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Research on spontaneous and subspontaneous flora of Botanical Garden "Vasile Fati" Jibou

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Abstract The research presented in this paper had the purpose of inventory and knowledge of spontaneous and subspontaneous plant species of Botanical Garden "Vasile Fati" Jibou, Salaj, Romania. Following systematic investigations undertaken in the botanical garden a large number of spontaneous taxons were found from the Romanian flora (650 species of vascular plants and 20 species of moss). Also were inventoried 38 species of adventive plants, permanently established in Romania and 176 vascular plant species that have migrated from culture and multiply by themselves throughout the garden. In the garden greenhouses were found 183 subspontaneous species and weeds, both from the Romanian flora as well as tropical plants introduced by accident. Thus the total number of wild species rises to 1055, a large number compared to the occupied area. Some rare spontaneous plants and endemic to the Romanian flora (*Galium abaujense, Cephalaria radiata, Crocus banaticus*) were found. Cultivated species that once migrated from culture, accommodated to environmental conditions and conquered new territories; standing out is the *Cyrtomium falcatum* fern, once escaped from the greenhouses it continues to develop on their outer walls.

Key words

Jibou Botanical Garden, spontaneous flora, adventive and subspontaneous plants, floristic analysis, Romania

Jibou Botanical Garden is the second largest botanical garden in Romania, after "Anastasie Fătu" Botanical Garden from Iaşi, with an area of 27 ha. Due to the large size, there are still numerous areas that are not landscaped and have slightly altered former vegetation. Thus within the garden there are forests of Turkey oak (*Quercus cerris*) and European beech (*Fagus sylvatica*), scrublands, stretched mesophilic and xerophyte hayfields, calcareous rockery and smaller marshes with characteristic vegetation, but also ruderal surfaces occupied by adventive and invasive species. Knowledge and the classification of the spontaneous vegetation is thus necessary because no previous studies have been made on them.

Also because the studied area spans over an entire botanical garden it is a good opportunity to research wild exotic flora and its adaptation to local environmental conditions. Many species around the world considered today adventive and invasive have had as starting point botanical gardens, from which they escaped and subsequently dispersed in in the indigenous flora of those countries. Because of this, botanical gardens and greenhouses are an extremely interesting environment in terms of flora research, but often underappreciated [11]. In Romania the extent of such research is very low, only several studies being made on the plants escaped from the Botanical Garden in Cluj-Napoca [23, 9] and Bucharest [1].

Greenhouses are an exciting environment to study because they have different soil and climatic conditions compared to the outside, in which numerous exotic species can adapt and breed further without any care [11].

Material and Methods

The studies were conducted over the course of 17 months, between 2013 and 2014, by monitoring all periods of vegetation. The plants were observed directly in the field, and unknown species were collected and determined with the use of determinators [5, 20]. Species nomenclature is consistent with The Plant List [26] site and APG III classification system. The garden seed catalogs were analyzed for the introduction of various exotic species in culture. The „*Caracterizare ecologică şi fitocenologică a speciilor spontane din flora României"* [18] advisor was used for the analysis of bioforms, geo-elements and the ecology of native species.

The Botanical Garden is part of the Biological Research Institute from Jibou and was founded in 1968 on the initiative of Professor Vasile Fati. It spans over the park area of the medieval castle, former residence of Wesselényi family. Over the years the Botanical Garden area increased considerably, reaching 27 ha; located at an altitude of approximately 272 m it has avaried topography with relatively few flat surfaces. Pedo-climatic and floristic studies of the area were carried out during 1959-1968 by leading botanists from Romania [7, 19]. The geographical coordinates of the garden are 47º 16' N and 23º 15' E longitude [27].

Results and Discussions

Throughout the garden area there were recorded a number of 1055 spontaneous and subspontaneous plants, from 113 families of vascular plants and 12 families of moss; extremely high numbers for only 27 ha. Among these,650 plants are from Romanian flora and 20 species of moss. Table 1. records 638 species that are from the external sector. In the microproduction greenhouses were recorded other native species that are not found outside the greenhouse, such as *Centaurium pulchellum, Gnaphalium uliginosum, Laphangium luteoalbum, Cystopteris fragilis, Calluna vulgaris*, which probably arrived here from the soil brought from neighboring areas of the city. A number of 38 representatives from adventitious species are found permanently established in the Romanian flora (Table 2.). Among these there are some rare species such as *Helminthotheca echioides*. The number of exotic species escaped from culture in the outer sectors is also high - 176 species, and in the greenhouses 183 species escaped from previous cultures or accidentally introduced from the native or tropical wild flora, (Table 3. and 4.). The external sectors have a total of 852 superior taxas, indigenous or escaped from cultures wild plants, which multiply by themselves and find good conditions to adapt.

