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Spontaneous flora of the Vraca Memorial Park (Sarajevo, Bosnia and Herzegovina)

Original Article

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Abstract:

The Vraca Memorial Park was built in 1980-1981 around the old Austro-Hungarian fortress located above the city of Sarajevo, on northwestern slopes of Trebević mountain slightly above 600 m asl. It covers an area of approximately 8 ha. The southwestern part of the park is mostly covered by semi-natural forest, the central part is mostly paved, whereas the northeastern part is partly covered by ornamental forest and some grassland patches. Despite being declared a National Monument of Bosnia and Herzegovina in 2005, the Park is neglected and ruined, which allowed diverse subspontaneous vegetation to develop. The paper presents the results of systematic research and analysis of the spontaneous vascular flora of the Vraca Memorial Park. A total of 280 species of 182 genera and 67 families were recorded. With 37 species, Poaceae are the most abundant, followed by Compositae with 29, and Fabaceae and Rosaceae (23 species each). Numerous seedlings of shrubs and trees planted for ornamental purposes were observed, as well as the presence of two protected Orchidaceae species.

Key words:
Sarajevo, urban flora, urban habitats, alien flora, indicators of anthropogenic changes

Apstract:

Spontana flora Spomen-parka Vraca (Sarajevo, Bosna i Hercegovina)

Spomen-park Vraca izgrađen je u periodu 1980-1981. godine oko stare austrougarske tvrđave koja se nalazi iznad grada Sarajeva, na severozapadnim padinama planine Trebević, malo iznad 600 m nadmorske visine. Prostire se na površini od oko 8 ha. Jugozapadni deo parka obrastao je poluprirodnom šumom, centralni deo je popločan, a severoistočni prekriven travnatum površinama i ukrasnim drvećem i grmljem. Iako je 2005. proglašen nacionalnim spomenikom Bosne i Hercegovine, park je u velikoj meri zapušten, što je omogućilo razvoj raznovrsne subspontane vegetacije. U radu su prikazani rezultati sistematskog istraživanja i analize spontane vaskularne flore Spomen-parka Vraca, gde je zabeleženo ukupno 280 vrsta iz 182 roda i 67 porodica, od kojih su najbrojnije Poaceae sa 37 vrsta, a slede Compositae sa 29 i Fabaceae i Rosaceae (svaka sa 23 vrste). U parku je zabeležen veliki broj klijanaca ukrasnog drveća i grmlja, kao i dve zaštićene vrste iz porodice Orchidaceae.

Ključne reči:
Sarajevo, urbana flora, urbana staništa, strana flora, indikatori antropogenih promena

Introduction

Parks are open urban spaces generally reserved for public use. They are often larger than other urban green spaces and tend to consist of different habitats with a number of native and introduced plant species, combined to satisfy recreational and other requirements of urban green areas. Nielsen et al. (2014) reviewed 62 papers on biodiversity of parks, and concluded that the findings consistently showed that parks are among the most species rich types of urban green spaces. They also noted that most papers indicated large share of non-native species in parks. The same was noted for park of Lužnica manor

near Zaprešić (Hršak et al., 2015) and large public park in Tirana (Mesiti & Dinga, 2016). Changes in management of urban parks were found to have significant effect on changes in composition of flora (Bianco et al., 2003). Despite being declared a National Monument of Bosnia and Herzegovina in 2005 (Komisija za očuvanje nacionalnih spomenika, 2005), the Vraca Memorial Park, which was built around the old Austro-Hungarian fortress located above the city of Sarajevo, and open to the public on 25. November 1981 (Sulejmanagić, 2017), is neglected and ruined, which allowed diverse subspontaneous vegetation to develop. The paper presents the results of systematic research and an analysis of the spontaneous vascular flora of the Vraca Memorial Park.

Materials and Methods

Study area

The Vraca Memorial Park is located above the city of Sarajevo, on the top of a small range of northwestern slopes of Trebević mountain reaching slightly above 600 m asl. It covers an area of approximately 8 ha. The southwestern part is mostly covered by semi-natural forest, central part is mostly paved by various types of stones, and northeastern part is covered by partly ornamental forest and with some grassland patches. The area is under influence of mid-European continental climate from the North, and the Mediterranean from the South.

