

VEGETATION OF TRZEBINIA TOWN IN CONDITIONS OF STRONG HUMAN IMPACT. I. VASCULAR FLORA

ALICJA SUDER, STANISŁAW CABALA

Uniwersytet Śląski, Katedra Ekologii, ul. Bankowa 9, 40-032 Katowice

Keywords: Trzebinia town, flora.

SZATA ROŚLINNA MIASTA TRZEBINI W WARUNKACH SILNEJ ANTROPOPRESJI. I. FLORA NACZYNIOWA

W wyniku przeprowadzonych badań na terenie Trzebini w latach 1999–2000 stwierdzono 642 gatunki roślin naczyniowych, z których znaczna część reprezentuje rodziny *Asteraceae*, *Fabaceae*, *Cyperaceae*, *Poaceae*, *Rosaceae*. Nie potwierdzono występowania 51 taksonów. Wśród form życiowych dominują hemikryptofity. Pod względem warunków siedliskowych najczęściej jest gatunków preferujących pełne światło z przejściowym ocienieniem oraz umiarkowanie ciepłe i umiarkowanie chłodne warunki termiczne, gleby świeże i wilgotne o pH od słabo kwaśnego po zasadowe, bogate w związki organiczne, piaszczysto-gliniaste lub ciężkie gliny. We florze miasta duży udział mają gatunki obcego pochodzenia (19,8%). Największą frekwencję mają archeofity, a wśród kenofitów – agriofity. Mimo znacznej synantropizacji flora miasta charakteryzuje się wysokim udziałem gatunków chronionych (40) i zagrożonych w skali Górnego Śląska (84). Natomiast gatunków górskich jest niewiele (15). Obszarem o największych walorach florystycznych na terenie Trzebini jest Podbuczyna, a o najmniejszych – Centrum i Chechło.

Summary

As a result of the field survey carried out in the area of Trzebinia in years 1999–2000, 642 vascular plant species were recorded, many of them represented by: *Asteraceae*, *Fabaceae*, *Cyperaceae*, *Rosaceae* families. 51 taxa were not confirmed. Among life forms hemicryptophytes predominate. With regard to habitat conditions, there are mostly photophilous species preferring full light with temporary shading and temperate warm and temperate cool temperature conditions, fresh and humid soils with pH ranging from light acid to alkaline, rich in organic compounds, sandy-clay or heavy clay soils. In the flora of the town species of alien origin have huge contribution (19.8%). Archaeophytes and among kenophytes – agriophytes, are the most frequent. Despite considerable synanthropization the flora of the town is characterized by a large participation of protected species (40) and endangered ones in the scale of Upper Silesia (84). However, there are not many montane species (15). The most precious area in Trzebinia, from floristic point view, is Podbuczyna and the most disturbed – the centre and Chechło.

INTRODUCTION

Trzebinia is a town situated in the western part of Małopolska region. The vicinity of Cracovian and Silesian academic centers as well Chrzanów Regional Museum made the area of the town an object of floristic studies conducted since the 19th century by M. Chmiel [1],

A. Czylok [2], J. Krupa [5], I. Mazaraki [8], M. Mazaraki [9], T. Nowak, L. Bernacki [11], M. Piwowarczyk [16], A. Rehman [17], K. Rostański, P. Grzegorzek, A. Rostański, B. Tokarska-Guzik [18]. In spite of much of collected materials on work of the town's flora has been written so far. The part of collected data is of little usefulness, because there is no exact information about localities of particular plant species. Moreover, many hundred years old industrial tradition dating from the beginning of the 13th century and intensification of industrialization and urbanization processes in the last century led to large environmental transformations of the town [7]. Therefore Trzebinia has been treated by some botanists as a derelict land and deprived of natural features. In connection to this, floristic studies have been restricted to small fragments of the town, comprising mostly areas transformed by man.

The aims of the paper are:

- to qualify floristic resources of Trzebinia;
- to show a degree of large influence of intensification of human economic activity on flora;
- to indicate areas with the biggest accumulations of botanical originalities which might be objects of protective actions in the future.

LOCATION AND CHARACTERIZATION OF THE STUDY AREA

The geographical coordinates of Trzebinia town are 50°09'30" North and 19°28'30" East [7]. According to geomorphological division of Poland the study area belongs to the Małopolska Upland province, subprovince of Śląsk-Kraków Upland [4]. In the area of the town there is a frontier of two macroregions: Kraków-Częstochowa Upland and Silesian Upland. The Cracovian part is smaller and comprises the southern and eastern fragments of the town. As to geological structure, Miocene deposits (clays, sands and gypsums) preponderate. Whereas in the northern and western parts of Trzebinia belonging to Silesian Upland deposits of carbon geological formation predominate (sandstones, shales, coal-bearing conglomerates) and Triassic (shelly limestone, the Bunter). The study area covers 3130 ha.

The area relief is much differentiated. The northern and southern fragments of Trzebinia are featured by lowland landscape, covered by little river valleys. However, the eastern and western parts of the town compose belts of hills and hummocks, of which the highest is Góra Bożniowa (402.2 m high). The differences in height in the depicted area are considerable and amount over 130 m [12].

Climate conditions of Trzebinia do not differ much from moderate values for Poland. The rainiest month is July, and the minimum of rainfalls occurs in January. Snow mantle is present for 75 days, but their numbers have been permanently decreasing for a couple of years. The average annual temperature is 7.8°C. The warmest month is July, and the coldest – January. Within a year, 90–100 days with ground frosts occur and vegetation season lasts between 200 and 210 days. [12].

In the study area, the biggest area is covered by podzolic soils, formed from mellow glacial and light loamy sands. They cover the northern and southern areas of the town, separated in its medium part by a belt of brown soils. The latter arised from deficient outwash loamy glacial sands and occur usually in the common complex with rendzinas. However, hydromorphic soils are largely associated with river valleys. They cover the largest areas in the southern-eastern part of Trzebinia [20].

The town area belongs to the drainage basin of the Vistula. The northern part of the basin is dewatered by the Kozi Bród. This is the longest river within Trzebinia, which after connection with other streams in Jaworzno town and with the Łużnik debouches into the Biała Przemsza. The southern part of the town is drained by the Chechło river with tributaries – the Czarna Woda, the Młoszówka, the Wodna i the Luszówka. In the study area there are plentiful reservoirs of stagnant waters. The biggest are, formed in the river, lagoon called “Chechło Lake” and “Balaton” arised as a result of flooding of a worked-out quarry [12].

The beginning of industry development started at the end of the 13th century, when in Trzebinia first lead-mine aroused [6]. However, the biggest environmental changes occurred on the turn of the 19th century in connection with development of coal mining. The main coal recipients were local foundries and founded at the beginning of the 20th century power station “Siersza” and cement mill “Górka”. Also other works were then founded such as, among others, oil distillery “Trzebinia” (1896), coal mine and foundry works “Trzebinia” (1908), oil-processing plant (1921) [13]. After the Second World War most of works were rebuilt and modernized. New coal mines were founded too, together with power station “Siersza II”, magnesium foundry and oil industry works [14]. Extension of industrial infrastructure caused massive migration of people. Nowadays, Trzebinia has 20 thousand citizens [3]. As a result of economic transformations after 1989 majority of plants were closed, however this short period of time is not enough to repair the effects of industrial activity.

METHODS

The field survey was carried out in years 1999–2000. The town area was divided into nine regions, which mostly overlap administrative districts of Trzebinia (Fig. 1).

The nomenclature of species was given after Mirek *et al* [10], and the nomenclature of families after Takhtajan [21]. The floristic list shown in an alphabetical order was divided into two parts (A and B). The first part (A) includes endangered taxa in Upper Silesia [15] and protected ones [19], whereas in the second part (B) – the rest of species. For each species a number is given except for its varieties and subspecies which were not numbered. In the list of species additional information is included which concerns:

- localities of particular taxon in the study area: 1 – Piaski; 2 – Centrum; 3 – Bożniowa; 4 – Trzebionka; 5 – Chechło; 6 – Wodna; 7 – Podbuczyna; 8 – Góry Luszowskie; 9 – Siersza;
- abbreviations of the names of authors who first gave information about locality of a given taxon: B – L. Bernacki, T. Nowak; C – M. Chmiel; G – P. Grzegorzek; A. Rostański; I – I. Mazaraki; K – J. Krupa; M – M. Mazaraki; N – J. Nowak; O – L. Olesiński; P – M. Piwowarczyk; R – A. Rehman; S – A. Sendek; U – M. Kuc; Z – A. Czyłok;
- a – when the information about a given locality came from Herbarium of Chrzanów Regional Museum in Chrzanów, an asterisk (*) was given by authors’ name;
- b – the localities not confirmed during the studies, have been marked with a symbol x, however the rest data about locality are from the cited literature.

Moreover, in the first part of floristic list (A) the following symbols have been used:

- I – protected species: + – strict protection, * – partial protection;
- II – endangered species in Upper Silesia.

Threat criteria: Ex – extinct species and probably extinct species,
 E – endangered species,
 V – vulnerable species,
 R – rare species,
 I – species with indeterminate status of threat.

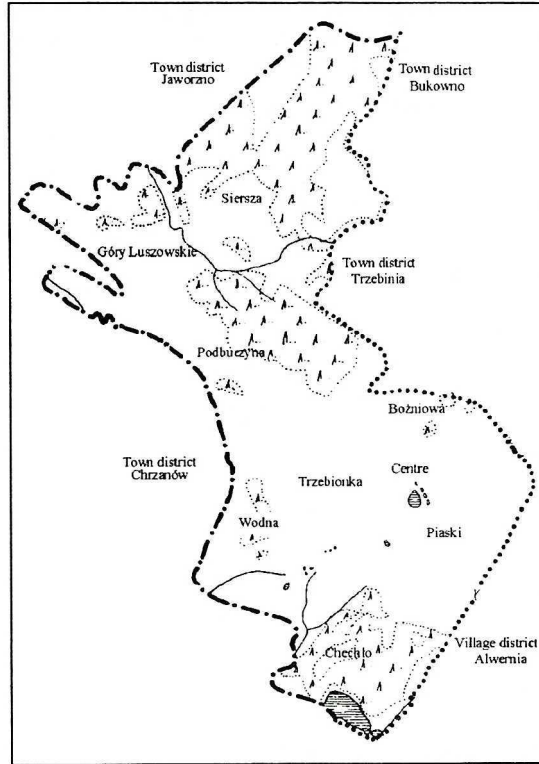


Fig 1. Location and boundaries of Trzebinia town

Montane species have been marked with a symbol – °, given by name of particular species. The list of confirmed, in investigated area, taxa was analyzed in regard to the life forms and habitat requirements on the basis of ecological indices [25], attachment to particular historical-geographical group [22, 23], threat criterion in the area of Upper Silesian Industrial region and species protection. The contribution of montane species to the flora of examined area was evaluated [24].