The largest families with over 20 representatives are: *Asteraceae* (100 species), *Poaceae* (68), *Rosaceae* (66), *Fabaceae* (45), *Lamiaceae* (45), *Brassicaceae* (36), *Caryophyllaceae* (30), *Apiaceae* (28), *Plantaginaceae* (28), *Cyperaceae* (26), *Polygonaceae* (21), and *Ranunculaceae* (21 species). The genus with the most species are: *Carex* (19 species), *Veronica* (16), *Euphorbia* (14), *Rubus* (12), *Potentilla* (10), and *Rumex* (10 species).

Spontaneous flora

The conducted studies took place in all sectors of the botanical garden, external and in the greenhouses. Spontaneous species in the botanical garden are listed in Table 1. Most spontaneous species were recorded in large sectors or still partly landscaped sectors such as "Romanian Flora", "Vine Valley", "Arboretum", "Systematic", "Zoologic", "Phytogeographic", and "Economy". In areas with native vegetation dominates the following species:

– the European beech forest (*Fagus sylvatica)* from the "Vine Valley" represents a forest with archaic vegetation, atypical species for the surrounding hills, rather reminiscent to the low mountain areas. Among the most interesting species there are: *Aposeris foetida, Ranunculus lanuginosus, Cerastium sylvaticum, Carex pendula, Atropa belladonna, Rubus idaeus, Cardamine glanduligera, Staphylea pinnata, Digitalis grandiflora, Doronicum columnae, Erythronium dens-canis, Hedera helix, Equisetum telmateia, Aethusa cynapium, Lathraea squamaria, Chrysosplenium alternifolium, Crocus banaticus, Dryopteris carthusiana, Dryopteris affinis, Hepatica nobilis, Impatiens noli-tangere, Mercurialis perennis, Sanicula europaea, Scilla kladnii, Stachys alpina.*

– The Turkey oak forest from "Romanian Flora" and "Zoologic" sector shide precious specimens of old trees such as: *Quercus robur, Sorbus torminalis, Fraxinus excelsior.*Some remarkable species are: *Galium abaujense, Cephalanthera damasonium, Silene viscaria, Melittis mellisophyllum, Berberis vulgaris, Crataegus rhipidophylla, Hypericum hirsutum, Malus sylvestris, Trifolium medium* subsp. *banaticum, Vicia cassubica.*

– Limestone rockery from the south-west area preserves species such as: *Linum flavum, Linum tenuifolium, Rhamnus saxatilis* subsp. *tinctorius, Galium glaucum, Inula ensifolia, Anthericum ramosum, Campanula sibirica, Chamaecytisus albus, Inula conyza, Trifolium rubens, Cerinthe minor, Cephalaria radiata.*

– Main hayfields are dominated by*Arrhenatherum elatius* and *Bromus erectus.*Among the interesting plants are: *Polygala major, Aster amellus, Ornithogalum pyramidale, Centaurea oxylepis, Carex humilis, Colchicum autumnale, Cruciata pedemontana, Dianthus giganteiformis* subsp. *pontederae, Helictotrichon pubescens, Knautia arvensis* subsp. *rosea, Lithospermum officinale, Melampyrum arvense, Onobrychis arenaria, Peucedanum carvifolia, Rosa gallica, Trisetum flavescens.*

– Grasslands and ruderal areas also include interesting species: *Crepis nicaeensis, Helminthotheca echioides, Brassica nigra, Chenopodium glaucum, Kickxia elatine, Kickxia spuria, Verbascum thapsus, Veronica dillenii.*

– Among wetlands and ponds of water the following species are found: *Veronica anagalloides, Alisma lanceolatum, Ranunculus sceleratus, Potamogeton crispus, Plantago uliginosa, Rumex hydrolapathum, Rumex maritimus.*

As seen in Tabel 1., the indigenous flora includes 638 species of vascular plants in the sectors of the botanical garden, and 12 indigenous spontaneous species inside the greenhouses (Table 4.); these species were not observed in the exterior gardens. Among the most important species stand out the ones from The Red List or Natura 2000 (*Rumex thyrsiflorus, Cephalaria radiata*), as well as other rare plants from the Romanian flora (*Cephalanthera damasonium, Galium abaujense, Hieracium maculatum, Leontodon saxatilis, Mentha arvensis* subsp. *austriaca*) [5, 8, 17, 25].

Also found are species endemic in Transylvania (*Cephalaria radiata*) or Carpathian endemic (*Cardamine glanduligera, Crocus banaticus*) [12, 20].Worth mentioning are old trees with important populations of *Loranthus europaeus* and *Viscum album*, which settle even on exotic trees.