Field investigation

The field survey was performed from the summer of 2015 to the spring of 2019. A complete list of taxa developed in three "sub-habitat" types (walls/pavements, grassland and forest) of the Vraca Memorial Park was made. Ornamental species were listed only if specimens developed in a site where there were obviously not deliberately planted (e.g. in cracks of the wall or pavement) were observed.

Data analysis

The nomenclature of plants follows Euro+Med PlantBase and The International Organization for Plant Information Database. The analyses of plant life forms (phanerophyte - Ph, chamaephyte - Ch, hemicryptophyte - H, geophyte - G, hydrophyte - Hy and therophyte - T), as well as origin of plants are given. Life forms were given according to Raunkiaer (1934), and degree of naturalization according to Pyšek et al. (2002), Mosyakin & Yavorska (2003) and Ignatieva & Konechnaya (2004).

Table 1. Indicators of anthropogenic changes

Indicator of total anthropophytization	IAnt = An/(Sp+An) ×100%
Indicator of permanent anthropophytization	IAnp = Mt/(Sp+Mt) ×100%
Indicator of total archaeophytization	IArt = Ar/(Sp+An) ×100%
Indicator of permanent archaeophytization	IArp = Ar/(Sp+Mt) ×100%
Indicator of total kenophytization	IKnt = Kn/(Sp+An) ×100%
Indicator of permanent kenophytization	IKnp = Kn/(Sp+Mt) ×100%
Indicator of modernization	IM = Kn/Mt ×100%
Indicator of fluctuation changes	IF = Df/(Sp+An) ×100%

An – total number of alien species, Sp – number of native species, Mt – number of permanently established alien species (Ar + Kn - Df), Ar – number of archaeophytes, Kn – number of kenophytes (neophytes), Df – number of diaphytes (casual aliens).

The indicators of anthropogenic changes in the flora of Vraca Memorial Park were calculated according to Jackowiak (1990, 2006), as stated by Witosławski & Bomanowska (2009) (**Tab. 1**).

Results and discussion

During this research, a total of 280 species of 182 genera and 67 families were recorded. The most abundant families were Poaceae (37 taxa, 13.21%), Compositae (29 taxa, 10.36%), Fabaceae and Rosaceae (23 taxa, 8.21% each) (**Tab. 2**). Poaceae and Compositae also were the dominant families in the "Grand Park of Tirana" in Albania (Mesiti & Dinga, 2016) and park of Lužnica manor in Croatia (Hršak et al., 2015).

Table 2. The most abundant families in the flora of Vraca Memorial Park

Family	No. of taxa	% of total park flora (280)
Poaceae	37	13.21
Compositae	29	10.36
Rosaceae	23	8.21
Fabaceae	23	8.21
Lamiaceae	14	5
Caryophyllaceae	11	3.93
Brassicaceae	10	3.57

Table 3. Number of taxa in different habitats of Vraca Memorial Park

Habitat	No. of taxa	% of total park flora (280)
Walls/pavement	174	62.14
Forest	196	70
Grassland	116	41.43

Table 4. Distribution of life forms in Vraca Memorial Park, per habitat types

Habitat	Life form									
	Ch		G		H		Ph		T	
	No.	%	No.	%	No.	%	No.	%	No.	%
Walls/pavement	10	5.75	5	2.87	78	44.83	31	17.82	47	27.01
Forest	9	4.59	15	7.65	92	46.94	42	21.43	38	19.39
Grassland	4	3.45	9	7.76	76	65.52	3	2.59	24	20.69
Entire park	15	5.36	20	7.14	130	46.43	47	16.78	68	24.28

Table 5. Alien flora of Vraca Memorial Park, per habitat types

	Alien (Total)	Naturalized	Invasive	Archaeophytes	Neophytes
Walls/pavement	17	13	10	4	13
Forest	15	7	4	7	8
Grassland	6	4	3	3	3
Entire park	24	16	11	7	17

Most taxa (196, or 70% of the total number of taxa of the park) were recorded in forested part of the Vraca Memorial Park, and the least (116, or 41.43%) in the grassland patches in the northeast (**Tab. 3**).

