo in Poznań (CZARNA 2005). The most frequent species (frequency classes 4 and 5) in Świerczewo include *Alliaria petiolata*, *Arrhenatherum elatius*, *Dactylis glomerata* and *Gagea pratensis*, while in the open-air gravestone collection in Wschowa the species are *Aegopodium podagraria*, *Ficaria verna*, *Tilia cordata*, *Tulipa sylvestris* and *Veronica sublobata*.

A similarity was observed in the order of predominance of Raunkiaer's life forms in the flora of the analysed cemetery to those in old and contemporary cemeteries in Ostrów Wielkopolski and environs (CELKA 2004) as well as the old cemetery in Świerczewo in Poznań (CZARNA 2005). In the analysed cemetery a slightly lower number of hemicryptophytes was recorded. A slightly higher proportion of therophytes is probably caused by numerous paths, which are constantly treaded on by visitors to the former cemetery. In turn, the cemetery in Świerczewo is visited only occasionally, primarily on the 1st November, i.e. the traditional Polish All Saints' Day. Among the seven analysed cemeteries in Ostrów Wielkopolski and environs, most were old, no longer used, in which hardly any annual plants were found. The correlation between the rate of path treading and the distribution of life forms is especially evident in cemeteries in Zakopane. In Pęksowe Brzysko (the Old Cemetery) the highest proportion was found for annual plants, while in the New Cemetery perennial plants were the most numerous. This results from the fact that paths between graves in Pęksowe Brzysko are frequently treaded on by tourists, while those in the New Cemetery are practically not treaded on or raked (CZARNA and PISKORZ 2005).

In terms of the geographic-historical classification in the Wschowa cemetery apophytes and spontaneophytes were the most numerous, while in the old cemetery in Świerczewo (CZARNA 2005) diaphytes ranked second after apophytes, followed by archeophytes, kenophytes and only then by spontaneophytes. In contrast, in cemeteries in Ostrów Wielkopolski and its environs (CELKA 2004) diaphytes ranked third, after apophytes and spontaneophytes. This results from the fact that the cemetery in Świerczewo ceased to be used only recently and there are still open cemeteries among those analysed in Ostrów Wielkopolski and its environs, whereas the Wschowa cemetery has been closed for many years.

A large proportion in the flora of the cemetery comprises species of an unknown phytosociological affiliation – the group ranking third (18.2%). In turn, in

the Świerczewo cemetery (CZARNA 2005) and those in Ostrów (CELKA 2004) it was the least numerous group (22%). Such an order indicates a considerable proportion of foreign species, which had been cultivated in the past, not constituting a permanent element in the flora of these cemeteries.

No epiphyte was found in the analysed cemetery among vascular plants, as a result of adequate maintenance of the wall surrounding the cemetery and well-kept graves.

In 1980 in the open-air gravestone collection in Wschowa there were a total of 274 trees growing: 19 *Aesculus hippocastanum*, one *Abies alba*, 11 *Acer platanoides*, 27 *Fraxinus excelsior*, four *F. excelsior* 'Pendula', five *Picea abies*, one *Picea pungens* 'Argentea', one *Populus alba*, 11 *Quercus robur*, 28 *Robinia pseudoacacia*, one *Salix alba* 'Tristis', one *Taxus baccata*, five *Thuja occidentalis*, 125 *Tilia* sp. and 34 *Ulmus* sp. (RACZKOWSKA and RACZKOWSKI 1980). A total of 357 trees belonging to 17 species were recorded. The most numerous group comprised little-leaf lindens, Russian elms and European ashes. An increase in the number of trees is connected with planting performed in recent years.

#### CONCLUSION

In the evangelical cemetery in Wschowa a total of 100 vascular plant species were recorded.

Species of interest include *Omphalodes scorpioides*, *Galeobdolon montanum* and *Tulipa sylvestris*. There *Omphalodes scorpioides* has its fifth position known to date in the Wielkopolska region (CZARNA 2001). *Galeobdolon montanum* is rarely reported in the Wielkopolska region. *Tulipa sylvestris* has acclimated well in the analysed cemetery (frequency class 5).

There are a total of 357 trees growing in the cemetery, of which 26 are specimens with dimensions of monument trees.

The shrub layer is not very well-developed – from among previously planted shrubs, undershrubs and climbers only *Hedera helix*, *Parthenocissus quinquefolia*, *Syringa vulgaris* and *Vinca minor* remained. We need to stress the presence of *Hedera helix* flowering on 20 trees.

The ground cover is especially rich and colourful only in the early spring. At that time we may observe such plants as *Alliaria petiolata*, *Anemone nemorosa*, *Eranthis hyemalis*, *Ficaria verna*, *Gagea lutea*, *Galanthus nivalis*, *Myosotis sylvatica*, *Ornithogalum nutans*, *Ranunculus auricomus*, *Scilla sibirica*, *Tulipa sylvestris* and *Viola odorata*. In the summer the dominant species is *Aegopodium podagraria*.

Some species, both native and foreign, were considered permanent cemetery species. These included *Eranthis hyemalis*, *Galanthus nivalis*, *Galeobdolon montanum*, *Hedera helix*, *Iris germanica*, *I. sibirica*, *Matteucia struthiopteris*, *Myosotis sylvatica*, *Narcissus poeticus*, *Ornithogalum nutans*, *O. umbellatum*, *Parthenocissus quinquefolia*, *Scilla sibirica*, *Syringa vulgaris*, *Tulipa sylvestris*, *Vinca minor* and *Viola odorata*. The above mentioned species may prove helpful in the identification (phytoindication) of locations of former cemeteries.

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