Table 1

Spontaneous flora species from Romania found in Jibou Botanical Garden

No.	Species	Family	No.	Species	Family
1.	*Acer campestre* L.	Sapindaceae	320.	*Lathyrus niger* (L.) Bernh.	Fabaceae
2.	*Acer platanoides* L.	Sapindaceae	321.	*Lathyrus pratensis* L.	Fabaceae
3.	*Acer pseudoplatanus* L.	Sapindaceae	322.	*Lathyrus sylvestris* L.	Fabaceae
4.	*Acer tataricum*L.	Sapindaceae	323.	*Lathyrus tuberosus* L.	Fabaceae
5.	*Achillea collina* (Becker ex Rchb.f.) Heimerl	Asteraceae	324.	*Lathyrus vernus* (L.) Bernh.	Fabaceae
6.	*Achillea millefolium* L.	Asteraceae	325.	*Lavatera thuringiaca* L.	Malvaceae
7.	*Achillea nobilis* subsp. *neilreichii* (A.Kern.) Velen.	Asteraceae	326.	*Leersia oryzoides* (L.) Sw.	Poaceae
8.	*Achillea setacea*Waldst. & Kit.	Asteraceae	327.	*Lembotropis nigricans* (L.) Griseb.	Fabaceae
9.	*Aegopodium podagraria* L.	Apiaceae	328.	*Lemna minor* L.	Araceae
10.	*Aethusa cynapium* L.	Apiaceae	329.	*Leontodon crispus* DC. ex Nyman	Asteraceae
11.	*Agrimonia eupatoria* L.	Rosaceae	330.	*Leontodon hispidus* L.	Asteraceae
12.	*Agrostis canina* L.	Poaceae	331.	*Leontodon saxatilis* Lam.	Asteraceae
13.	*Agrostis capillaris* L.	Poaceae	332.	*Leonurus cardiaca* L.	Lamiaceae
14.	*Agrostis gigantea* Roth	Poaceae	333.	*Leopoldia comosa* (L.) Parl.	Asparagaceae
15.	*Agrostis stolonifera* L.	Poaceae	334.	*Lepidium campestre* (L.) R.Br.	Brassicaceae
16.	*Ajuga genevensis* L.	Lamiaceae	335.	*Lepidium draba* L.	Brassicaceae
17.	*Ajuga reptans* L.	Lamiaceae	336.	*Leucanthemum vulgare* (Vaill.) Lam.	Asteraceae
18.	*Alisma lanceolatum* With.	Alismataceae	337.	*Ligustrum vulgare* L.	Oleaceae
19.	*Alisma plantago-aquatica* L.	Alismataceae	338.	*Linaria vulgaris* Mill.	Plantaginaceae
20.	*Alliaria petiolata* (M.Bieb.) Cavara & Grande	Brassicaceae	339.	*Linum catharticum* L.	Linaceae
21.	*Allium oleraceum* L.	Amaryllidaceae	340.	*Linum flavum* L.	Linaceae
22.	*Allium scorodoprasum* L.	Amaryllidaceae	341.	*Linum tenuifolium* L.	Linaceae
23.	*Allium vineale* L.	Amaryllidaceae	342.	*Lithospermum officinale* L.	Boraginaceae
24.	*Alopecurus aequalis* Sobol.	Poaceae	343.	*Lolium perenne* L.	Poaceae
25.	*Alopecurus pratensis* L.	Poaceae	344.	*Loranthus europaeus* Jacq.	Loranthaceae
26.	*Anagallis arvensis* L.	Primulaceae	345.	*Lotus corniculatus* L.	Fabaceae
27.	*Anchusa officinalis* L.	Boraginaceae	346.	*Luzula campestris* (L.) DC.	Juncaceae
28.	*Anemo nenemorosa* L.	Ranunculaceae	347.	*Luzula luzuloides* (Lam.) Dandy & Wilmott	Juncaceae
29.	*Anemone ranunculoides* L.	Ranunculaceae	348.	*Luzula pilosa* (L.) Willd.	Juncaceae
30.	*Angelica sylvestris* L.	Apiaceae	349.	*Lycopus europaeus* L.	Lamiaceae
31.	*Anthemis arvensis* L.	Asteraceae	350.	*Lysimachia nummularia* L.	Primulaceae
32.	*Anthericum ramosum* L.	Asparagaceae	351.	*Lysimachia vulgaris* L.	Primulaceae