The analysis of life forms in the entire park showed the domination of hemicryptophytes with 130 taxa (46.43%), followed by therophytes (68 taxa, 24.28%), phanerophytes (47 taxa, 16.78%) geophytes (20 taxa, 7.14%), and chamaephytes (15 taxa, 5.36%). Hemicryptophytes also represented the major part of taxa in all three habitats of the park (44.83% in walls/pavements, 46.94% in forested part of the park and 65.52% in grassland). Therophytes were the second most numerous group in walls/pavements (27.01%) and grasslands (20.69%). The domination of therophytes and hemicryptopytes in the wall flora was also observed by Altay et al. (2010). In forested part of the park, phanerophytes were the second most numerous group (21.43%). In walls/pavement habitats, the geophytes were the least numerous group (2.87%), in grassland it was the phanerophytes (2.59%) and in forested parts of the park, chamaephytes (4.59%) (**Tab. 4**).

The alien flora of the Vraca Memorial Park consists of 24 taxa (8.57%), 7 of which (29.17%) are archaeophytes, and 17 (70.83%) neophytes. According to del Tredici (2010), the ratio of neophytes to archaeophytes rises in direct relation to the intensity of human disturbance. This is due to the fact that archaeophytes are typically associated with traditional rural environments or intermediate levels of anthropogenic activities (Preston et al., 2004), and neophytes are more common in highly disturbed anthropogenous habitats, which provide distinctive environmental conditions that favor the establishment of species from warmer and drier areas (Pyšek, 1998; Pyšek et al., 2002; Godefroid & Koedam, 2007; La Sorte et al., 2007). Of three habitats in the Vraca Memorial Park, most alien plant species were registered in cracks of walls and pavements, followed by forested parts of the park and only 6 alien species were recorded in grasslands (**Tab. 5**).

Table 6. Indicators of anthropogenic changes in the Vraca Memorial Park

Indicator (%)	Walls/ pavement	Forest	Grassland	Entire park
Iant	9.77	7.65	5.17	8.57
Ianp	8.72	6.22	5.17	7.25
Iart	2.3	3.06	2.59	2.14
Iarp	2.33	3.11	2.59	2.17
Iknt	6.32	3.06	2.59	5
Iknp	6.39	3.11	2.59	5.07
IM	73.33	50	50	70
IF	1.15	1.53	0	1.43

Indicators of anthropogenic changes values in the flora of Vraca Memorial Park are presented in **Tab. 6**.

The indicators of anthropophytization (IAnt = 8.57%; IAnp = 7.25%) showed the considerable anthropogenic influence on the total flora of Vraca Memorial Park, but were not as high as in Savica park area near Zagreb (IAnt = 28.78%; IAnp = 26.76%) calculat-

ed by Alegro et al. (2013) or Rzeszów Foothills in Poland (IAnt = 21.3%) by Jaźwa & Stadnicka-Futoma (2015). This is probably due to the fact that very small number of aliens in comparison to the native plants was registered in forested area and grassland. Higher indicator values of kenophytization (IKnt = 5%; IKnp = 5.07%) showed that the flora of the park is more influenced by neophytes than by archaeophytes (IArt = 2.14%; IArp = 2.17%). In both archaeophytes and neophytes, the values of total and permanent indicators were similar, showing that alien flora is well established, which was confirmed by the low value of the indicator of fluctuating changes (IF = 4.45%).

The forested part of the Vraca Memorial Park is characterized by numerous seedlings of shrubs and trees planted for ornamental purposes, notably *Aesculus hippocastanum* L., *Catalpa bignonioides* Walter, *Quercus rubra* L., *Parthenocissus quinquefolia* (L.) Planchon, and *Mahonia aquifolium* (Pursh.) Nutt. were observed, as well as the presence of two Orchidaceae species included in the Red List of Flora of Federation of Bosnia and Herzegovina: *Cephalanthera damasonium* (Mill.) Druce (NT) and *Cephalanthera longifolia* (L.) Fritsch (VU) (Đug et al., 2013). The flora developing in the vertical parts of walls was characterized by the presence of widespread and ruderal plants typical for rocky places and uncultivated lands, heliophilous, drought-resistant taxa with shallow root system, capable of growing on a thin soil layer. In pavements, tops and bottoms of the walls, where the soil layer is thicker, shade-tolerant species, some of which require higher humidity are developed. The same was noted by Pavlova & Tonkov (2005) and Nedelcheva (2011). Numerous seedlings of *Spiraea japonica* L. were observed in cracks of the pavement in Vraca Memorial Park. The vegetation of the park is similar to the vegetation of trampled and paved habitat types in Sarajevo, and developed partly as a result of early naturalization of planted ornamental species.