Table 1. The list taxa confirmed in the study area

A. Protected and endangered species

No.	Species	I	II	Locality
1	<i>Anthericum ramosum</i> L.	-	R	9I
2	^o <i>Anthriscus nitida</i> (Wahlenb.) Hazsl	-	R	7
3	<i>Aquilegia vulgaris</i> L.	+	R	1,7,9
4	<i>Asarum europaeum</i> L.	*	-	7
5	<i>Asperula cynanchica</i> L.	-	R	3P,6C,8C,9
6	<i>Batrachium trichophyllum</i> (Chaix) Bosch	-	R	1
7	<i>Botrychium lunaria</i> (L.) Sw.	-	R	7,9
8	<i>Bromus benekenii</i> (Lange) Trimen	-	R	7
9	<i>Calla palustris</i> L.	-	R	7
10	<i>Camelina sativa</i> (L.) Crantz	-	I	6
11	^o <i>Cardaminopsis halleri</i> (L.) Hayek	-	R	1,4,6,7x8C,9
12	<i>Carex appropinquata</i> Schumach.	-	R	1,2
13	<i>Carex davalliana</i> Sm.	-	V	1,6
14	<i>Carex hartmanii</i> Cajander	-	R	8
15	<i>Carex hostiana</i> DC.	-	E x	8
16	<i>Carex montana</i> L.	-	R	3,6C,8C,9
17	<i>Carex pilulifera</i> L.	-	E	8
18	<i>Carex pseudocyperus</i> L.	-	V	6,7
19	<i>Carlina acaulis</i> L.	+	R	3R,P,6C,x8C,9
20	<i>Centaurea phrygia</i> L.	-	E	1,6,8
21	<i>Centaurium erythraea</i> Rafn ssp. <i>erythraea</i>	*	R	1,3P,6*O,N,7
22	<i>Cephalanthera damasonium</i> (Mill.) Druce	+	E	7
23	<i>Cephalanthera longifolia</i> (L.) Fritsch	+	E	7
24	<i>Cephalanthera rubra</i> (L.) Rich.	+	E	7
25	<i>Chimaphila umbellata</i> (L.) W. P. C. Barton	+	V	1,9K
26	<i>Comarum palustre</i> L.		V	4, x5I
27	<i>Convallaria majalis</i> L.	*	-	1,3,7,9
28	<i>Corallorhiza trifida</i> Châtel.	+	E	7,9
29	<i>Crepis mollis</i> (Jacq.) Asch.s.s.	-	R	3
30	<i>Dactylorhiza incarnata</i> (L.) Soó	+	E	1,2,6,8
31	<i>Dactylorhiza majalis</i> (Rchb.) P. F. Hunt & Summerh.	+	V	1,2,6B,8
32	<i>Daphne mezereum</i> L.	+	V	7
33	<i>Dianthus carthusianorum</i> L.	*	-	1,3,6B,9I
34	<i>Dianthus deltoides</i> L.	*	-	3P,5,6,7,9*O
35	<i>Drosera rotundifolia</i> L.	+	V	1,x5*N
36	<i>Epipactis atrorubens</i> (Hoffm.) Besser	+	V	1,2,3P,4,5,6K,7,8C,9
37	<i>Epipactis helleborine</i> (L.) Crantz.	+	R	1,2,3P,4,6,7,9
38	<i>Epipactis palustris</i> (L.) Crantz.	+	R	1,2K,Z,4,5,6B,8
39	<i>Equisetum hyemale</i> L.		V	6

40	<i>°Equisetum telmateia</i> Ehrh.	+	V	6
41	<i>°Equisetum variegatum</i> Schleich.	-	V	2Z,x6*O
42	<i>Eriophorum latifolium</i> Hoppe	-	V	1,x5I,6,7,8
43	<i>Festuca trachyphylla</i> (Hack.) Krajina	-	R	3
44	<i>Filipendula vulgaris</i> Moench	-	R	3
45	<i>Frangula alnus</i> Mill.	*	-	1,2,3,4,5,6,7,8,9
46	<i>Galium odoratum</i> (L.) Scop.	*	-	7,9
47	<i>Gentiana pneumonanthe</i> L.	+	V	x2K,6B,8
48	<i>Gentianella ciliata</i> (L.) Borkh.	+	E	3,6
49	<i>Gladiolus imbricatus</i> L.	+	V	8
50	<i>°Gymnadenia conopsea</i> (L.) R. Br.	+	V	1,2,6B,8
51	<i>Hedera helix</i> L.	+	-	3,7,9
52	<i>Hepatica nobilis</i> Schreb.	*	-	x6K,7,9
53	<i>Hottonia palustris</i> L.	-	V	4
54	<i>Iris sibirica</i> L.	+	E	6,8
55	<i>Lilium martagon</i> L.	+	R	7
56	<i>Listera ovata</i> (L.) R. Br.	+	R	1,4,x5I,6,7
57	<i>°Lysimachia nemorum</i> L.	-	R	7
58	<i>Lysimachia thyrsoflora</i> L.	-	R	4
59	<i>Malaxis monophyllos</i> (L.) Sw.	+	-	2Z
60	<i>Melampyrum arvense</i> L.	-	R	2,3P,6C,8K,C,9
61	<i>Menyanthes trifoliata</i> L.	*	R	6,8
62	<i>Moneses uniflora</i> (L.) A. Gray	-	R	7,9
63	<i>Myosotis caespitosa</i> Schultz	-	I	4
64	<i>Neottia nidus-avis</i> (L.) Rich.	+	V	7,9
65	<i>Ononis spinosa</i> L.	*	R	3P,6B,8
66	<i>Orthilia secunda</i> (L.) House	-	R	1,7,9
67	<i>Parnassia palustris</i> L.	-	R	2Z,6B,8,x9*O
68	<i>°Petasites albus</i> (L.) Gaertn.	-	R	7
69	<i>Polygala amarella</i> Crantz	-	I	6
70	<i>°Polygonatum vericillatum</i> (L.) All.	-	R	7
71	<i>Primula veris</i> L.	*	R	1,3P,6,8C,9
72	<i>Pyrola chlorantha</i> Sw.	-	R	9K
73	<i>Pyrola rotundifolia</i> L.	-	R	1,4,7,9
74	<i>Rhynchospora alba</i> (L.) Vahl.	-	V	1
75	<i>Ribes nigrum</i> L.	*	R	1,7,9
76	<i>Ribes spicatum</i> E. Robson	-	V	9
77	<i>Rosa agrestis</i> Savi	-	I	3
78	<i>Scrophularia umbrosa</i> Dumort.	-	R	7,9
79	<i>Senecio paludosus</i> L.	-	V	8
80	<i>°Senecio rivularis</i> (Waldst. & Kit.) DC.	-	V	1,4,6,8
81	<i>Serratula tinctoria</i> L.	-	R	8
82	<i>Silvaum silaus</i> (L.) Schinz & Thell.	-	R	1,6,8
83	<i>Teucrium botrys</i> L.	-	R	3
84	<i>Thalictrum flavum</i> L.	-	V	8
85	<i>Thalictrum lucidum</i> L.	-	R	8

86	<i>Thalictrum minus</i> L.	-	V	3P,6,x8C,9
87	<i>Tofieldia calyculata</i> (L.) Wahlenb.	+	V	2Z,x4*N,x6K
88	<i>Utricularia minor</i> L.	-	V	6
89	<i>Veronica scutellata</i> L.	-	V	4,6,8
90	<i>Viburnum opulus</i> L.	*	-	3P,6,7,9
91	<i>Vicia dumetorum</i> L.	-	R	7,9
92	<i>Vicia sylvatica</i> L.	-	R	9
93	<i>Vicia tenuifolia</i> Roth	-	V	3,6
94	<i>Vinca minor</i> L.	+	-	1,7

B. Remaining species

Lp.	Species	Locality		
1	<i>Abies alba</i> Mill.	7,9		
2	<i>Acer ginala</i> Maxim.	2,5,9		
3	<i>Acer negundo</i> L.	2,9		
4	<i>Acer platanoides</i> L.	1,2,4,5,6,7,8,9		
5	<i>Acer pseudoplatanus</i> L.	1,2,4,5,7,9		
	<i>Acer pseudoplatanus</i> L. var. <i>purpureum</i>	2,5		
6	<i>Acer tataricum</i> L.	9		
7	<i>Achillea collina</i> Becker ex Rehb.	1,2,3,6,8,9		
8	<i>Achillea millefolium</i> L.	1,2,3P,4,5,6B,7,8,9*O		
9	<i>Acinos arvensis</i> (Lam.) Dandy	3P		
10	<i>Aegopodium podagraria</i> L.	1,2,3P,4,5,6,7,8,9		
11	<i>Aesculus hippocastanum</i> L.	2,4,5,6,8,9		
12	<i>Aethusa cynapium</i> L.	2,5,8,9		
13	<i>Agrimonia eupatoria</i> L.	1,2,3P,4,5,6,7,8,9		
14	<i>Agropyron repens</i> (L.) P. Beauv.	1*O,2,3P,4,5,6*O,7,8,9		
	<i>Agropyron repens</i> (L.) P. Beauv. <i>ssp. caesium</i>	2,3,6		
15	<i>Agrostemma githago</i> L.	3P		
16	<i>Agrostis canina</i> L.	3P,8		
17	<i>Agrostis capillaris</i> L.	1,2,3P,4,5,6B,C,8C,9*O		
18	<i>Agrostis gigantea</i> Roth	2O,1,3,6*O,8		
19	<i>Ajuga reptans</i> L.	1,4,6,7,8,9		
20	<i>Alcea rosea</i> L.	3,9		
21	<i>Alchemilla glabra</i> Nevgenf.	6*N,B		
22	<i>Alchemilla xanthochlora</i> Rothm.	2		
23	<i>Alisma plantago – aquatica</i> L.	2,4,6B,7		
24	<i>Alium oleraceum</i> L.	3,6		
25	<i>Alium schoenoprasum</i> L.	7		
26	<i>Alium vineale</i> L.	2,7,x8C,9		
27	<i>Alnus glutinosa</i> (L.) Gaertn.	1,2,4,5,6,7,8,9		
28	<i>Alopecurus aequalis</i> Sobol.	7,x9*O		
29	<i>Alopecurus pratensis</i> L.	1,2,3,4,5,6,8,9		
30	<i>Alyssum alyssoides</i> (L.) L.	3		
31	<i>Amaranthus retroflexus</i> L.	8		

