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VASCULAR FLORA OF THE MUNICIPAL CEMETERY IN USTRZYKI DOLNE (BIESZCZADY MTS., POLAND)

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ABSTRACT. In the analysed municipal cemetery in Ustrzyki Dolne a total of 155 vascular plant species were recorded, out of which 74 were solely cultivated species, which do not run wild. In the tree layer *Acer platanoides* and *Betula pendula* predominated, while in the shrub layer the most frequent ornamental element was *Thuja occidentalis*, and relatively frequent elements were *Picea abies* and *Picea pungens*. The most frequent ornamental elements among cultivated herbaceous plants were *Begonia semperflorens*, *Centaurea mollis*, *Matteucia struthiopteris*, *Phlox paniculata*, *Salvia splendens* and *Viola* × *wittrockiana*. Paths between graves are very strongly overgrown, as they are not raked or visited regularly. The most frequent perennial plants found on paths included *Aegopodium podagraria*, *Plantago major*, *Poa pratensis* and *Trifolium pratense*. It was already observed earlier that in cemeteries in southern Poland a very frequent ornamental element was or even still is *Centaurea mollis*, while a relatively frequent was *Malva moschata* (Czarna and Piskorz 2005, Czarna et al. 2006, 2007). Both these species were also recorded in the analysed cemetery. *Erigeron annuus* and *E. ramosus* are American species, which were probably brought to the cemetery as cut flowers and put in vases, from which they spread over the area of the cemetery and remain there in good condition. Perennial cultivated species included *Centaurea mollis*, *Erigeron annuus*, *E. ramosus* and *Lupinus polyphyllus*.

KEY WORDS: Ustrzyki Dolne, municipal cemetery, flora of vascular plants, perennial cultivated species

INTRODUCTION

Cemeteries are integral elements of architecture and municipal green areas. Architecture and flora of cemeteries are connected with geographical factors (e.g. the geographical region, topographic features) as well as historical and social factors (the time they were established and used, religious traditions, customs of the local population). When looking at old, frequently no longer used cemeteries we may observe true harmony between vegetation and the arrangement of graves. In newer cemeteries in a vast majority of cases planned land management is found, in which the designed location of gravestones determines the arrangement of plants. Another factor closely regulating plant composition is connected with regular cultivation works, i.e. the introduction of new diaspores along with bouquet plants or earth, as well as raking and weeding.

The municipal cemetery at Szkolna Street in Ustrzyki Dolne combines the reminiscence of an old necropolis and features typical of a contemporary cemetery. It was established in the second half of the 19th century. The oldest Ukrainian gravestones date back to 1887 and 1895. The area of the cemetery was enlarged successively, in 1972 and then in 1976. At present it covers the area of approx. 1.3 ha.

The aim of the conducted investigations was to prepare a complete botanical inventory of the cemetery in Ustrzyki Dolne and to define the specific character of the flora, indicating ornamental plants used in the past and at present.

MATERIAL AND METHODS

Investigations were conducted in August 2006 in the entire area of the municipal cemetery in Ustrzyki Dolne (Fig. 1).

The nomenclature of taxa was adopted according to Mirek et al. (2002). In case of each recorded species a 5-point scale was applied, according to the cover rate, where respective numbers denote: 1 – a very rare species (below 10% cover), 2 – a relatively rare species (10-25%), 3 – a relatively frequent species (25-50%), 4 – a frequent species (50-75%), 5 – a very frequent species (75-100%). Moreover, all cultivated species (cul) were also included, with the 5-point frequency scale applied as well.