33.	*Anthoxanthum odoratum* L.	Poaceae	352.	*Lythrum salicaria* L.	Lythraceae
34.	*Anthriscus sylvestris* (L.) Hoffm.	Apiaceae	353.	*Malus sylvestris* (L.) Mill	Rosaceae
35.	*Aposeris foetida* (L.) Cass. ex Less.	Asteraceae	354.	*Malva neglecta* Wallr.	Malvaceae
36.	*Arabidopsis arenosa* (L.) Lawalrée	Brassicaceae	355.	*Malva sylvestris* L.	Malvaceae
37.	*Arabidopsis thaliana* (L.) Heynh.	Brassicaceae	356.	*Matricaria chamomilla* L.	Asteraceae
38.	*Arabis hirsuta* (L.) Scop.	Brassicaceae	357.	*Medicago falcata* L.	Fabaceae
39.	*Arctium lappa* L.	Asteraceae	358.	*Medicago lupulina* L.	Fabaceae
40.	*Arctium minus* (Hill) Bernh.	Asteraceae	359.	*Medicago sativa* subsp. *varia* (Martyn) Arcang.	Fabaceae
41.	*Arctium tomentosum* Mill.	Asteraceae	360.	*Melampyrum arvense* L.	Orobanchaceae
42.	*Arenaria serpyllifolia* L.	Caryophyllaceae	361.	*Melampyrum bihariense* A. Kern.	Orobanchaceae
43.	*Aristolochia clematitis* L.	Aristolochiaceae	362.	*Melica nutans* L.	Poaceae
44.	*Arrhenatherum elatius* (L.) P.Beauv. ex J.Presl & C.Presl.	Poaceae	363.	*Melica uniflora* Retz.	Poaceae
45.	*Artemisia absinthium* L.	Asteraceae	364.	*Melilotus albus* Medik.	Fabaceae
46.	*Artemisia vulgaris* L.	Asteraceae	365.	*Melilotus officinalis* (L.) Pall.	Fabaceae
47.	*Asarum europaeum* L.	Aristolochiaceae	366.	*Melittis melissophyllum* L.	Lamiaceae
48.	*Asparagus officinalis* L.	Asparagaceae	367.	*Mentha arvensis* L.	Lamiaceae
49.	*Asperula cynanchica* L.	Rubiaceae	368.	*Mentha arvensis* subsp. *austriaca* (Jacq.) Briq.	Lamiaceae
50.	*Aster amellus* L.	Asteraceae	369.	*Mentha longifolia* (L.) L.	Lamiaceae
51.	*Astragalus cicer* L.	Fabaceae	370.	*Mentha pulegium* L.	Lamiaceae
52.	*Astragalus glycyphyllos* L.	Fabaceae	371.	*Mercurialis perennis* L.	Euphorbiaceae
53.	*Athyrium filix-femina* (L.) Roth	Athyriaceae	372.	*Milium effusum* L.	Poaceae
54.	*Atriplex patula* L.	Amaranthaceae	373.	*Moehringia trinervia* (L.) Clairv.	Caryophyllaceae
55.	*Atriplex prostrata* Boucher ex DC.	Amaranthaceae	374.	*Mycelis muralis* (L.) Dumort.	Asteraceae
56.	*Atropa belladonna* L.	Solanaceae	375.	*Myosotis arvensis* (L.) Hill	Boraginaceae
57.	*Ballota nigra* L.	Lamiaceae	376.	*Myosotis ramosissima* Rochel	Boraginaceae
58.	*Barbarea vulgaris* R.Br.	Brassicaceae	377.	*Myosotis sparsiflora* J.C.Mikan ex Pohl	Boraginaceae
59.	*Bellis perennis* L.	Asteraceae	378.	*Oenanthe silaifolia* M.Bieb.	Apiaceae
60.	*Berberis vulgaris* L.	Berberidaceae	379.	*Onobrychis arenaria* (Kit.) DC.	Fabaceae
61.	*Berteroa incana* (L.) DC.	Brassicaceae	380.	*Onopordum acanthium* L.	Asteraceae
62.	*Bidens tripartita* L.	Asteraceae	381.	*Origanum vulgare* L.	Lamiaceae
63.	*Bothriochloa ischaemum* (L.) Keng	Poaceae	382.	*Ornithogalum pyramidale* L.	Asparagaceae
64.	*Brachypodium pinnatum* (L.) P.Beauv.	Poaceae	383.	*Oxalis acetosella* L.	Oxalidaceae