32	<i>Anagalis arvensis</i> L.	1,2,5,8,9
33	<i>Anemone nemorosa</i> L.	1,4,7,9
34	<i>Angelica sylvestris</i> L.	1,2,4,6B,7,8,9
35	<i>Anthemis arvensis</i> L.	1,2,4,5,6,8,9
36	<i>Anthoxanthum odoratum</i> L.	1,2*O,3P,4,5,6B,7,8C,9O
37	<i>Anthriscus sylvestris</i> (L.) Hoffm.	2,3P,4,7,9
38	<i>Anthyllis vulneraria</i> L.	3P,6C,7,8C,9
39	<i>Apera spica-venti</i> (L.) P.Beauv.	2,3P,6*O,7,8,9
40	<i>Arabidopsisthaliana</i> (L.)Heynh.	3
41	<i>Arabis glabra</i> (L.) Bernh.	6,9
42	<i>Arabis hirsuta</i> (L.) Scop.	3P,6,8C,9
43	<i>Arctium minus</i> (Hill.) Bernh.	4,5,7,8
44	<i>Arctium tomentosum</i> Mill.	2
45	<i>Arenaria serpyllifolia</i> L.	2,3,x6*U,8C,9*U
46	<i>Armeria maritima</i> (Mill.) Willd.p.p	1,6B,C,7,8C
47	<i>Armoracia rusticana</i> P.Gaertn., B. Mey.& Scherb.	3P,9
48	<i>Arrhenatherum elatius</i> P. Beauv. ex J. Presl & C. Presl	1,2,3P,4,5,6,8,9
49	<i>Artemisia absinthium</i> L.	5,9
50	<i>Artemisia campestris</i> L.	3P,6C,9
51	<i>Artemisia vulgaris</i> L.	1,2,3P,4,5,6,7,8,9
52	<i>Asparagus officinalis</i> L.	2,9
53	<i>Aster novae - angliae</i> L.	2,5,6,9
54	<i>Aster novi-belgii</i> L.	1,2,3,5,6,9*S
55	<i>Aster x salignus</i> Willd.	3,5,9
56	<i>Astragalus glycyphyllos</i> L.	6,7,8C,9
57	<i>Athvrium filix-femina</i> (L.)Roth.	1,3,4,7,9
58	<i>Avenula pubescens</i> (Huds.) Dumort.	1,2,3P,5,6,8C,9
59	<i>Barbarea vulgaris</i> R. Br.	2,3,5,6,8,9
60	<i>Bellis perennis</i> L.	1,2,3P,4,5,6,7,8,9
61	<i>Berberis vulgaris</i> L.	9
	<i>Berberis vulgaris</i> L.var. <i>atropurpurea</i>	2,6
62	<i>Berteroa incana</i> (L.) DC.	6
63	<i>Berula erecta</i> (Huds.) Coville	6,9
64	<i>Betonica officinalis</i> L.	8C,9
65	<i>Betula pendula</i> Roth	1,2,3P,4,5,6B,7,8,9*O
66	<i>Betula pubescens</i> Ehrh.	2Z,4,9
67	<i>Bidens cernua</i> L.	6
68	<i>Bidens frondosa</i> L.	1,2,4,5
69	<i>Blyssmus compressus</i> (L.) Panz. ex Link	x1*O,x5I,6B
70	<i>Brachypodium pinnatum</i> (L.) P. Beauv.	3P,6C,8C,9
71	<i>Brachypodium sylvaticum</i> (Huds.) P. Beauv.	7,9
72	<i>Briza media</i> L.	1,2,3P,4,5,6C,B,7,8C,9
73	<i>Bromus arvensis</i> L.	1,3,5,8,9
74	<i>Bromus carinatus</i> Hook. & Arh.	2,5,9

75	<i>Bromus hordeaceus</i> L.	2,9
76	<i>Bromus inermis</i> Leyss.	2*1,3P
77	<i>Bunias orientalis</i> L.	1,2,3P,5,6,9
78	<i>Calamagrostis epigejos</i> (L.)Roth	1,2,3P,4,5,6B,8,9
79	<i>Callitriche cophocarpa</i> Sendtn.	1,6
80	<i>Calluna vulgaris</i> (L.) Hull	1,3,4,5,9*O
81	<i>Caltha palustris</i> L.	1,2,4,5,6B,7,8,9
82	<i>Calystegia sepium</i> (L.) R. Br.	1,2,3,4,5,6,7,8,9
83	<i>Campanula glomerata</i> L.	1,2,4,5,8C,9I
84	<i>Campanula patula</i> L.	1,2,3,4,5,6,7,8,9
85	<i>Campanula percisifolia</i> L.	3P,8
86	<i>Campanula rapunculoides</i> L.	1,2,3P,5,6C,7,8,9
87	<i>Campanula rotundifolia</i> L.	1,2,3,4,5,6,7,8,9
88	<i>Campanula trachelium</i> L.	3P,7,8,9
89	<i>Capsella bursa-pastoris</i> (L.) Medik.	1,2,3,4,5,6,7,8,9
90	<i>Caragana arborescens</i> Lam.	2,5
91	<i>Cardamine amara</i> L. s. s.	1,2,7
92	<i>Cardamine pratensis</i> L. s. s.	1,2,4,5,6,7,8,9
93	<i>Cardaminopsis arenosa</i> (L.) Hayek	1,2,3,4,5,6,8C,9*O,U
94	<i>Carex acutiformis</i> Ehrh.	1,4,6,8
95	<i>Carex brizoides</i> L.	1,4,5,7
96	<i>Carex canescens</i> L.	1,4,x6*O,7,9
97	<i>Carex echinata</i> Murray	2,5,6,8,9
98	<i>Carex elongata</i> L.	7
99	<i>Carex ericetorum</i> Pollich	3,9
100	<i>Carex flacca</i> Schreb.	1,2,6C,7,8C,9*O
101	<i>Carex flava</i> L.	2,6B,7,8
102	<i>Carex gracilis</i> Curtis	2*O,6*O,7,8
103	<i>Carex hirta</i> L.	1,2,3,4,5,6*O,7,8C,9
104	<i>Carex lepidocarpa</i> Tausch	x5I,8
105	<i>Carex leporina</i> L.	1,4,x6*O,7
106	<i>Carex nigra</i> Reichard	1,2,6*O,8
107	<i>Carex pallescens</i> L.	7,8
108	<i>Carex panicea</i> L.	1,2,4,6B,8,x9*O
109	<i>Carex paniculata</i> L.	1,2*O,4,6,7
110	<i>Carex remota</i> L.	1,2,5,7,9
111	<i>Carex rostrata</i> Stokes	1,4,6*O,7
112	<i>Carex vesicaria</i> L.	4,7
113	<i>Carex vulpina</i> L.	1*O,2,4,6,8
114	<i>Carlina vulgaris</i> L.	2,3P,6C,9I
115	<i>Carpinus betulus</i> L.	1,4,6,7,9
116	<i>Centaurea cyanus</i> L.	1,2,3P,4,5,6,7,8,9
117	<i>Centaurea jacea</i> L.	1,2,3P,5,6C,B,8C
118	^o <i>Centaurea oxylepis</i> (Wimm. & Grab.) Havek	1,2,4,5,6,7,8
119	<i>Centaurea scabiosa</i> L.	2,3P,5,6,8C,9

120	<i>Centaurea stoebe</i> L.	3P,6C
121	<i>Cerastium arvense</i> L. s. s.	1,2,3P,4,5,6,7,8,9
122	<i>Cerastium holosteoides</i> Fr. em. Hyl.	1,2,3P,5,6B,*O,8,9
123	<i>Cerastium semidecandrum</i> L.	2,3,4,5,6,7,8C,9
124	<i>Cerasus avium</i> (L.) Moench	1,3,4,7,9
125	<i>Chaenomeles lagenaria</i> (Loisel.) Koidz. var. <i>alpina</i>	2
126	<i>Chaerophyllum aromaticum</i> L.	3P,5
127	<i>°Chaerophyllum hirsutum</i> L.	1,4,7,9
128	<i>Chamaecyparis pisifera</i> (Siebold & ZUCC.) Endl. var. <i>plumora</i>	2,5,9
129	<i>Chamaenerion angustifolium</i> (L.) Scop.	1,5,6,9*U
130	<i>Chamomilla suaveolens</i> (Pursh) Rydb.	1,2,5,9
131	<i>Chelidonium majus</i> L.	1,2,3P,4,5,6,7,8,9
132	<i>Chenopodium album</i> L.	1,2,3P,4,5,6*O,U,7,8,9
133	<i>Cichorium intybus</i> L.	1,2I,3P,4,5,6,7,8,9
134	<i>Circaea lutetiana</i> L.	7
135	<i>Cirsium arvense</i> (L.) Scop.	1,2,3P,5,6B,8C,9
136	<i>Cirsium oleraceum</i> (L.) Scop.	4,6,7
137	<i>Cirsium palustre</i> (L.) Scop.	1,4,6I,7,8,x9*O
138	<i>Cirsium rivulare</i> (Jacq.) All.	1,2,4,5,6B,7,8,9
139	<i>Cirsium vulgare</i> (Savi) Ten.	3,5,9
140	<i>Clinopodium vulgare</i> L.	2,5,9
141	<i>Consolida regalis</i> Gray	1,3P
142	<i>Convolvulus arvensis</i> L.	1,2,3P,4,5,6,7,8,9
143	<i>Conyza canadensis</i> (L.) Cronquist	1,2,5,9*O
144	<i>Cornus sanguinea</i> L.	1,2,3P,4,5,6,7,9
145	<i>Coronilla varia</i> L.	1,2,3P,5*1,6,7,8C,9
146	<i>Corylus avellana</i> L.	1,2,3,4,5,6,7,8,9
147	<i>Corynephorus canescens</i> (L.) P. Beauv.	x2*I,x4*O,6,9*O,U
148	<i>Cotoneaster horizontalis</i> Deche.	2
149	<i>Crategus laevigata</i> (Poir.)DC.	2,3,6,7
	<i>Crategus laevigata</i> (Poir.)DC. var. <i>Rubra Plena</i>	2,9
150	<i>Crategus monogyna</i> Jacq.	1,2,3,5,6,8,9
151	<i>Crepis biennis</i> L.	2*M,3P,5,6,8C,9
152	<i>Crepis capillaris</i> (L.) Wallr.	5,9
153	<i>Crepis paludosa</i> (L.) Moench	1,2,4,5I,6,7,8
154	<i>Cruciata glabra</i> (L.) Ehrend.	1,2,3,4,5,6B,7,8,9
155	<i>Cuscuta epithymum</i> (L.) L.s.s.	3
156	<i>Cynosurus cristatus</i> L.	2,3,5*1,7,9
157	<i>Dactylis glomerata</i> L.	1,2,3P,4,5,6B,7,8,9*O
158	<i>Danthonia decumbens</i> DC.	x4*O,8
159	<i>Daucus carota</i> L.	1,2,3P,4,5,6L,C,7,8,9*I
160	<i>Delphinium x cultorum</i> Voss	2,5,9
161	<i>Deschampsia coespitosa</i> (L.) P. Beauv.	2,6B,7,8,9

162	<i>Deschampsia flexuosa</i> (L.)Trin	1,2,3,4,5,6,7,8,9
163	<i>Dryopteris carthusiana</i> (Vill.) H. P. Fuchs	1,4,5,7,9
164	<i>Dryopteris filix-mas</i> (L.) Schott	1,2,3,4,7,9
165	<i>Echinops sphaerocephalus</i> L.	1,2,3,5,6,8,9
166	<i>Echium vulgare</i> L.	1,2,3P,5,6C,7,8C,9
167	<i>Elaeagnus angustifolia</i> L.	6
168	<i>Eleocharis palustris</i> (L.) Roem. & Schult.	1,2,4,5*1,6*L,O,B,7,8,9
169	<i>Elodea canadensis</i> Michx.	6
170	<i>Epilobium hirsutum</i> L.	1,x2*M,K,4,6*O,8
171	<i>Epilobium palustre</i> L.	1,2,4,5,6*O,7,8
172	<i>Epilobium parviflorum</i> Schreb.	1,2,3,4,5,6*O,7,8,9
173	<i>Equisetum arvense</i> L.	1,2,3P,4,5,6,7,8,9*O
174	<i>Equisetum fluviatile</i> L.	4,6,7,8,x9*O
175	<i>Equisetum palustre</i> L.	1,2,4,5,6B,7,8,9*O
176	<i>Equisetum sylvaticum</i> L.	1,x3P,4,5,6,7,9
177	<i>Erigeron acris</i> L.	1,2,3P,5,6B,8,9*O
178	<i>Erigeron annuus</i> (L.) Pers. ssp. <i>annuus</i>	1,2,5,6,9
179	<i>Eriophorum angustifolium</i> Honck.	2,6B,x9*O
180	<i>Erysimum cheiranthoides</i> L.	1,2,3,5,9
181	<i>Euonymus europaeus</i> L.	1,2,3,4,5,6,7,8,9
182	<i>Eupatorium cannabinum</i> L.	1,2*M,Z,K,4,5,6B,7,8,9*O
183	<i>Euphorbia cyparissias</i> L.	1,2,3P,4,5,6C,7,8C,9
184	<i>Euphorbia esula</i> L.	1,2,3P,5,6C,7,8,9
185	<i>Euphorbia helioscopia</i> L.	1,2,5,9
186	<i>Euphrasia rostkoviana</i> Hayne	1,2,3P,4,5,6B,7,8,9I
187	<i>Euphrasia stricta</i> D. Wolff. ex J. F. Lehm.	1,3P,6C,9I
188	<i>Fagus sylvatica</i> L.	1,2,4,5,7,9
189	<i>Falcaria vulgaris</i> Bernh.	2,3P,6C,8C
190	<i>Fallopia convolvulus</i> (L.) Å. Löve	2,5,8,9*O
191	<i>Festuca arundinacea</i> Schreb.	2,3P,6C,8C
192	<i>Festuca gigantea</i> (L.) Vill.	4,7,9
193	<i>Festuca ovina</i> L.	1,2*1,3,4*O,5,6B,C,9*O
194	<i>Festuca pratensis</i> Huds.	1,2,3,4,5,6,7,8C,9*O
195	<i>Festuca rubra</i> L. s. s.	1,2,3P,4,5,6B,7,8C,9
196	<i>Ficaria verna</i> Huds.	1,3,4,
197	<i>Filipendula ulmaria</i> (L.) Maxim.	1,2,x3P,4,5,6B,7,8,9
198	<i>Forsythia suspensa</i> (Thunb.) Vahl	1,2,5,8,9
199	<i>Fragaria vesca</i> L.	1,2,3P,4,5,6,7,8,9*O
200	<i>Fragaria viridis</i> Duchesne	2,3,6,9
201	<i>Fraxinus excelsior</i> L.	1,7,9
202	<i>Fumaria officinalis</i> L.	1,2,3,5,8,9
203	<i>Gagea pratensis</i> (Pers.)Dumort.	6
204	<i>Galeobdolon luteum</i> Huds.	7,9
205	<i>Galeopsis pubescens</i> Besser	1,2,5,6,7,9
206	<i>Galeopsis tetrahit</i> L.	1,2,3P,4*N,5,6,9
207	<i>Galinsoga ciliata</i> (Raf.) S. F. Blake	1,2*M,3P,4,5,6,7,8,9