Conclusion

Current neglected state of the Vraca Memorial Park led to the development of diverse subspontaneous vegetation, similar to the vegetation of trampled and paved habitat types in Sarajevo. The field survey performed in an area of 8 km^2, in three "sub-habitat" types (walls/pavements, grassland and forest) of the Vraca Memorial Park. A total of 280 species of 182 genera and 67 families were recorded. Most taxa were recorded in forested part of the Memorial Park, and the least in the grassland patches in the northeast. The park's flora is dominated by hemicryptophytes and native plants are more numerous in relation to alien taxa, but the indicators of anthropophytization still showed the considerable anthropogenic influence on the total flora of Vraca Memorial Park. The presence of two Orchidaceae species included in the Red List of Flora of Federation of Bosnia and Herzegovina indicates the potential importance of this area for conservation of native species.

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Annex 1.

Overview of flora of Vraca Monumental Park

No.	Taxon	Walls/pavement	Grassland	Forest
1	*Acer campestre* L.	+		+
2	*Acer negundo* L.	+		
3	*Acer platanoides* L.	+		+
4	*Acer pseudoplatanus* L.	+		+
5	*Acer tataricum* L.	+		+
6	*Achillea millefolium* L.	+	+	+
7	*Aegopodium podagraria* L.			+
8	*Aesculus hippocastanum* L.	+		+
9	*Agrimonia eupatoria* L.		+	
10	*Agrostis gigantea* Roth		+	
11	*Agrostis stolonifera* L.	+	+	+
12	*Ailanthus altissima* (Mill.) Swingle	+		
13	*Ajuga genevensis* L.	+	+	+
14	*Ajuga reptans* L.	+	+	+
15	*Alliaria petiolata* (M. Bieb.) Cavara et Grande	+	+	+
16	*Allium scorodoprasum* L.			+
17	*Ambrosia artemisiifolia* L.	+		
18	*Amelanchier ovalis* Medik.	+		
19	*Anisantha sterilis* (L.) Nevski	+	+	+
20	*Anthriscus sylvestris* (L.) Hoffm.	+		+
21	*Apera spica-venti* (L.) P.Beauv.		+	+
22	*Arabis hirsuta* (L.) Scop.			+
23	*Arctium lappa* L.	+		+
24	*Arctium tomentosum* Mill.		+	
25	*Aremonia agrimonoides* (L.) DC.		+	+
26	*Arenaria serpyllifolia* L.	+		+
27	*Arrhenatherum elatius* (L.) P.Beauv. ex J.Presl et C.Presl	+	+	+
28	*Artemisia vulgaris* L.	+	+	+
29	*Arum maculatum* L.			+
30	*Asplenium ruta-muraria* L.	+		
31	*Asplenium trichomanes* L.	+		
32	*Atriplex patula* L.		+	