65.	*Brachypodium sylvaticum* (Huds.) P.Beauv.	Poaceae	384.	*Papaver rhoeas* L.	Papaveraceae
66.	*Brassica nigra* (L.) K.Koch	Brassicaceae	385.	*Paris quadrifolia* L.	Melanthiaceae
67.	*Brassica rapa* subsp. *campestris* (L.) A.R.Clapham	Brassicaceae	386.	*Pastinaca sativa* L.	Apiaceae
68.	*Briza media* L.	Poaceae	387.	*Persicaria amphibia* var. *terrestris* (Leyss.) Munshi & Javeid	Polygonaceae
69.	*Bromus arvensis* L.	Poaceae	388.	*Persicaria hydropiper* (L.) Delarbre	Polygonaceae
70.	*Bromus commutatus* Schrad.	Poaceae	389.	*Persicaria lapathifolia* (L.) Delarbre	Polygonaceae
71.	*Bromus erectus* Huds.	Poaceae	390.	*Persicaria maculosa* Gray	Polygonaceae
72.	*Bromus hordeaceus* L.	Poaceae	391.	*Persicaria minor* (Huds.) Opiz	Polygonaceae
73.	*Bromus inermis* Leyss.	Poaceae	392.	*Persicaria mitis* (Schrank) Holub	Polygonaceae
74.	*Bromus japonicus* Thunb.	Poaceae	393.	*Peucedanum carvifolia* Vill.	Apiaceae
75.	*Bromus sterilis* L.	Poaceae	394.	*Peucedanum cervaria* (L.) Cusson ex Lapeyr.	Apiaceae
76.	*Bromus tectorum* L.	Poaceae	395.	*Phalaris arundinacea* L.	Poaceae
77.	*Bryonia alba* L.	Cucurbitaceae	396.	*Phleum phleoides* (L.) H.Karst.	Poaceae
78.	*Buglossoides purpurocaerulea* (L.) I.M.Johnst.	Boraginaceae	397.	*Phleum pratense* L.	Poaceae
79.	*Calamagrostis epigejos* (L.) Roth	Poaceae	398.	*Phragmites australis* (Cav.) Trin. ex Steud.	Poaceae
80.	*Calystegia sepium* (L.) R. Br.	Convolvulaceae	399.	*Picris hieracioides* Sibth. & Sm.	Asteraceae
81.	*Campanula bononiensis* L.	Campanulaceae	400.	*Picris hieracioides* subsp. *spinulosa* (Guss.) Arcang.	Asteraceae
82.	*Campanula glomerata* L.	Campanulaceae	401.	*Pilosella officinarum* Vaill.	Asteraceae
83.	*Campanula patula* L.	Campanulaceae	402.	*Pilosella piloselloides* (Vill.) Soják	Asteraceae
84.	*Campanula persicifolia* L.	Campanulaceae	403.	*Pilosella piloselloides* subsp. *bauhinii* (Schult.) S.Bräut. & Greuter	Asteraceae
85.	*Campanula rapunculoides* L.	Campanulaceae	404.	*Pimpinella saxifraga* L.	Apiaceae
86.	*Campanula sibirica* L.	Campanulaceae	405.	*Plantago lanceolata* L.	Plantaginaceae
87.	*Campanula trachelium* L.	Campanulaceae	406.	*Plantago major* L.	Plantaginaceae
88.	*Capsella bursa-pastoris* (L.) Medik.	Brassicaceae	407.	*Plantago media* L.	Plantaginaceae
89.	*Cardamine bulbifera* (L.) Crantz	Brassicaceae	408.	*Plantago uliginosa* F.W.Schmidt	Plantaginaceae
90.	*Cardamine glanduligera* O.Schwarz	Brassicaceae	409.	*Poa annua* L.	Poaceae
91.	*Cardamine hirsuta* L.	Brassicaceae	410.	*Poa bulbosa* L.	Poaceae
92.	*Cardamine impatiens* L.	Brassicaceae	411.	*Poa compressa* L.	Poaceae
93.	*Carduus acanthoides* L.	Asteraceae	412.	*Poa nemoralis* L.	Poaceae
94.	*Carduus crispus* Guirão ex Nyman	Asteraceae	413.	*Poa pratensis* L.	Poaceae
95.	*Carex caryophyllea* Latourr.	Cyperaceae	414.	*Poa trivialis* L.	Poaceae
96.	*Carex digitata* L.	Cyperaceae	415.	*Polygala major* Jacq.	Polygalaceae
97.	*Carex divulsa* Stokes	Cyperaceae	416.	*Polygonatum hirtum* (Bosc ex Poir.) Pursh	Asparagaceae
98.	*Carex hirta* L.	Cyperaceae	417.	*Polygonatum multiflorum* (L.) All.	Asparagaceae
99.	*Carex humilis* Leyss.	Cyperaceae	418.	*Polygonatum odoratum* (Mill.) Druce	Asparagaceae
100.	*Carex leporina* L.	Cyperaceae	419.	*Polygonum aviculare* L.	Polygonaceae
101.	*Carex michelii* Host	Cyperaceae	420.	*Populus alba* L.	Salicaceae
102.	*Carex montana* L.	Cyperaceae	421.	*Populus* × *canescens* (Aiton) Sm.	Salicaceae
103.	*Carex otrubae* Podp.	Cyperaceae	422.	*Populus nigra* L.	Salicaceae
104.	*Carex pairae* F.W.Schultz	Cyperaceae	423.	*Populus tremula* L.	Salicaceae
105.	*Carex pallescens* L.	Cyperaceae	424.	*Portulaca oleracea* L.	Portulacaceae
106.	*Carex pendula* Huds.	Cyperaceae	425.	*Potamogeton crispus* L.	Potamogetonaceae
107.	*Carex pilosa* Scop.	Cyperaceae	426.	*Potentilla anserina* L.	Rosaceae
108.	*Carex praecox* Schreb.	Cyperaceae	427.	*Potentilla argentea* L.	Rosaceae
109.	*Carex remota* L.	Cyperaceae	428.	*Potentilla argentea* subsp. *impolita* (Wahlenb.) Arcang.	Rosaceae
110.	*Carex spicata* Huds.	Cyperaceae	429.	*Potentilla chrysantha* (Zoll. & Moritzi) Trevir.	Rosaceae
111.	*Carex sylvatica* Huds.	Cyperaceae	430.	*Potentilla heptaphylla* L.	Rosaceae
112.	*Carex tomentosa* L.	Cyperaceae	431.	*Potentilla incana* P.Gaertn., B.Mey. & Scherb.	Rosaceae
113.	*Carlina biebersteini i*subsp. *brevibracteata* (Andrae) K.Werner	Asteraceae	432.	*Potentilla recta* L.	Rosaceae
114.	*Carlina vulgaris* L.	Asteraceae	433.	*Potentilla reptans* L.	Rosaceae
115.	*Carpinus betulus* L.	Betulaceae	434.	*Potentilla supina* L.	Rosaceae
116.	*Centaurea jacea* L.	Asteraceae	435.	*Potentilla thuringiaca* Bernh.	Rosaceae
117.	*Centaurea micranthos* (Griseb.) S.G.Gmel. ex Hayek	Asteraceae	436.	*Primula veris* L.	Primulaceae
118.	*Centaurea oxylepis* (Wimm. & Grab.) Hayek	Asteraceae	437.	*Primula vulgaris* Huds.	Primulaceae
119.	*Centaurea pannonica* (Heuff.) Hayek	Asteraceae	438.	*Prunella laciniata* (L.) L.	Lamiaceae
120.	*Centaurea phrygia* subsp.*indurata* (Janka) Stoj. & Acht.	Asteraceae	439.	*Prunella vulgaris* L.	Lamiaceae
121.	*Centaurea scabiosa* L.	Asteraceae	440.	*Prunus avium* (L.) L.	Rosaceae
122.	*Centaurium erythraea* Rafn	Gentianaceae	441.	*Prunus spinosa* L.	Rosaceae
123.	*Cephalanthera damasonium* (Mill.) Druce	Orchidaceae	442.	*Pulmonaria obscura* Dumort.	Boraginaceae
124.	*Cephalaria radiata* Griseb. & Sohenk	Caprifoliaceae	443.	*Pulmonaria officinalis* L.	Boraginaceae
125.	*Cerastium brachypetalum* Desp. ex Pers.	Caryophyllaceae	444.	*Pyrus pyraster* (L.) Burgsd.	Rosaceae
126.	*Cerastium fontanum* subsp.*vulgare* (Hartm.) Greuter & Burdet	Caryophyllaceae	445.	*Quercus cerris* L.	Fagaceae