208	<i>Galinsoga parviflora</i> Cav.	1,2,3,4,5,6,7,8,9
209	<i>Galium aparine</i> L.	1,7,9
210	<i>Galium boreale</i> L.	8
211	<i>Galium mollugo</i> L.	1,2,3P,4,5I,6B,C,7,8C,9
212	<i>Galium palustre</i> L.	1,2,4,5I,6,7,8
213	<i>Galium uliginosum</i> L.	1,2,4,5,6B,7,8
214	<i>Galium verrucosum</i> Huds.	1
215	<i>Galium verum</i> L.	1,2,3P,4,5,6C,7,8C,9
216	<i>Genista tinctoria</i> L.	3P,7,8C
217	<i>Geranium columbinum</i> L.	9
218	<i>Geranium molle</i> L.	2,3,5,9
219	<i>Geranium palustre</i> L.	1,x3P,4,5,6B,7,8
220	<i>Geranium pratense</i> L.	1,2,3P,5,6,8,9
221	<i>Geranium pusillum</i> Brum. f. ex L.	8,9
222	<i>Geranium robertianum</i> L.	1,2,3,4,5,6,7,8,9
223	<i>Geum rivale</i> L.	1,2,4,6,7,8,9
224	<i>Glechoma hederacea</i> L.	1,2,3P,4,5,6,7,8,9
225	<i>Glyceria fluitans</i> (L.) R. Br.	1,4,6,7,8
226	<i>Glyceria maxima</i> (Hartm.) Hilmb.	4
227	<i>Glyceria plicata</i> Fr.	1,4*N
228	<i>Helianthemum nummularium</i> (L.) Mill. <i>ssp. obscurum</i>	1,2,3P,5,6C,7,8C,9
229	<i>Helianthus tuberosus</i> L.	1,2,5,9
230	<i>Heracleum sphondylium</i> L.	1,2,3P,4,5*M,6,7,8,9
231	<i>Herniaria glabra</i> L.	3,9
232	<i>Hieracium lachenalii</i> C. C. Gmel.	1,2,5,6*O,9
233	<i>Hieracium murorum</i> L.	1,2,4,5,7,9
234	<i>Hieracium pilosella</i> L.	1,2,3P,5,6C,7,9*U
235	<i>Hieracium piloselloides</i> Vill.	2,9
236	<i>Hieracium sabaudum</i> L.	6,9
237	<i>Hippophaë rhamnoides</i> L.	2,6
238	<i>Holcus lanatus</i> L.	1,2Z,3P,4,5I,6B,7,8,9*O
239	<i>Holcus mollis</i> L.	2,3,6,9
240	<i>Humulus lupulus</i> L.	1
241	<i>Hypericum tetrapterum</i> Fr.	6,8
242	<i>Hypericum perforatum</i> L.	1,2,3P,4,5,6B,7,8,9
243	<i>Hypochoeris radicata</i> L.	6,8C
244	<i>Impatiens glandulifera</i> Royle	8,9
245	<i>Impatiens noli-tangere</i> L.	6,7
246	<i>Impatiens parviflora</i> DC.	2,5,6,7,9
247	<i>Iris pseudoacorus</i> L.	1,2,4
248	<i>Jasione montana</i> L.	1,2,3P,6,9C,I
249	<i>Juncus articulatus</i> L. em.K. Richt.	1,2*O,4,5,6B,7,8,x9*O
250	<i>Juncus bulbosus</i> L.	4,7
251	<i>Juncus compressus</i> Jacq.	5*I,6,8
252	<i>Juncus conglomeratus</i> L. em. Leers	1,2,4,5,6B,7,8

253	<i>Juncus effusus</i> L.	1,2,4,5,6,7,8,x9*O
254	<i>Juncus inflexus</i> L.	1,2,4,5,6B,7,8,x9*O
255	<i>Juncus tenuis</i> Willd.	1,2,3P,5,6,8,9*O
256	<i>Juniperus communis</i> L.	1,2,3,5,7,9
257	<i>Knautia arvensis</i> (L.) J.M.Coult.	1,2,3P,5*I,6,7,8C,9
258	<i>Koeleria glauca</i> (Spreng.) DC.	6,9
259	<i>Laburnum anagyroides</i> Medik.	1,2,9
260	<i>Lactuca serriola</i> L.	2,3,5,9
261	<i>Lamium album</i> L.	1,2,3P,4,5,6,7,8,9
262	<i>Lamium amplexicaule</i> L.	2,5,6,9
263	<i>Lamium maculatum</i> L.	1,2,3,5,6,9
264	<i>Lamium purpureum</i> L.	1,2,5,8
265	<i>Lapsana communis</i> L. s. s.	4*N,6,8
266	<i>Larix decidua</i> Mill.	1,2,3,4,5,6,7,8,9
267	<i>Lathyrus niger</i> (L.) Bernh.	7
268	<i>Lathyrus pratensis</i> L.	1,2,3,4,5*M,6,7,8,9
269	<i>Lathyrus tuberosus</i> L.	1,2,3P,4,5,6,8,9
270	<i>Lathyrus vernus</i> (L.) Bernh.	7,9
271	<i>Lemna minor</i> L.	7
272	<i>Leontodon autumnalis</i> L.	2,5,6,9*O
273	<i>Leontodon hispidus</i> L. ssp. <i>hastilis</i> (L.) Rchb.	1,2,3,4,5,6B,7,8,9
	<i>Leontodon hispidus</i> L. ssp. <i>hispidus</i>	1,2,3P,4,5,6B,C,7,8C,9*O
274	<i>Leonurus cardiaca</i> L.	6
275	<i>Lepidium campestre</i> (L.) R. Br.	1,5,6,8
276	<i>Leucanthemum vulgare</i> Lam.s.s	1,2,3P,4,5*I,6B,7,8C,9
277	<i>Levisticum officinale</i> W. D. J. Koch	2,5
278	<i>Ligustrum vulgare</i> L.	1,2,3,5,6,9
279	<i>Linaria vulgaris</i> Mill.	X2*I,3P,5*I,8,9*U,O
280	<i>Linum catharticum</i> L.	1,2,3P,4,5I,6B,C,7,8C,9*O,I
281	<i>Lithospermum arvense</i> L.	1,2,3,4,5,6*O,7,8,9
282	<i>Lolium multiflorum</i> Lam.	1,2,5,6,9
283	<i>Lolium perenne</i> L.	1,2,3P,4,5,6,7,8,9
284	<i>Lonicera tatarica</i> L.	2,6,8,9
285	<i>Lonicera xylosteum</i> L.	7
286	<i>Lotus corniculatus</i> L.	1,2,3P,4,5*M,6B,C,7,8C,9
287	<i>Lotus uliginosus</i> Schkuhr	1,2,3,4,5,6,7,8,9
288	<i>Lupinus polyphyllus</i> Lindl.	1,2,3P,5,8,9
289	<i>Luzula campestris</i> (L.) DC.	1,2,3,4,5,6,7,8C,9
290	<i>Luzula pilosa</i> (L.) Willd.	4,7,9
291	<i>Lychnis flos-cuculi</i> L.	1,2,3,4,5,6B,7,8,9
292	<i>Lycium barbarum</i> L.	6
293	<i>Lycopus europaeus</i> L.	1,2,4,5,6B,7,8,x9*O
294	<i>Lysimachia nummularia</i> L.	1,2,6,7,8
295	<i>Lysimachia vulgaris</i> L.	1,2,3P,4,5,6B,7,8,9
296	<i>Lythrum salicaria</i> L.	1,2,3,4,5,6B,7,8,9
297	<i>Maianthemum bifolium</i> L.	3,4,7,9

298	<i>Malus domestica</i> Borkh.	3,5,9
299	<i>Malva alcea</i> L.	1,3P
300	<i>Malva neglecta</i> Wallr	1,2,3,5,8,9
301	<i>Malva sylvestris</i> L.	1,2,3,5,6,8,9
302	<i>Matricaria maritima</i> L. <i>ssp. inodora</i> (L.) Dostál	1,2,3P,4,5,6*O,7, 8,9
303	<i>Medicago falcata</i> L.	2,3P,5,6C,8C,9
304	<i>Medicago lupulina</i> L.	1,3P,7,8C,9*O
305	<i>Medicago sativa</i> L.	1,2,3P,4,5,6C,9
306	<i>Medicago x varia</i> Martyn	2,3P
307	<i>Melampyrum pratense</i> L.	1,4,5,7,9
308	<i>Melandrium album</i> (Mill.) Garcke	1,2,3P,4,5,6,7,8,9
309	<i>Melica nutans</i> L.	1,2,5,7,8,9
310	<i>Melilotus alba</i> Medik.	1,2,3P,4,5,6B,7,8,9
311	<i>Melilotus officinalis</i> (L.) Pall.	1,2,3,4,5*M,6,7,8C,9
312	<i>Mentha aquatica</i> L.	1,2*M,4,5,6B,7,8
313	<i>Mentha arvensis</i> L.	1,2,4,5,6B,7,8
314	<i>Mentha longifolia</i> L. L.	1,4,5,6,8
315	<i>Mercurialis perennis</i> L.	7
316	<i>Molinia coerulea</i> (L.) Moench.	1,2,4*O,N,5,6B,8C
317	<i>Mycelis muralis</i> (L.) Dumort.	1,4,5,6,7,9
318	<i>Myosotis arvensis</i> (L.) Hill.	2,3P,5,8,9
319	<i>Myosotis palustris</i> L. L.	1,2,4,5,6*O,7,8
320	<i>Myosotis ramosissima</i> Rochel	1,2,3,5,9
321	<i>Myosoton aquaticum</i> (L.) Moench	1,4,7
322	<i>Myriophyllum verticillatum</i> L.	2,4,6,7
323	<i>Nardus stricta</i> L.	1,4*O,9
324	<i>Nepeta cataria</i> L.	6,8
325	<i>Odontites serotina</i> (Lam.) Rchb. s. s.	1,2,5,6B,8
326	<i>Odontites verna</i> (Bellardi) Dumort.	1,2,5,6,8
327	<i>Oenanthe aquatica</i> (L.) Poir.	4
328	<i>Oenothera biennis</i> L. s. s.	1G,2G,3P,4,5,6,7,8,9G
329	<i>Ononis arvensis</i> L.	3P,6B,8
330	<i>Origanum vulgare</i> L.	3P,6C
331	<i>Orobanche lutea</i> Baumg	3P,6C
332	<i>Oxalis acetosella</i> L.	1,4,7,9
333	<i>Oxalis stricta</i> L.	1,2,5,9
334	<i>Padus avium</i> Mill.	1,4,5,7,9
335	<i>Padus serotina</i> (Ehrh.) Borkh.	2,3,9
336	<i>Papaver rhoeas</i> L.	1,2,3P,4,5,6,7,8,9
337	<i>Papaver somniferum</i> L.	2,9
338	<i>Paris quadrifolia</i> L.	1,7
339	<i>Parthenocissus vitacea</i> (L.) Fritsch.	2
340	<i>Pastinaca sativa</i> L.	1,2,3P,4,5,6B,7,8,9
341	<i>Petasites hybridus</i> (L.) Gaertn., B. Mey. & Schreb.	6