33	*Ballota nigra* L.	+		
34	*Barbarea vulgaris* R. Br.			+
35	*Bellis perennis* L.	+	+	+
36	*Betula pendula* Roth	+		+
37	*Brachypodium sylvaticum* (Huds.) P.Beauv.	+		+
38	*Bromopsis benekenii* (Lange) Holub			+
39	*Bromopsis erecta* (Huds.) Fourr.	+	+	
40	*Bromopsis inermis* (Leyss.) Holub			+
41	*Bromus commutatus* Schrad.	+	+	+
42	*Bromus hordeaceus* L.	+	+	+
43	*Bromus squarrosus* L.	+		
44	*Calystegia sepium* (L.) R. Br.	+	+	+
45	*Calystegia silvatica* (Kit.) Griseb.			+
46	*Campanula patula* L.	+		+
47	*Campanula rapunculus* L.			+
48	*Capsella bursa-pastoris* (L.) Medik.	+	+	+
49	*Cardamine hirsuta* L.	+		+
50	*Carex hirta* L.		+	+
51	*Carex spicata* Huds.	+		+
52	*Carex sylvatica* Huds.			+
53	*Carpinus betulus* L.			+
54	*Catalpa bignonioides* Walter	+		+
55	*Centaurea jacea* L.		+	
56	*Centaurea scabiosa* L.			+
57	*Centaurea stoebe* L.	+		
58	*Centaurium pulchellum* (Sw.) Druce	+		
59	*Cephalanthera damasonium* (Mill.) Druce			+
60	*Cephalanthera longifolia* (L.) Fritsch			+
61	*Cerastium arvense* L.			+
62	*Cerastium fontanum* Baumg.	+	+	+
63	*Cerastium glomeratum* Thuill.	+	+	+
64	*Chelidonium majus* L.	+		+
65	*Cichorium intybus* L.	+	+	+
66	*Cirsium arvense* (L.) Scop.		+	
67	*Cirsium vulgare* (Savi) Ten.	+	+	
68	*Clematis vitalba* L.	+	+	+
69	*Clinopodium acinos* (L.) Kuntze	+		+
70	*Clinopodium vulgare* L.	+	+	+
71	*Convolvulus arvensis* L.	+	+	+
72	*Cornus sanguinea* L.	+		+
73	*Corylus avellana* L.			+
74	*Cotoneaster horizontalis* Decne.	+		
75	*Crataegus monogyna* Jacq.			+
76	*Crepis biennis* L.	+		
77	*Cruciata laevipes* Opiz		+	+
78	*Cymbalaria muralis* P.Gaertn., B.Mey. et Scherb.	+		
79	*Cynosurus cristatus* L.		+	+
80	*Dactylis glomerata* L.	+	+	+
81	*Daucus carota* L.	+	+	+
82	*Dianthus barbatus* L.		+	
83	*Dioscorea communis* (L.) Caddick & Wilkin			+
84	*Diplotaxis muralis* (L.) DC	+		
85	*Dipsacus fullonum* L.	+		
86	*Dipsacus laciniatus* L.	+	+	+
87	*Echinochloa crus-galli* (L.) P.Beauv.	+		
88	*Echium vulgare* L.			+
89	*Elytrigia repens* (L.) Nevski	+	+	+
90	*Epilobium roseum* Schreber	+		
91	*Equisetum arvense* L.		+	
92	*Equisetum telmateia* Ehrh.			+
93	*Eragrostis minor* Host	+		
94	*Erigeron annuus* (L.) Pers.	+	+	+
95	*Erigeron canadensis* L.	+		
96	*Erodium cicutarium* (L.) L'. Hér.	+		+
97	*Euphorbia amygdaloides* L.		+	
98	*Euphorbia cyparissias* L.		+	+
99	*Euphorbia esula* L.			+
100	*Euphorbia helioscopia* L.	+		
101	*Euphorbia platyphyllos* L.			+
102	*Festuca heterophylla* Lam.	+		
103	*Festuca rubra* L.	+		+
104	*Festulolium loliaceum* (Huds.) P.Fourn	+		
105	*Ficaria verna* Huds.		+	
106	*Filipendula ulmaria* (L.) Maxim.			+
107	*Filipendula vulgaris* Moench		+	+
108	*Fragaria vesca* L.	+		+
109	*Fraxinus excelsior* L.	+		+
110	*Fraxinus ornus* L.	+	+	+
111	*Galium aparine* L.	+	+	+
112	*Galium mollugo* L.	+	+	+
113	*Galium verum* L.	+	+	+
114	*Geranium columbinum* L.			+
115	*Geranium molle* L.	+		+
116	*Geranium pusillum* Burm. f.	+		+
117	*Geranium robertianum* L.	+	+	+
118	*Geum urbanum* L.	+	+	+
119	*Glechoma hederacea* L.	+	+	+
120	*Hedera helix* L.	+		+
121	*Heracleum sphondylium* L.		+	+
122	*Holcus lanatus* L.	+	+	+
123	*Hordeum murinum* L.	+	+	+
124	*Hypericum perforatum* L.	+	+	+
125	*Juglans regia* L.	+		+
126	*Juncus articulatus* L.	+		
127	*Juncus bufonius* L.	+		
128	*Juncus compressus* Jacq.	+		
129	*Juncus tenuis* Willd.	+		
130	*Knautia arvensis* (L.) DC.			+
131	*Lactuca muralis* (L.) Gaertn.	+		+
132	*Lactuca serriola* L.	+		+