The list of perennial cultivated species is given below. This group included firstly those plants, which were planted at a given site and after a given grave was no longer they have been growing in good condition up to the present or even have been spreading; secondly, it in-

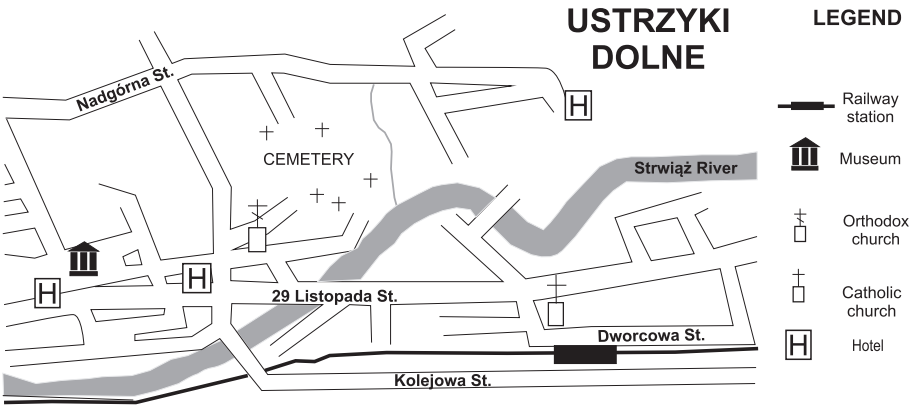

Fig. 1. Location of municipal cemetery in Ustrzyki Dolne

cluded cut plants, which bore ripe fruit and have spread over the area of the cemetery.

The spectrum of life forms according to Raunkiaer was adopted following Kornaś and Medwecka-Kornaś (1986), Jackowiak (1993) and Zarzycki et al. (2002).

The herbarium material was deposited at the herbarium of the Department of Botany, the Agricultural University of Poznań (POZNB).

RESULTS AND DISCUSSION

In the analysed municipal cemetery in Ustrzyki Dolne a total of 155 vascular plant species were recorded, out of which 74 are solely cultivated species, which do not run wild (Table 1).

Species predominant in the tree layer were *Acer platanoides* and *Betula pendula*, while in the shrub layer a common ornamental element was *Thuja occidentalis*, whereas *Picea abies* and *Picea pungens* were relatively frequent. We need to emphasize here a limited share of *Syringa vulgaris*, which in small lowland cemeteries is found relatively frequently and in large numbers, especially around cemeteries, where it forms hedges.

Table 1. List of vascular plants species of the municipal cemetery in Ustrzyki Dolne

Taxon	Frequency classes	Life forms
1	2	3
Tree layer		
Acer platanoides L.	5 cul	M
Acer pseudoplatanus L.	1 cul	M
Aesculus hippocastanum L.	1 cul	M
Betula pendula Roth	4 cul	M
Larix decidua Mill.	1 cul	M
Picea pungens Engelm.	2 cul	M
Quercus robur L.	1 cul	M
Thuja occidentalis L.	1 cul	M
Tilia cordata Mill.	1 cul	M
Tilia platyphyllos Scop.	1 cul	M
Shrubby layer		
Abies alba Mill.	1 cul	M
Abies concolor Lindl. ex Hildebr.	1 cul	M
Acer platanoides L.	1	M
Acer pseudoplatanus L.	1	M
Berberis vulgaris L.	1 cul	N
Buxus sempervirens L.	1 cul	N
Fraxinus excelsior L.	1	M
Hydrangea sp.	1 cul	N
Juniperus communis L.	1 cul	N
Larix decidua Mill.	1 cul	M
Picea abies (L.) H. Karst.	3 cul	M
Picea pungens Engelm.	3 cul	M
Pinus nigra J.F. Arnold	1 cul	M
Pyrus pyraster (L.) Burgsd.	1	M
Rhus typhina L.	1 cul	M(N)
Rosa canina L.	1	N
Rosa × *francofourtana* Münchh.	1 cul	N
Rosa multiflora Thunb.	1 cul	N
Salix alba L.	1	M
Salix caprea L.	1	M(N)
Sambucus nigra L.	1	N
Spiraea chamaedryfolia L. emend. Jacq.	1 cul	N
Spiraea × *vanhouttei* (Briot) Zabel	1 cul	N
Symphoricarpos albus (L.) S.F. Blake	2 cul	N
Syringa vulgaris L.	1 cul	N
Thuja occidentalis L.	5 cul	M(N)
Herb layer		
Achillea millefolium L.	1	G
Aegopodium podagraria L.	3	H
Ageratum mexicanum Sims	1 cul	H
Ajuga reptans L.	1 cul	H
Alcea rosea L.	1 cul	H