342	<i>Peucedanum oreoselinum</i> (L.) Moench	3P,6C,x8C,9
343	<i>Peucedanum palustre</i> (L.) Moench	1,2,4,5,7
344	<i>Phalaris arundinacea</i> L.	1,2,4
	<i>Phalaris arundinacea</i> L. var. <i>picta</i>	2
345	<i>Philadelphus lemoinei</i> Lem.	2,6
346	<i>Phleum pratense</i> L.	1,2,3P,4,5,6,7,8,9*O
347	<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	1,2,4,5,6*O,B,7,8,9
348	<i>Physocarpus opulifolius</i> (L.) Maxim.	2,3
349	<i>Picea abies</i> (L.) M. Karst.	1,2,4,7,9
350	<i>Picris hieracioides</i> L.	2,3,6,8,x9*O
351	<i>Pimpinella saxifraga</i> L.	1,2,3P,4,5,6C,7,8C,9
352	<i>Pinus nigra</i> J. F. Arnold	3,9
353	<i>Pinus sylvestris</i> L.	1,2,3,4,5,6B,7,8,9
354	<i>Plantago lanceolata</i> L.	1,2,3P,4,5,6*O,7,8,9
355	<i>Plantago major</i> L.	1,2,3P,4,5,6,7,8,9*O
356	<i>Plantago media</i> L.	2,3P,6C,8C,9
357	<i>Poa angustifolia</i> L.	2,3,6C
358	<i>Poa compressa</i> L.	2,3P,6,8C,x9*O
359	<i>Poa palustris</i> L.	1,2,4,6,7,8
360	<i>Poa pratensis</i> L.	1,2,3P,4,5,6B,7,8,9*O,U
361	<i>Poa trivialis</i> L.	1,2,3,4,5,6,7,8,9
362	<i>Polygala comosa</i> Schkuhr	2,3P,6C,8C,9
363	<i>Polygala vulgaris</i> L.	2,3,6
364	<i>Polygonatum multiflorum</i> (L.) All.	7
365	<i>Polygonum amphibium</i> L.	2,4
366	<i>Polygonum aviculare</i> L.	1,2,3,4,5,6,7,8,9*O
367	<i>Polygonum bistorta</i> L.	8
368	<i>Polygonum hydropiper</i> L.	1,2,4,7,8,x9*O
369	<i>Polygonum mite</i> Schrank	4,x9*O
370	<i>Polygonum persicaria</i> L.	1,2,4,5,7,8,x9*O
371	<i>Populus alba</i> L.	1,6*O,U,B
372	<i>Populus nigra</i> L.	1,2,4,5,6,9*O
373	<i>Populus tremula</i> L.	1,2,3,4,5,6B,7,8,9*O
374	<i>Populus Maximowiczii</i> Henry	1,2,9
375	<i>Populus x canadensis</i> Moench. var. <i>Marilandica</i>	9
376	<i>Potamogeton crispus</i> L.	2,4
377	<i>Potamogeton lucens</i> L.	4,7
378	<i>Potamogeton natans</i> L.	2,7
379	<i>Potentilla anserina</i> L.	1,2,3,5,6,8,9
380	<i>Potentilla arenaria</i> Borkh.	6C,7,8C,9I
381	<i>Potentilla erecta</i> (L.) Raesch.	1,2,3,4,5,6B,7,8,9
382	<i>Potentilla reptans</i> L.	1,2,3P,6,7,9
383	<i>Prunella vulgaris</i> L.	1,2Z,3,4,5,6,7,8,9*O

384	<i>Prunus spinosa</i> L.	1,2,3P,5,6
385	<i>Pteridium aquilinum</i> (L.)Kuhn	1,2,3P,4,5,6C,7,9
386	<i>Pulmonaria officinalis</i> L. s. s.	7
387	<i>Pyrola minor</i> L.	7,9
388	<i>Pyrus communis</i> L.	3,6,9
389	<i>Quercus petraea</i> (Matt.) Liebl.	1,2,3,4,5,7,9
390	<i>Quercus robur</i> L.	1,2,4,5,7,9
391	<i>Quercus rubra</i> L.	1,2,3,4,5,9
392	<i>Ranunculus acris</i> L. s. s.	1,2,3,4,5,6,7,8C,9*O
393	<i>Ranunculus auricomus</i> L. s. l.	1,6,8
394	<i>Ranunculus bulbosus</i> L.	1,2,3P,5,6C,8
395	<i>Ranunculus flammula</i> L.	1,4,x5*1,7,8,x9*O
396	<i>Ranunculus repens</i> L.	1,2,3,4,5,6B,7,8,9
397	<i>Ranunculus sceleratus</i> L.	1,2,7
398	<i>Reseda lutea</i> L.	1,2,3P,4,5,6C,7,8K,9
399	<i>Reynoutria japonica</i> Houtt.	1,2,3,5,6,8,9
400	<i>Rhamnus catharticus</i> L.	3,9
401	<i>Rhinanthus minor</i> L.	3P,8
402	<i>Rhinanthus serotinus</i> (Schönh.) Oborn?	6B,8C,9
403	<i>Rhus typhina</i> L.	1,6,9
404	<i>Ribes aureum</i> Pursh	2
405	<i>Ribes rubrum</i> L.	1,4,5,7,9
406	<i>Ribes uva-crispa</i> L.	1,7
407	<i>Robinia pseudacacia</i> L.	1,2,3,4,5,6,9
408	<i>Rorippa x armoracioides</i> (Tausch)	4,5*O
409	<i>Rorippa palustris</i> (L.) Besser	2,x6*O,U,7
410	<i>Rorippa x prostrata</i> (J. P. Bergeret) Schinz & Thell.	1,2,3,5,9
411	<i>Rosa canina</i> L.	3P,6,9
412	<i>Rosa rugosa</i> Thunb.	2,3,6
413	<i>Rubus caesius</i> L.	3P,6,7,9
414	<i>Rubus glivicensis</i> (Sprib. ex Sudre) Sprib.	9
415	<i>Rubus idaeus</i> L.	1,4,5,6,7,9
416	<i>Rubus pedemontanus</i> Pinkw.	9
417	<i>Rubus plicatus</i> Weihe & Nees	6B,9
418	<i>Rudbeckia laciniata</i> L.	1,6
419	<i>Rumex acetosa</i> L.	1,2,3P,4,5,6B,7,8,9*O
420	<i>Rumex acetosella</i> L.	1,2,3P,4,5,6,7,8,9*O
421	<i>Rumex conglomeratus</i> Murray	1,2,4,6,8
422	<i>Rumex crispus</i> L.	1,2,3P,4,5,6*O,7,8,9
423	<i>Rumex hydrolapathum</i> Huds.	4,x5*M
424	<i>Rumex obtusifolius</i> L.	1,2,5,7,8,9
425	<i>Rumex sanguineus</i> L.	1,7
426	<i>Rumex tenuifolius</i> (Wallr.) Å. Löve	2
427	<i>Rumex thyrsoiflorus</i> Fingerh.	1,2,3,5,8
428	<i>Sagina nodosa</i> (L.) Fenzl.	x4*N,7

429	<i>Salix acutifolia</i> Willd.	2
430	<i>Salix alba</i> L.	2,9*O
431	<i>Salix aurita</i> L.	1,4,x9*O
432	<i>Salix cinerea</i> L.	1,4,6B,7,9
433	<i>Salix fragilis</i> L.	1,2,4,5,6,7,9*O
434	<i>Salix pentandra</i> L.	1,4,6B,7,9*O
435	<i>Salix purpurea</i> L.	1,4,6,7,9*O
436	<i>Salix rosmarinifolia</i> L.	1,2Z,4*O,6B,9*O
437	<i>Salvia pratensis</i> L.	6,x8C,9
438	<i>Salvia verticillata</i> L.	3P,x5*M,6C,9
439	<i>Sambucus ebulus</i> L.	6
440	<i>Sambucus nigra</i> L.	1,2,4,5,6,8
441	° <i>Sambucus racemosa</i> L.	1,4,7,9
442	<i>Sanguisorba minor</i> Scop.	2,3P,6,9
443	<i>Sanguisorba officinalis</i> L.	1,4,5,6B,8
444	<i>Sanicula europaea</i> L.	7,9
445	<i>Saponaria officinalis</i> L.	1,2,3,5,6,8,9
446	<i>Sarothamnus scoparius</i> (L.) Wimm.	1,3P4,5,9
447	<i>Scabiosa ochroleuca</i> L.	1,2,3P,6*I,B,7,8C,9
448	<i>Schoenoplectus lacustris</i> (L.) Palla	4,7
449	<i>Scirpus sylvaticus</i> L.	1,2,4,5,6,7,8
450	<i>Scleranthus perennis</i> L.	1,4,5,6*O,9
451	<i>Scrophularia nodosa</i> L.	1,3,4,7
452	<i>Scutellaria galericulata</i> L.	1,2,4,5,6,7,8
453	<i>Sedum acre</i> L.	1,2,3P,4,5,6,8C,9*O
454	<i>Sedum maximum</i> (L.) Hoffm.	2,3P,6,8,9
455	<i>Selinum carvifolia</i> L. L.	1,6,7,8
456	° <i>Senecio fuchsii</i> C. C. Gmel.	7,9
457	<i>Senecio jacobea</i> L.	1,2,3P,5,6C,9
458	<i>Senecio vernalis</i> Waldst. & Kit.	3P,7,9*O
459	<i>Senecio viscosus</i> L.	2,5,9*O
460	<i>Senecio vulgaris</i> L.	1,2,3,5,6,8,9*O
461	<i>Seseli annuum</i> L.	2,3P,6C,7,8C,9
462	<i>Setaria viridis</i> (L.) P. Beauv.	1,2,4,5,6*O,7,8,9
463	<i>Silene nutans</i> L.	1,2,3P,4,6,8C,9
464	<i>Silene vilgaris</i> (Moench) Garcke	1,2*I,3P,4,5,6B,7,8C,9*O
465	<i>Sinapis arvensis</i> L.	1,2,3,4,5,6,8,9
466	<i>Sisymbrium altissimum</i> L.	1,2,5,6,9
467	<i>Sisymbrium loeselii</i> L.	1,3,
468	<i>Sisymbrium officinale</i> (L.) Scop.	2,3,5,6,8
469	<i>Solanum dulcamara</i> L.	1,4,7
470	<i>Solanum nigrum</i> L. em. Mill.	2,9
471	<i>Solidago gigantea</i> Aiton	1,2,3,5,6,8,9
472	<i>Solidago graminifolia</i> (L.) Elliott	6
473	<i>Solidago virgaurea</i> L. s. s.	1,2,3P,6C
474	<i>Sonchus arvensis</i> L.	x2*M,3P,6,x9*O