133	*Lamium maculatum* L.			+
134	*Lamium purpureum* L.			+
135	*Lapsana communis* L.	+		+
136	*Lathyrus latifolius* L.		+	+
137	*Lathyrus nissolia* L.	+		+
138	*Lathyrus pratensis* L.		+	
139	*Lathyrus tuberosus* L.		+	+
140	*Leontodon hispidus* L.		+	
141	*Lepidium campestre* (L.) R. Br.	+		+
142	*Lepidium draba* L.	+		
143	*Leucanthemum vulgare* Lam.	+		
144	*Ligustrum vulgare* L.			+
145	*Linaria vulgaris* Mill.	+	+	
146	*Lolium perenne* L.	+	+	+
147	*Lonicera caprifolium* L.	+		+
148	*Lonicera nitida* Wilson			+
149	*Lotus corniculatus* L.	+	+	+
150	*Lysimachia nummularia* L.		+	+
151	*Lythrum salicaria* L.	+	+	+
152	*Mahonia aquifolium* (Pursh.) Nutt.			+
153	*Malva moschata* L.			+
154	*Matricaria discoidea* DC.	+		
155	*Medicago falcata* L.	+	+	+
156	*Medicago lupulina* L.	+	+	+
157	*Medicago sativa* L.		+	+
158	*Melica ciliata* L.	+		+
159	*Melilotus albus* Medik.		+	
160	*Melilotus officinalis* (L.) Lam.		+	+
161	*Mentha longifolia* (L.) L.	+	+	+
162	*Microrrhinum minus* (L.) Fourr.	+		
163	*Myosotis arvensis* (L.) Hill	+	+	+
164	*Myosotis ramosissima* Rochel			+
165	*Myosotis sylvatica* Hoffm.			+
166	*Ochlopoa annua* (L.) H. Scholz	+	+	+
167	*Origanum vulgare* L.			+
168	*Ornithogalum pyrenaicum* L.			+
169	*Oxalis corniculata* L.	+		+
170	*Oxalis fontana* Bunge	+		
171	*Parthenocissus quinquefolia* (L.) Planchon	+		+
172	*Pastinaca sativa* L.	+		
173	*Persicaria lapathifolia* (L.) Delarbre	+		
174	*Petrorhagia saxifraga* (L.) Link	+		
175	*Phleum pratense* L.		+	
176	*Physalis alkekengi* L.	+		+
177	*Picea abies* (L.) H. Karst.			+
178	*Picris hieracioides* L.		+	+
179	*Pimpinella saxifraga* L.		+	
180	*Plantago lanceolata* L.	+	+	+
181	*Plantago major* L.	+	+	+
182	*Plantago media* L.	+	+	+
183	*Poa angustifolia* L.			+
184	*Poa bulbosa* L.		+	
185	*Poa compressa* L.	+	+	
186	*Poa nemoralis* L.	+		+
187	*Poa pratensis* L.		+	
188	*Poa trivialis* L.	+	+	+
189	*Polygonum aviculare* L.	+		
190	*Populus nigra* L.	+		
191	*Potentilla argentea* L.			+
192	*Potentilla micrantha* Ramond ex DC.			+
193	*Potentilla reptans* L.	+	+	+
194	*Primula acaulis* (L.) L.		+	
195	*Prunella vulgaris* L.	+	+	+
196	*Prunus avium* L.			+
197	*Prunus cerasifera* Ehrh.	+	+	+
198	*Prunus spinosa* L.			+
199	*Pteridium aquilinum* (L.) Kuhn			+
200	*Quercus robur* L.	+		+
201	*Quercus rubra* L.			+
202	*Ranunculus acris* L.		+	+
203	*Reseda lutea* L.	+		
204	*Rhinanthus rumelicus* Velen.			+
205	*Robinia pseudoacacia* L.	+		+
206	*Rorippa sylvestris* (L.) Besser	+		+
207	*Rosa arvensis* Huds.	+		+
208	*Rosa canina* L.	+		+
209	*Rubus caesius* L.	+		+
210	*Rubus plicatus* Weihe et Nees	+		+
211	*Rumex acetosa* L.		+	
212	*Rumex crispus* L.	+	+	+
213	*Rumex obtusifolius* L.			+
214	*Rumex patientia* L.	+	+	
215	*Rumex sanguineus* L.			+
216	*Sagina apetala* Ard.	+		
217	*Sagina procumbens* L.	+		
218	*Salix alba* L.	+		
219	*Salix caprea* L.	+		
220	*Sambucus ebulus* L.	+		+
221	*Sambucus nigra* L.	+		+
222	*Sanguisorba minor* Scop.	+	+	+
223	*Sanguisorba minor* subsp. *balearica* (Nyman) Muñoz Garm. & C. Navarro	+		
224	*Schedonorus arundinaceus* (Schreb.) Dumort.	+	+	+
225	*Schedonorus pratensis* (Huds.) P. Beauv.		+	+
226	*Sedum album* L.	+		
227	*Sedum rupestre* L.	+		
228	*Sedum sexangulare* L.	+		
229	*Senecio vulgaris* L.			+
230	*Setaria viridis* (L.) P.Beauv.	+		
231	*Silene vulgaris* (Moench) Garcke	+		
232	*Sisymbrium officinale* (L.) Scop.	+		
233	*Smyrnium perfoliatum* L.			+