1	2	3
Aquilegia × *hybrida* Hort.	1 cul	H
Armoracia rusticana P. Gaertn., B. Mey. & Scherb.	2	H
Artemisia vulgaris L.	1	H
Aster novi-belgii L.	1 cul	H
Athyrium filix-femina (L.) Roth	1 cul	H
Begonia semperflorens Link & Otto	2 cul	H
Begonia × *tuberhybrida* Voss	1 cul	H
Bellis perennsis L.	1	H
Bergenia cordifolia (Haw.) Sternb.	1 cul	C
Bromus hordeaceus L.	1	T
Calendula officinalis L.	1 cul	T
Calluna vulgaris (L.) Hull	1 cul	Ch
Calystegia sepium (L.) R. Br.	1	G
Campanula patula L.	1	H
Campanula rapunculoides L.	1	H
Capsella bursa-pastoris (L.) Medik.	1	T
Centaurea mollis Waldst. & Kit.	2, 1 cul	Ch
Cerastium bibersteinii DC.	1 cul	H
Cerastium holosteoides Fr. emend. Hyl.	1	H
Chaerophyllum aromaticum L.	1	H
Chenopodium album L.	1	T
Cichorium intybus L.	1	G
Cirsium arvense (L.) Scop.	1	G
Convallaria majalis L.	1 cul	G
Cosmos bipinnatus Cav.	1 cul	T
Crepis biennis L.	1	T
Cruciata glabra (L.) Ehrend.	1	H
Dahlia variabilis (Willd.) Desf.	1 cul	H
Dianthus barbatus L.	1 cul	C
Dianthus chinensis L.	1 cul	T
Echinochloa crus-galli (L.) P. Beauv.	1	T
Epilobium alpestre (Jacq.) Krock.	1	H
Epilobium roseum Schreb.	1	H
Equisetum arvense L.	1	G
Erigeron annuus (L.) Pers.	2	T
Erigeron ramosus (Walters) Britton, Sterns & Poggenb.	2	T
Erysimum cheiranthoides L.	1	T
Fragaria vesca L.	1	H
Fuchsia sp.	1 cul	N
Galinsoga ciliata (Raf.) S.F. Blake	1	T
Galium mollugo L.	1	H
Gazania rigens Gaertn.	1 cul	H
Geranium macrorrhizum L.	1 cul	H

1	2	3
Glechoma hederacea L.	1	H
Gypsophila paniculata L.	1 cul	C
Heracleum sphondylium L.	1	H
Heuchera × *brizoides* Lemoine	1 cul	H
Hypochoeris radicata L.	1	H
Impatiens parviflora DC.	1	T
Iris germanica L.	1 cul	H
Lamium album L.	1	H
Lamium purpureum L.	1	T
Lapsana communis L.	1	T
Lathyrus pratensis L.	1	H
Leontodon autumnalis L.	1	H
Leontodon hispidus L.	1	H
Lobularia maritima (L.) Desv.	1 cul	T(C)
Lolium perenne L.	2	H
Lotus corniculatus L.	1	H
Lupinus polyphyllus Lindl.	2	H
Lysimachia nummularia L.	1	H
Malva moschata L.	1 cul	H
Matteucia struthiopteris (L.) Tod.	2 cul	H
Medicago lupulina L.	1	H
Mentha longifolia (L.) L.	1	G
Mentha × *verticillata* L.	1	Hy
Oxalis fontana Bunge	1	T
Paeonia officinalis L.	1 cul	H
Pastinaca sativa L.	1	H
Petunia × *atkinsiana* D. Don	1 cul	T
Phalaris arundinacea L.	1 cul	H
Phlox paniculata L.	2 cul	H
Phlox subulata L.	1 cul	Ch
Physostegia virginica (L.) Benth.	1 cul	H
Plantago lanceolata L.	1	H
Plantago major L.	3	H
Poa annua L.	2	H(T)
Poa pratensis L.	4	H
Polygonum aviculare L.	2	T
Polygonum persicaria L.	1	T
Potentilla anserina L.	1	H
Potentilla reptans L.	1	H
Primula elatior (L.) Hill	1 cul	H
Prunella vulgaris L.	1	H
Ranunculus acris L.	1	H
Ranunculus repens L.	2	H
Rorippa palustris (L.) Besser	1	T
Rudbeckia hirta L.	1 cul	H(T)
Rudbeckia laciniata L.	1 cul	H
Rumex confertus Willd.	1	H