475	<i>Sonchus asper</i> (L.) Hill.	6,9*O
476	<i>Sonchus oleraceus</i> L.	3
477	<i>Sorbus aucuparia</i> L. em. Hendl.	1,2,4,5,6,7,8,9
478	<i>Sorbus intermedia</i> (Ehrh.) Pers.	2,9
479	<i>Sparganium emersum</i> Rehmann	4
480	<i>Sparganium erectum</i> L. em. Rchb. s. s.	2,4,7
481	<i>Spiraea japonica</i> L. f. var. <i>Macrophylla</i>	3
482	<i>Spiraea media</i> Schmidt	3,7,9
483	<i>Spiraea menziessi</i> Poll.	4
484	<i>Stachys palustris</i> L.	1,3,5*N,7,8,9
485	<i>Stachys sylvatica</i> L.	4,7
486	<i>Stellaria graminea</i> L.	2,8
487	<i>Stellaria media</i> (L.) Vill.	1,2,3,4,5,6,7,8,9
488	<i>Symphoricarpos albus</i> (L.) S. F. Blake	2,9
489	<i>Symphytum officinale</i> L.	1,2,3,5,6,7,8,9
490	<i>Syringa vulgaris</i> L.	2,9
491	<i>Succisa pratensis</i> Moench	1,6B,8
492	<i>Tanacetum vulgare</i> L.	1,2,3P,4,5,6,7,8,9
493	<i>Taraxacum officinale</i> F. H. Wigg.	1,2,3P,4,5,6,7,8,9
494	<i>Tetragonolobus maritimus</i> (L.) Roth ssp. <i>siliquosus</i> (L.) Murb.	x2*1,6B
495	<i>Thlaspi arvense</i> L.	2,3,5,6,8,9
496	<i>Thuja occidentalis</i> L.	2,5,6,9
497	<i>Thymus pulegioides</i> L.	1,2,3P,4,5,6C,B,7,8C,9
498	<i>Thymus serpyllum</i> L. em. Fr.	7,9
499	<i>Tilia cordata</i> Mill.	1,2,4,5,6,7,8,9
500	<i>Tilia platyphyllos</i> Scop.	2,9
501	<i>Torilis japonica</i> (Houtt.) DC.	6,7
502	<i>Tragopogon orientalis</i> L.	1,2,3P,4,6,8C,9
503	<i>Trientalis europaea</i> L.	1,4,7,9
504	<i>Trifolium arvense</i> L.	1,2,3P,5,6,7,9
505	<i>Trifolium aureum</i> Pollich	9
506	<i>Trifolium campestre</i> Schreb.	1,3,9
507	<i>Trifolium dubium</i> Sibth.	2,3P
508	<i>Trifolium medium</i> L.	2,3P,6C,8K,C,9
509	<i>Trifolium montanum</i> L.	3P,6C,8C,9
510	<i>Trifolium pratense</i> L.	1,2,3P,4,5,6*O,N,C,7,8,9
511	<i>Trifolium repens</i> L.	1,2,3P,4,5,6*O,U,7,8,9
512	<i>Trifolium resupinatum</i> L. var. <i>majus</i> Boiss.	2
513	<i>Triglochin palustre</i> L.	2,x5*I
514	<i>Trisetum flavescens</i> (L.) P. Beauv.	3
515	<i>Tussilago farfara</i> L.	1,2,3P,4,5,6B,7,8,9
516	<i>Typha angustifolia</i> L.	2,4,6,7,x9*O
517	<i>Typha latifolia</i> L.	1,2,4,5,x6B,7,x9*O
518	<i>Ulmus glabra</i> Huds.	7
519	<i>Ulmus laevis</i> Pall.	2,4,7,8,9

520	<i>Urtica dioica</i> L.	1,2,3P,4,5,6,7,8,9
521	<i>Utricularia vulgaris</i> L.	4,6
522	<i>Vaccinium myrtillus</i> L.	1,4,7,9*O
523	<i>Vaccinium vitis-idaea</i> L.	1,4,7,9*O
524	<i>Valeriana officinalis</i> L.	3,6
525	<i>Valeriana simplicifolia</i> (Rchb.) Kabath	1,2,4,5,6B,7,8
526	<i>Verbascum densiflorum</i> Bertol.	1,2,3,5,6,9
527	<i>Verbascum lychnitis</i> L.	1,2,3P,5,6C,8C
528	<i>Verbascum nigrum</i> L.	1,3,4,6,8C,9
529	<i>Veronica arvensis</i> L.	2,3,5,6,8,9
530	<i>Veronica beccabunga</i> L.	1,x5*I,x9*O
531	<i>Veronica chamaedrys</i> L.	1,2,3P,4,5,6,7,8C,9
532	<i>Veronica hederifolia</i> L. s. s.	9
533	<i>Veronica officinalis</i> L.	1,4,7,8,9*O
534	<i>Veronica persica</i> Poir.	1,2,3,5,6,7,9
535	<i>Veronica spicata</i> L.	3P
536	<i>Vicia angustifolia</i> L.	1,2,3P,5,6,8,9
537	<i>Vicia cracca</i> L.	1,2,3P,4,5,6B,7,8C,9
538	<i>Vicia dasycarpa</i> Ten.	1,2,5,9
539	<i>Vicia grandiflora</i> Scop.	3
540	<i>Vicia hirsuta</i> (L.) S. F. Gray	1,2,3P,5,6*O,N,8,9
541	<i>Vicia sepium</i> L.	3,6
542	<i>Vicia tetrasperma</i> (L.) Schreb.	1,2,3,5*M,6,9*I
543	<i>Vicia villosa</i>	1,2,3,5*M,6
544	<i>Viola arvensis</i>	1,2,3,4,5,6,7,8,9*O
545	<i>Viola palustris</i>	4,7
546	<i>Viola reichenbachiana</i>	1,4,7,9
547	<i>Viola riviniana</i>	4,7,9
548	<i>Viola tricolor</i>	1,2,3,4,5,6,7,8,9*O

The list of taxa not confirmed during research:

Achillea ptarmica L. – 9, I; *Alyssum saxatile* L. – 3, P; *Bromus tectorum* L. – 9, *O; *Bulboschoenus maritimus* (L.) Palla – 6 *N i *O; *Carex caryophylla* Latourr. – 6 C, 8 C; *Carex distans* L. – 5 *I; *Carex disticha* Huds. – 6 *O; *Carex dioica* L. – 5 *I; *Carex elata* All. – 9, *O; *Carex oederi* Retz. – 6 *O; *Chaenorhinum minus* (L.) Lange – 9 *I; *Chamaecytisus ratisbonensis* (Schaeff.) Rothm. – 8 C; *Digitaria ischaemum* (Schreb.) H. L. Mühl. – 9 *M; *Epilobium roseum* Schreb. – 9, *O; *Eragrostis minor* Host – 2 *N; *Galeopsis ladanum* L. – 9, *U; *Genista pilosa* L. – 6 *O; *Geranium sanguineum* L. – 3 P; 8 C; *Gnaphalium uliginosum* L. – 9 *O; *Inula salicina* L. – 8 K; *Juncus alpino-articulatus* Chaix – 6 *O; *Juncus bufonius* L. – 5 *N, *I; *Juncus filiformis* L. – 9 *O; *Liparis loeselii* (L.) Rich. – 2 Z; *Lolium temulenum* L. – 2 *O; *Luzula multiflora* (Retz.) Lej. – 6 *O; *Lycopodium annotinum* L. – 6 K; *Oenothera paradoxa* Hudziok – 2 G; *Oenothera rubricaulis* Kleb. – 2 G; *Orobanche maior* Sm. – 8 C; *Oxybachus nyctagineus* (Michx.) Sweet. – 5 *N, *I; *Petrorhagia saxifraga* (L.) Link. – 2 *I, 3 P; *Peucedanum cervaria* (L.) Lapeyr. – 8 C; *Phleum phleoides* (L.) H. Karst. – 3 P, 5 *N, 6 C, 8 C; *Poa annua* L. – 9 *O; *Polygonum lapathifolium* L. subsp. *brittingeri* (Opiz) Rech. f. – 9 *S; *Prunella grandiflora* (L.) Scholler – 8 C; *Pulsatilla patens* (L.) Mill. – 9 I; *Ranunculus polyanthemus* L. – 3 P; *Sagina procumbens* L. – 9 *O; *Salix caprea* L. – 9 *O; *Salix repens* L. subsp. *arenaria* (L.) Hiitonen – 6 *O; *Salix viminalis* L. – 9 *O; *Salsola kali* L. – 2 *N; *Spergula arvensis* L. – 9 *O; *Spergula morisoni* Boreau – 9 *O; *Stachys germanica* L. – 2 *I; *Teesdalea nudicaulis* (L.) R. Br. – 9 K; *Trifolium hybridum* L. – 3 P; *Verbascum thapsus* L. – 3 P; *Veronica teucrium* L. – 3 P;

ANALYSIS OF FLORA

In the area of the town 624 vascular plant species belonging to 96 families were recorded. The most frequently represented family is *Asteraceae*, and next *Fabaceae*, *Cyperaceae*, *Poaceae* and *Rosaceae* (Fig. 2).

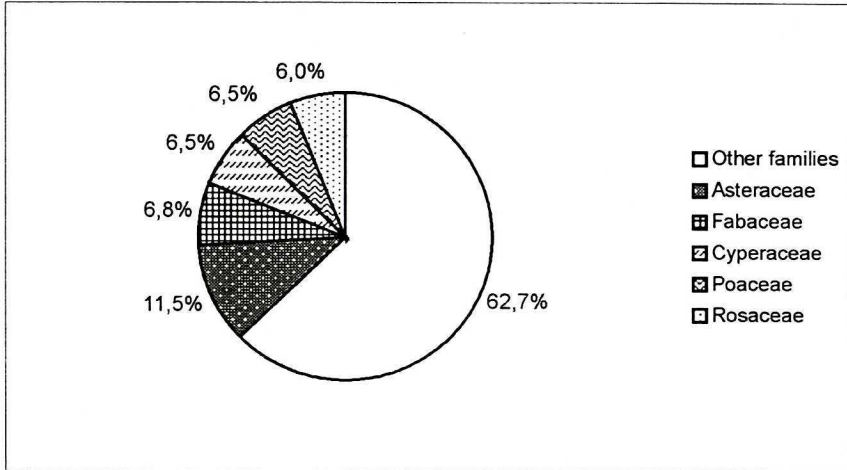


Fig. 2. Participation of particular families in the flora of the study area

The biological spectrum of the flora is typical for the vegetation of a mesothermal climate zone. The most abundant are hemicryptophytes (39.2%), and then terophytes (12.0%) and geophytes (8.7%). Remaining life forms – nanophanerophytes (4.0%), megaphanerophytes (3.9%), herbal chamaephytes (2.3%), chamaephytes (1.6%) and hydrophytes (1.5%) are represented by a small number of species (Fig. 3).