234	*Solanum nigrum* L.			+
235	*Solidago gigantea* Aiton		+	+
236	*Sonchus asper* (L.) Hill		+	
237	*Sonchus oleraceus* L.	+	+	
238	*Sorbus aucuparia* L.			+
239	*Spiraea japonica* L. f.	+		
240	*Stachys sylvatica* L.			+
241	*Stellaria graminea* L.			
242	*Stellaria media* (L.) Vill.	+		
243	*Syringa vulgaris* L.			+
244	*Taraxacum* sect. *Taraxacum* F. H. Wigg.	+	+	+
245	*Taxus baccata* L.			+
246	*Teucrium chamaedrys* L.			+
247	*Thymus pulegioides* L.	+	+	+
248	*Tilia cordata* Mill.			+
249	*Tilia platyphyllos* Scop.	+		+
250	*Torilis arvensis* (Huds.) Link	+		
251	*Torilis japonica* (Houtt.) DC.	+		+
252	*Trifolium aureum* Pollich		+	+
253	*Trifolium campestre* Schreber		+	+
254	*Trifolium dubium* Sibth.			+
255	*Trifolium hybridum* L.	+		
256	*Trifolium medium* L.		+	
257	*Trifolium pratense* L.	+	+	+
258	*Trifolium repens* L.	+	+	+
259	*Tripleurospermum inodorum* (L.) Sch. Bip.	+		+
260	*Trisetum flavescens* (L.) P.Beauv.	+	+	+
261	*Tropaeolum majus* L.	+		
262	*Tussilago farfara* L.	+	+	
263	*Ulmus minor* Mill.	+		+
264	*Urtica dioica* L.	+	+	+
265	*Verbascum thapsus* L.	+		
266	*Verbena officinalis* L.	+	+	+
267	*Veronica arvensis* L.	+	+	+
268	*Veronica chamaedrys* L.		+	
269	*Veronica hederifolia* L.	+		
270	*Veronica persica* Poir.	+	+	
271	*Viburnum lantana* L.			+
272	*Viburnum opulus* L.			+
273	*Vicia cracca* L.		+	+
274	*Vicia hirsuta* (L.) Gray		+	
275	*Vicia sativa* L.		+	+
276	*Vicia tetrasperma* (L.) Schreber	+		+
277	*Vicia villosa* Roth ssp. *varia* (Host) Corb.		+	
278	*Vinca minor* L.			+
279	*Viscum album* L.			+
280	*Vulpia myuros* (L.) C.C.Gmel.	+		+