127.	*Cerastium glomeratum* Thuill.	Caryophyllaceae	446.	*Quercus dalechampii* Ten.	Fagaceae
128.	*Cerastium semidecandrum* L.	Caryophyllaceae	447.	*Quercus petraea* (Matt.) Liebl.	Fagaceae
129.	*Cerastium sylvaticum* Waldst. & Kit.	Caryophyllaceae	448.	*Quercus robur* L.	Fagaceae
130.	*Ceratophyllum demersum* L.	Ceratophyllaceae	449.	*Ranunculus acris* L.	Ranunculaceae
131.	*Cerinthe minor* L.	Boraginaceae	450.	*Ranunculus acris* subsp. *strigulosus* Hyl.	Ranunculaceae
132.	*Chaerophyllum aromaticum* L.	Apiaceae	451.	*Ranunculus auricomus* L.	Ranunculaceae
133.	*Chaerophyllum bulbosum* L.	Apiaceae	452.	*Ranunculus bulbosus* L.	Ranunculaceae
134.	*Chaerophyllum temulum* L.	Apiaceae	453.	*Ranunculus lanuginosus* L.	Ranunculaceae
135.	*Chamaecytisus albus* Rothm.	Fabaceae	454.	*Ranunculus polyanthemos* subsp. *polyanthomoides* Ahlfv.	Ranunculaceae
136.	*Chelidonium majus* L.	Papaveraceae	455.	*Ranunculus repens* L.	Ranunculaceae
137.	*Chenopodium album* L.	Amaranthaceae	456.	*Ranunculus sardous* Crantz	Ranunculaceae
138.	*Chenopodium glaucum* L.	Amaranthaceae	457.	*Ranunculus sceleratus* L.	Ranunculaceae
139.	*Chenopodium hybridum* L.	Amaranthaceae	458.	*Reseda lutea* L.	Resedaceae
140.	*Chenopodium polyspermum* L.	Amaranthaceae	459.	*Rhamnus cathartica* L.	Rhamnaceae
141.	*Chenopodium strictum* Roth	Amaranthaceae	460.	*Rhamnus saxatilis* subsp. *tinctoria* Nyman	Rhamnaceae
142.	*Chrysosplenium alternifolium* L.	Saxifragaceae	461.	*Rhinanthus rumelicus* Velen.	Orobanchaceae
143.	*Cichorium intybus* L.	Asteraceae	462.	*Rorippa austriaca* (Crantz) Spach	Brassicaceae
144.	*Circaea lutetiana* L.	Onagraceae	463.	*Rorippa sylvestris* (L.) Besser	Brassicaceae
145.	*Cirsium arvense* (L.) Scop.	Asteraceae	464.	*Rosa canina* L.	Rosaceae
146.	*Cirsium vulgare* (Savi) Ten.	Asteraceae	465.	*Rosa corymbifera* Borkh.	Rosaceae
147.	*Clematis vitalba* L.	Ranunculaceae	466.	*Rosa dumalis* Bechst.	Rosaceae
148.	*Clinopodium acinos* (L.) Kuntze	Lamiaceae	467.	*Rosa gallica* L.	Rosaceae
149.	*Clinopodium menthifolium* (Host) Stace	Lamiaceae	468.	*Rosa rubiginosa* L.	Rosaceae
150.	*Clinopodium vulgare* L.	Lamiaceae	469.	*Rosa squarrosa* (A.Rau) Boreau	Rosaceae
151.	*Colchicum autumnale* L.	Colchicaceae	470.	*Rosa subcanina* (H.Christ) Vuk.	Rosaceae
152.	*Conium maculatum* L.	Apiaceae	471.	*Rubus caesius* L.	Rosaceae
153.	*Consolida regalis* Gray	Ranunculaceae	472.	*Rubus candicans* Weihe ex Rchb.	Rosaceae
154.	*Convolvulus arvensis* L.	Convolvulaceae	473.	*Rubus canescens* DC.	Rosaceae
155.	*Cornus mas* L.	Cornaceae	474.	*Rubus grabowskii* Weihe ex Günther, Grab. & Wimm.	Rosaceae
156.	*Cornus sanguinea* L.	Cornaceae	475.	*Rubus hirtus* Waldst. & Kit.	Rosaceae
157.	*Corydalis cava* (L.) Schweigg. & Körte	Papaveraceae	476.	*Rubus idaeus* L.	Rosaceae
158.	*Corydalis solida* (L.) Clairv.	Papaveraceae	477.	*Rubus montanus* Lib. ex Lej.	Rosaceae
159.	*Corylus avellana* L.	Betulaceae	478.	*Rubus plicatus* Weihe & Nees	Rosaceae