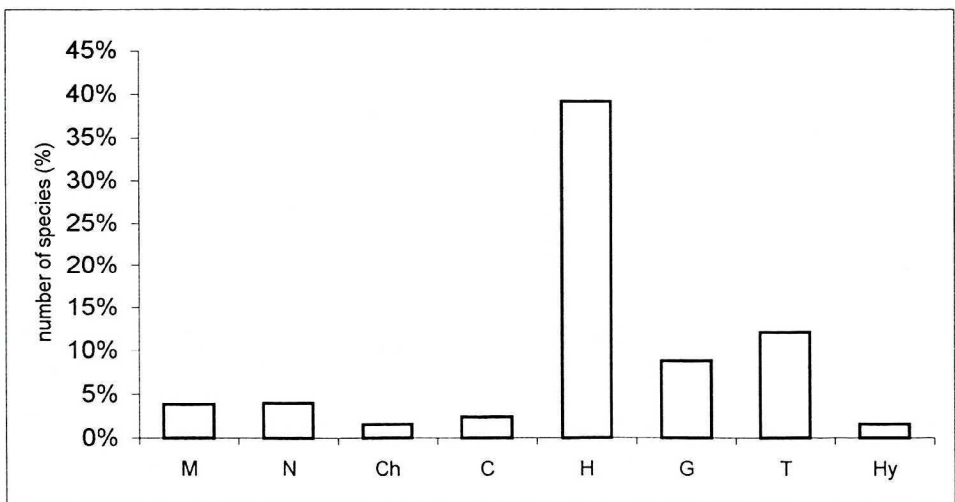


Fig. 3. Biological spectrum

The flora analysis with regard to its particular parameters showed that in most cases species occupy habitats with moderate intensification of a given factor. In relation to light requirements, most of taxa need total illumination or tolerate temporary shading. First of all, they are meadow, pasture or ruderal species. However, shady or fully shadowy places are covered by a small number of species – forest and thickets plants (Fig. 4).

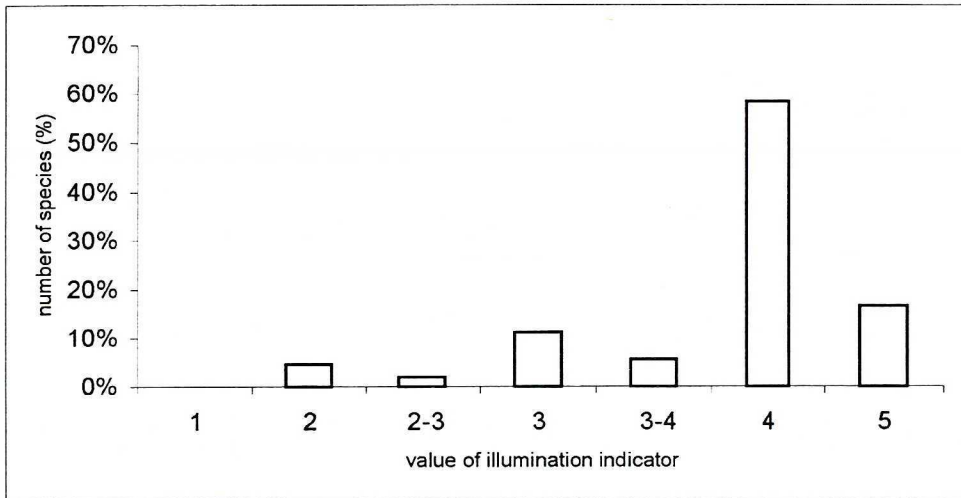


Fig 4. Participation of species in regard to degree of illumination of habitat

Temperature requirements are more varying in the investigated area. The most numerous group is composed by species of temperate warm and temperate cool habitats. The big participation also concerns species with a huge tolerance to temperature. The comparison of extreme values of temperature coefficient indicates prevalence of taxa of warmer habitats in relation to a little group of species occupying lowland areas (Fig. 5).

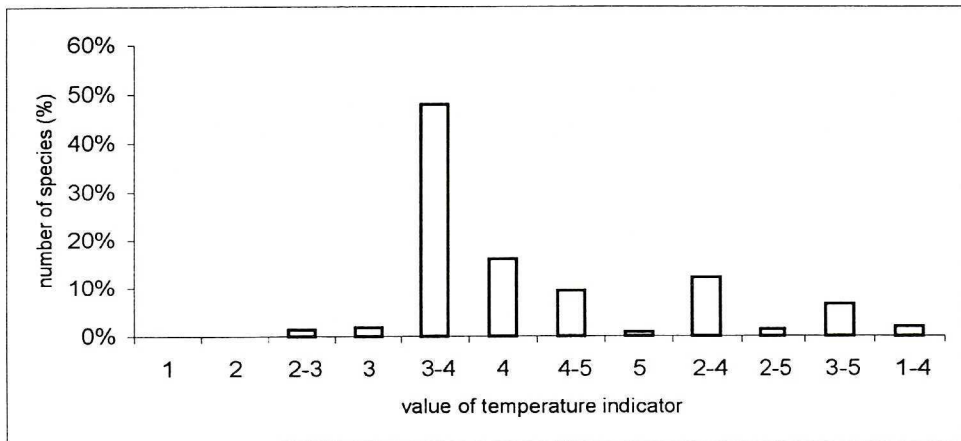


Fig 5. Participation of species in regard to temperature indicator value

The wide spectrum of edaphic coefficients and richness of vascular flora confirms large habitat diversity in the area of the town. The most of species were on fresh and humid habitats with pH ranging from light acid, neutral or alkaline. In regard to granulometric composition of soils, most of taxa grow on sandy or clay soils or heavy clays. Also the considerable participation is represented by species occurring on soils rich in organic compounds or mineral-mould and peaty soils, with high values of trophic indicator, characteristic for eutrophic and mesotrophic habitats (Fig. 6–10).