1	2	3
Rumex obtusifolius L.	1	H
Salvia splendens Sello	2 cul	T
Saxifraga aizoides L.	1 cul	H
Sedum sexangulare L.	1 cul	C
Sedum spectabile Boreau	1 cul	G
Sedum spurium M. Bieb.	1 cul	C
Senecio cineraria DC.	1 cul	Ch
Senecio ovatus (P. Gaertn., B. Mey. & Scherb.) Willd.	1	H
Solidago canadensis L.	1 cul	G
Solidago virgaurea L.	1	H
Sonchus arvensis L.	1	G
Sonchus asper (L.) Hill	1	T
Sonchus oleraceus L.	1	T
Stachys byzantina K. Koch	1 cul	H
Stellaria media (L.) Vill.	2	T
Tanacetum parthenium (L.) Sch. Bip.	1 cul	H
Tanacetum vulgare L.	1	H
Taraxacum officinale Web.	2	H
Trapaeolum majus L.	1 cul	T
Trifolium pratense L.	3	H
Trifolium repens L.	2	H
Tussilago farfara L.	1	G
Urtica dioica L.	1	H
Verbena × *hybrida* Voss	1 cul	H
Veronica filiformis Sm.	2	H
Vicia cracca L.	2	G
Vicia sepium L.	1	G
Vinca minor L.	1 cul	Ch
Viola × *wittrockiana* Hort.	2 cul	H(T)

Frequency classes: 1 – very rare; 2 – rare; 3 – moderately frequent; 4 – frequent; 5 – very frequent; cul – cultivated.
Life forms: M – megaphanerophytes; N – nanophanerophytes; G – geophytes; H – hemicryptophytes; T – therophytes; Hy – hydrophytes and helophytes; C – non-woody chamaephytes; Ch – woody chamaephytes.

Among cultivated herbaceous plants the most frequent ornamental elements included *Begonia semperflorens*, *Matteucia struthiopteris*, *Phlox paniculata*, *Salvia splendens* and *Viola* × *wittrockiana*. Interesting species, rarely used as ornamental plants included *Gazania rigens, Geranium macrorrhizum, Heuchera* × *brizoides* and *Senecio cineraria*. Among cultivated plants the biggest percentage was recorded for perennial plants (20%), while annual plants accounted for only 4.5%. It was already observed earlier that in cemeteries in southern Poland *Centaurea mollis* was and still is a very frequent ornamental element, while *Malva moschata* was relatively frequent (Czarna and Piskorz 2005, Czarna et al. 2006, 2007). Both of these two species were recorded in the analysed cemetery. *Erigeron annuus* and *E. ramosus* are American species, which were probably brought as cut flowers and put in vases, from which they spread over the area of the cemetery and they survive there in good condition. The two latter species are also frequent elements in cemeteries in lowland Poland (Czarna 2005). Among the above mentioned cultivated species only the following may be classified as perennial cultivated species: *Centaurea mollis, Erigeron annuus, Erigeron ramosus*, as well as *Lupinus polyphyllus*.