160.	*Cota tinctoria* (L.) J.Gay	Asteraceae	479.	*Rubus praecox* Bertol.	Rosaceae
161.	*Crataegus laevigata* (Poir.) DC.	Rosaceae	480.	*Rubus serpens* Weihe ex Lej. & Courtois	Rosaceae
162.	*Crataegus monogyna* Jacq.	Rosaceae	481.	*Rubus sulcatus* Vest	Rosaceae
163.	*Crataegus rhipidophylla* Gand.	Rosaceae	482.	*Rumex acetosa* L.	Polygonaceae
164.	*Crepis biennis* Lapeyr.	Asteraceae	483.	*Rumex acetosella* L.	Polygonaceae
165.	*Crepis foetida* subsp. *rhoeadifolia* (M.Bieb.) Čelak.	Asteraceae	484.	*Rumex conglomeratus* Murray	Polygonaceae
166.	*Crepis nicaeensis* Balb. ex Pers.	Asteraceae	485.	*Rumex crispus* L.	Polygonaceae
167.	*Crepis setosa* Haller f.	Asteraceae	486.	*Rumex hydrolapathum* Huds.	Polygonaceae
168.	*Crepis tectorum* L.	Asteraceae	487.	*Rumex maritimus* L.	Polygonaceae
169.	*Crocus banaticus* J.Gay	Iridaceae	488.	*Rumex obtusifolius* L.	Polygonaceae
170.	*Cruciata glabra* (L.) Opiz	Rubiaceae	489.	*Rumex patientia* L.	Polygonaceae
171.	*Cruciata laevipes* Opiz	Rubiaceae	490.	*Rumex sanguineus* L.	Polygonaceae
172.	*Cruciata pedemontana* (Bellardi) Ehrend.	Rubiaceae	491.	*Rumex thyrsiflorus* Fingerh.	Polygonaceae
173.	*Cuscuta epithymum* (L.) L.	Convolvulaceae	492.	*Sagina procumbens* L.	Caryophyllaceae
174.	*Cuscuta epithymum* subsp. *trifolii* (Bab.) Berher	Convolvulaceae	493.	*Salix alba* L.	Salicaceae
175.	*Cynodon dactylon* (L.) Pers.	Poaceae	494.	*Salix caprea* L.	Salicaceae
176.	*Cynoglossum officinale* L.	Boraginaceae	495.	*Salix cinerea* L.	Salicaceae
177.	*Cyperus fuscus* L.	Cyperaceae	496.	*Salix fragilis* L.	Salicaceae
178.	*Dactylis glomerata* L.	Poaceae	497.	*Salix purpurea* L.	Salicaceae
179.	*Dactylis polygama* Horv.	Poaceae	498.	*Salix triandra* L.	Salicaceae
180.	*Daucus carota* L.	Apiaceae	499.	*Salix* × *rubens* Schrank	Salicaceae
181.	*Descurainia sophia* (L.) Webb ex Prantl	Brassicaceae	500.	*Salvia glutinosa* L.	Lamiaceae
182.	*Dianthus armeria* L.	Caryophyllaceae	501.	*Salvia nemorosa* L.	Lamiaceae
183.	*Dianthus carthusianorum* L.	Caryophyllaceae	502.	*Salvia pratensis* L.	Lamiaceae
184.	*Dianthus giganteiformis* subsp. *pontederae* (A.Kern.) Soó	Caryophyllaceae	503.	*Salvia verticillata* L.	Lamiaceae
185.	*Digitalis grandiflora* Mill.	Plantaginaceae	504.	*Sambucus ebulus* L.	Adoxaceae
186.	*Digitaria ischaemum* (Schreb.) Muhl.	Poaceae	505.	*Sambucus nigra* L.	Adoxaceae
187.	*Digitaria sanguinalis* (L.) Scop.	Poaceae	506.	*Sanguisorba minor* Scop.	Rosaceae
188.	*Dipsacus fullonum* L.	Caprifoliaceae	507.	*Sanicula europaea* L.	Apiaceae
189.	*Dipsacus laciniatus* L.	Caprifoliaceae	508.	*Saponaria officinalis* L.	Caryophyllaceae
190.	*Doronicum columnae* Ten.	Asteraceae	509.	*Scabiosa ochroleuca* L.	Caprifoliaceae
191.	*Dorycnium herbaceum* Villar	Fabaceae	510.	*Sclerochloa dura* (L.) P.Beauv.	Poaceae
192.	*Dryopteris affinis* Fraser-Jenk.	Dryopteridaceae	511.	*Scilla kladnii* Schur	Asparagaceae