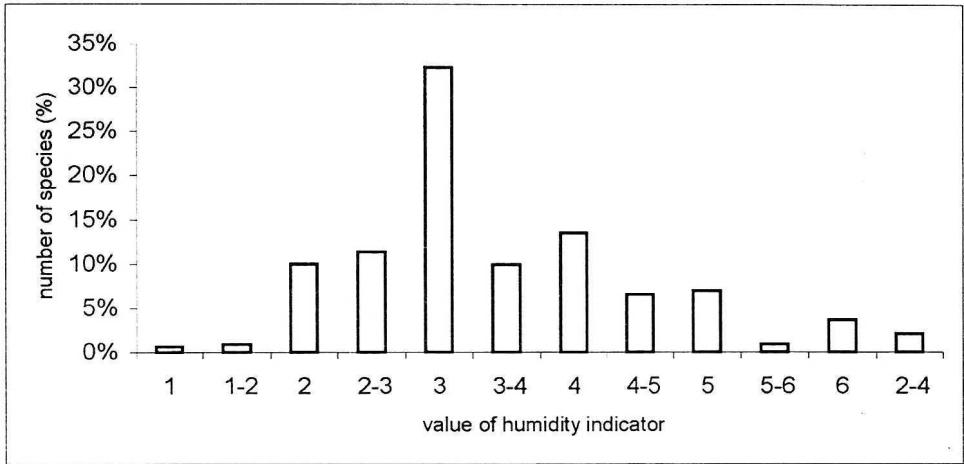


Fig 6. Participation of species in regard to humidity of habitat

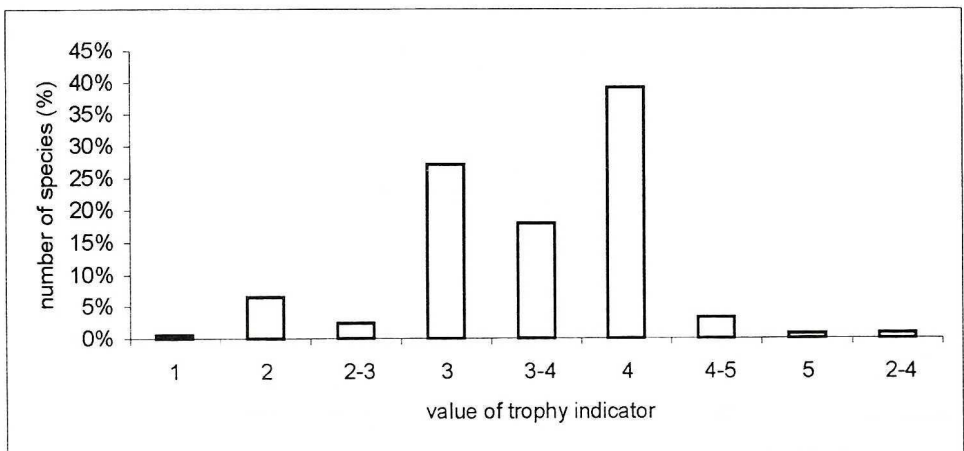


Fig 7. Participation of species in regard to nutrients abundance of habitat

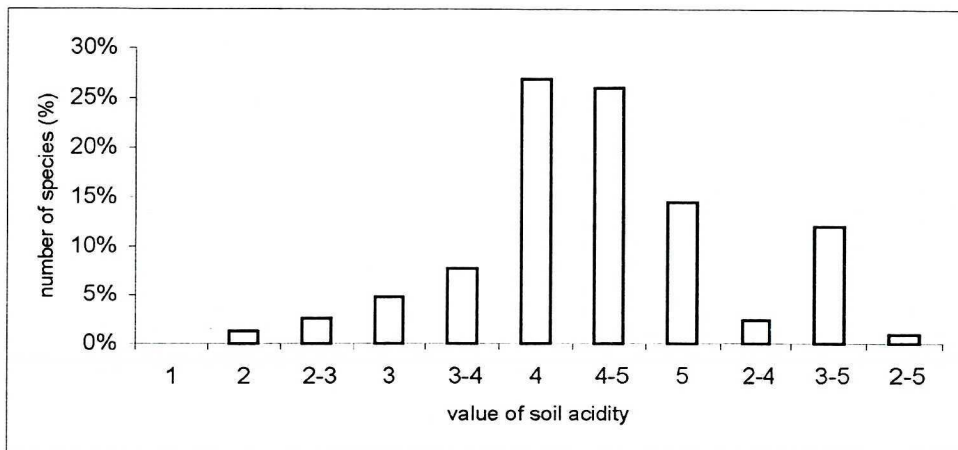


Fig 8. Participation of species in regard to acidity of habitat

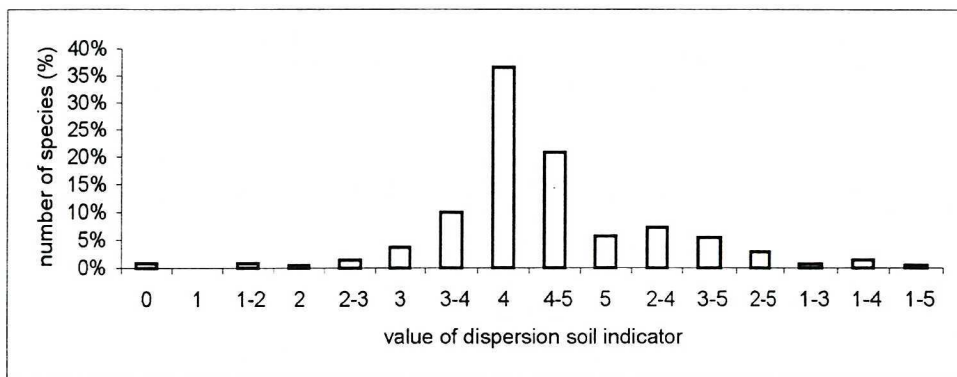


Fig 9. Participation of species in regard to granulometric composition of soil

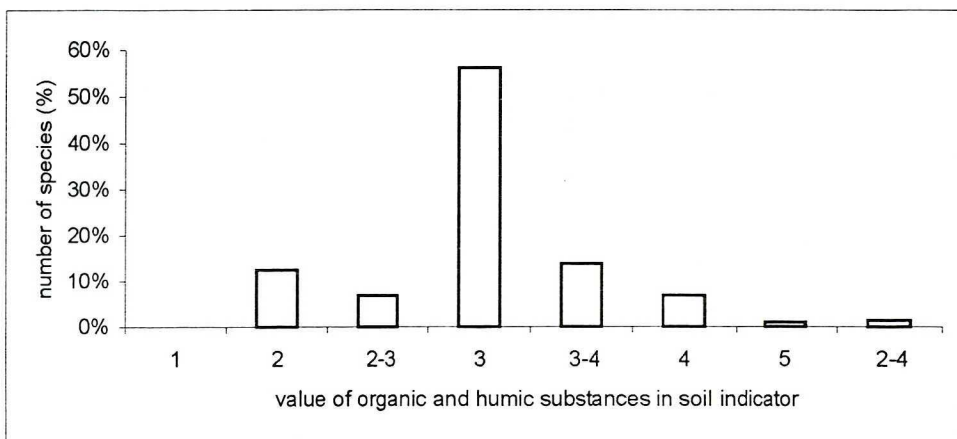


Fig 10. Participation of species in regard to organic substances contents in soil

The flora of investigated area reveals huge synanthropization degree manifesting itself by considerable frequency of species of alien origin. They are 19.8% of total number of taxa confirmed in study area (Fig. 11).

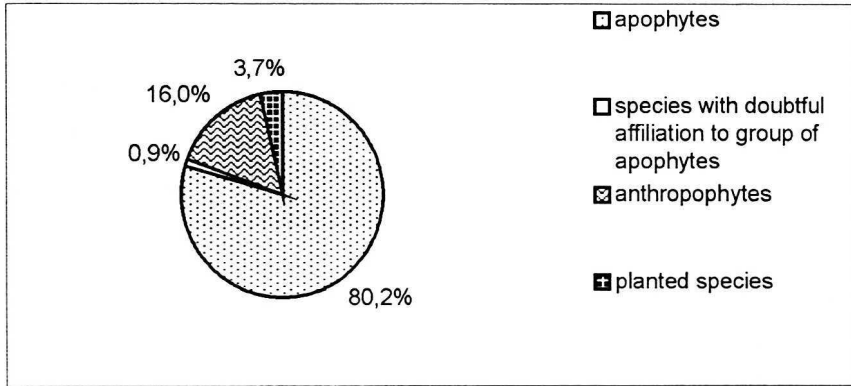


Fig 11. Percentage participation of native and alien species in the flora of Trzebinia

In this group anthropophytes are the most abundant (16%). Other (3.7%) are various tree species of alien origin cultivated in flower-beds, cemeteries, along roads. The affiliation of 6 species to given historical-geographical group remains unsolved. They have not been listed as archaeophytes [23], however it is not known either if they are indigenous species [22]. For this reason they were distinguished as another group besides apophytes, anthropophytes, and introduced species. Among anthropophytes, archaeophytes have a bigger contribution (46.1%); the frequency of kenophytes is a little smaller (43.3%), whereas ephemeroxytes are 10.6% of synanthropic flora (Fig. 12).

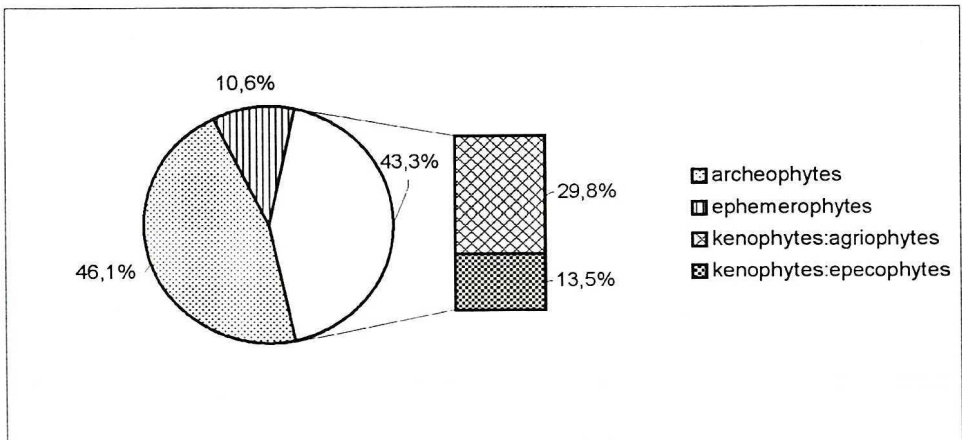


Fig 12. Participation of particular anthropophytes groups in synanthropic flora

In the group of kenophytes, agriophytes dominate (29.8%) over epycophytes (13.5%).

One of botanical values of the town is considerable participation of protected species (40), which are 6.2% of flora of the investigated area. Among them 27 taxa are strictly protected and 13 partially protected. The most numerous group of protected plants is *Orchidaceae* family represented by 13 species. There are many endangered species in Upper Silesia, whose total number is 84 – 13.0% of flora of the analyzed area. In this group there are 10 endangered, 29 vulnerable, 40 rare species and 4 species with unidentified status of threat. The locality of *Carex hostiana* DC. was confirmed – taxon which was thought as extinct or probably extinct in the area of Upper Silesia. The number of montane species is small – 15 which is 2.3% of flora of presented area.

Estimating floristic values of particular districts within Trzebinia the following aspects were taken into consideration: contribution of protected and endangered species in the scale of Upper Silesia, contribution of montane species, degree of synanthropization with respect to percentage participation of archaeophytes and kenophytes as well (Fig. 13–14).

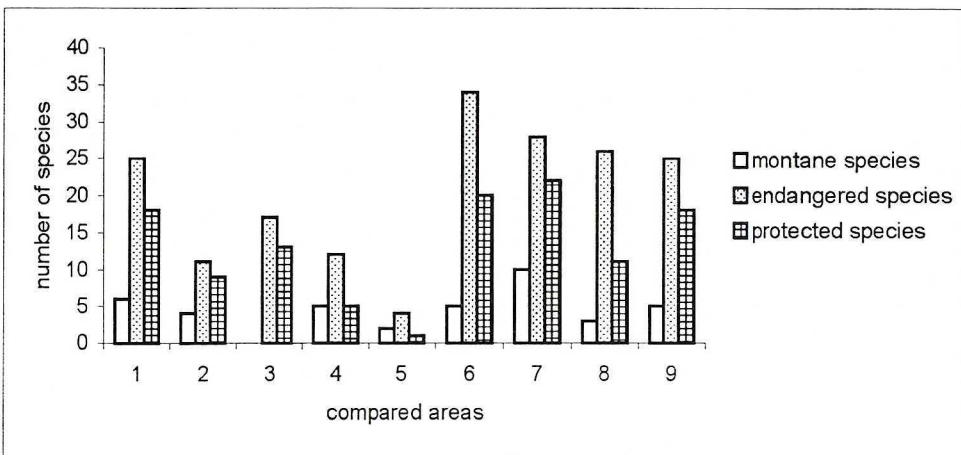


Fig 13. Participation of protected, endangered and montane species in the flora of particular districts of Trzebinia

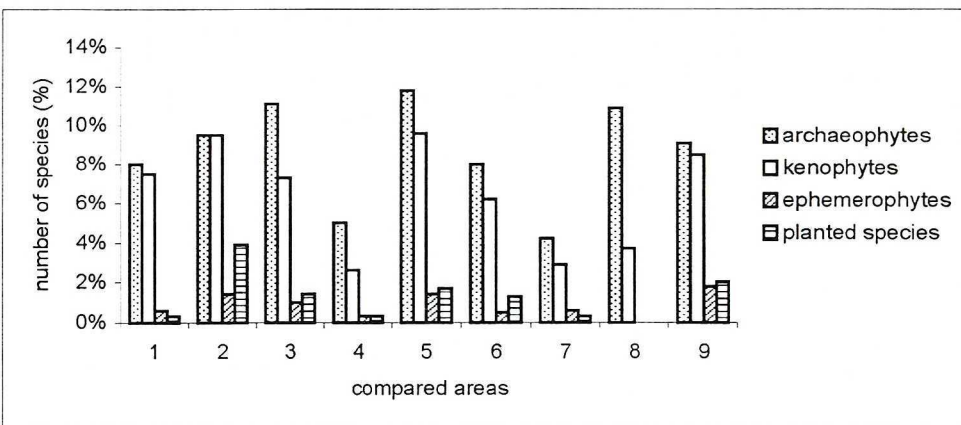


Fig 14. Percentage participation of species of alien origin within compared districts of the town

The analysis has led to the conclusion that the most precious area in regard to floristic values is Podbuczyna (7) in respect to the biggest total participation of protected, endangered and montane species, and also low frequency of synanthropic species. Other districts – Góry Luszowskie (8), Wodna (6), Siersza (9), Bożniowa (3), Trzebionka (4) and Piaski (1) are also featured by the occurrence of abundant group of protected, endangered and montane species. However, these areas in the same time are characterized by low degree of naturalness, by reason of considerable contribution of archaeophytes and kenophytes in the flora. The most disturbed areas by human – the Centre (2) and Chechłó (5) have the largest percentage of synanthropic flora. Despite of this, even in these districts, there are areas which are enclaves of rare and interesting plant species.

SUMMARY AND CONCLUSIONS

1. In the area of Trzebionka 642 vascular plant species were recorded, 51 were not confirmed.
2. Most taxa represent the families of *Asteraceae*, *Fabaceae*, *Cyperaceae* and *Rosaceae*.
3. In the biological spectrum hemicryptophytes prevail, the big participation is revealed by terophytes and geophytes too.
4. In respect to habitat conditions the taxa predominate are those which prefer full light, with temporary shading, temperate warm and temperate cool temperature conditions, fresh and humid soils with light acid, neutral or alkaline pH, sandy-clay soils or heavy clays rich with organic substances (mineral-organic and peaty) with eutrophic and mesotrophic nature.
5. 19.8% of taxa in the flora of the town are species of alien origin: anthropophytes (16.0%), planted species (3.7%) and species with uncertain status of anthropophyte (0.9%). The participation of particular anthropophytes groups in synanthropic flora is following: archaeophytes (46.1%), kenophytes (43.2%), ephemeroxytes (10.6%). Among kenophytes, agriophytes dominate over epecophytes (13.5%).
6. In spite of a large and permanent influence of human economic activity, the flora of Trzebionka is featured by considerable richness and share of many protected and rare species. In the study area 40 protected species were observed, among them 27 strictly protected and 13 partially protected. Besides 84 endangered species in the scale of Upper Silesia were confirmed.
7. Montane species contribution is rather small because they constitute 2.3% of the town flora.
8. The most precious area from floristic point of view is Podbuczyna and the most disturbed – the centre and Chechłó.

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Received: December 19, 2002, accepted: March 1, 2004.