In frequently visited cemeteries, in which paths are trampled or raked, or weeded, there are many annual plants. In the municipal cemetery in Ustrzyki Dolne paths between graves are very strongly overgrown. For this reason a very small percentage of flora consisted of therophytes, while a considerable percentage – of hemicryptophytes (Fig. 2). A similar phenomenon was

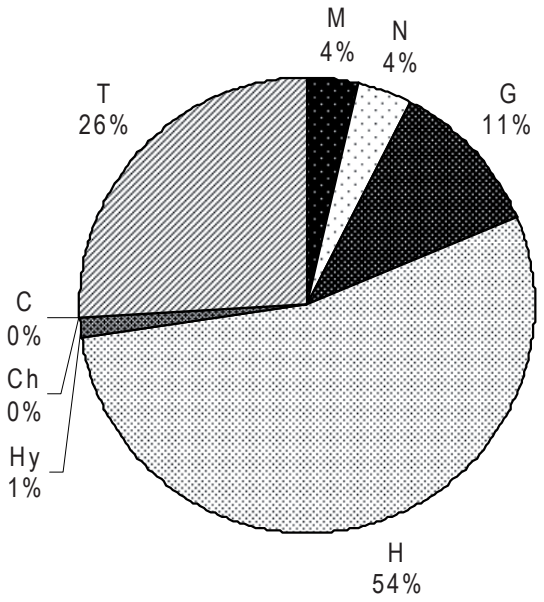

Fig. 2. The proportion of life form groups in non cultivated vascular flora of cemetery in Ustrzyki Dolne. Life forms: M – megaphanerophytes; N – nanophanerophytes; G – geophytes; H – hemicryptophytes; T – therophytes; Hy – hydrophytes and helophytes; C – non-woody chamaephytes; Ch – woody chamaephytes

observed in the so-called New Cemetery in the town of Zakopane (Czarna and Piskorz 2005), in selected cemeteries in the town of Ostrów Wielkopolski and its environs (Celka and Żywica 2004) and in the left-bank Warszawa (Lisowska et al. 1994). Considerable variation was found in the so-called Old cemetery in Zakopane – a considerable share of therophytes was recorded here, amounting to over 65%, while the percentage of hemicryptophytes was much lower, i.e. only over 28% (Czarna and Piskorz 2005). Such a situation is connected with the cemetery being visited with high frequency and by large numbers of tourists, who trample paths, turning them into advantageous sites to be colonized by annual plants. The most frequent perennial plants found in the cemetery in Ustrzyki Dolne included *Aegopodium podagraria*, *Plantago major*, *Poa pratensis* and *Trifolium pratense*. Among cultivated plants the biggest percentage was recorded for hemicryptophytes, i.e. over

41%, and nano- and megaphanerophytes, jointly over 35% (Fig. 3).

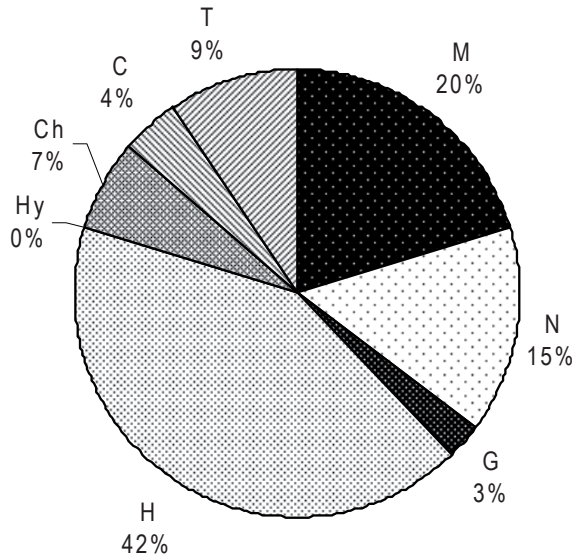

Fig. 3. The proportion of life form groups in cultivated vascular flora of cemetery in Ustrzyki Dolne. Life forms: M – megaphanerophytes; N – nanophanerophytes; G – geophytes; H – hemicryptophytes; T – therophytes; Hy – hydrophytes and helophytes; C – non-woody chamaephytes; Ch – woody chamaephytes

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