193.	*Dryopteris carthusiana* (Vill.) H.P. Fuchs	Dryopteridaceae	512.	*Scirpus sylvaticus* L.	Cyperaceae
194.	*Dryopteris filix-mas* (L.) Schott	Dryopteridaceae	513.	*Scorzoneroides autumnalis* (L.) Moench	Asteraceae
195.	*Echinochloa crus-galli* (L.) P.Beauv.	Poaceae	514.	*Scrophularia nodosa* L.	Scrophulariaceae
196.	*Echium vulgare* L.	Boraginaceae	515.	*Scrophularia scopolii* Hoppe ex Pers.	Scrophulariaceae
197.	*Elymus caninus* (L.) L.	Poaceae	516.	*Scrophularia umbrosa* Dumort.	Scrophulariaceae
198.	*Elymus hispidus* (Opiz) Melderis	Poaceae	517.	*Securigera varia* (L.) Lassen	Fabaceae
199.	*Elymus repens* (L.) Gould	Poaceae	518.	*Sedum acre* L.	Crassulaceae
200.	*Epilobium angustifolium* L.	Onagraceae	519.	*Sedum sexangulare* L.	Crassulaceae
201.	*Epilobium hirsutum* L.	Onagraceae	520.	*Senecio vulgaris* L.	Asteraceae
202.	*Epilobium montanum* L.	Onagraceae	521.	*Seseli annuum* L.	Apiaceae
203.	*Epilobium parviflorum* Schreb.	Onagraceae	522.	*Setaria pumila* (Poir.) Roem. & Schult.	Poaceae
204.	*Epilobium tetragonum* L.	Onagraceae	523.	*Setaria verticillata* (L.) P.Beauv.	Poaceae
205.	*Epilobium tetragonum* subsp. *lamyi* (F.W.Schultz) Nyman	Onagraceae	524.	*Setaria viridis* (L.) P.Beauv.	Poaceae
206.	*Equisetum arvense* L.	Equisetaceae	525.	*Silene baccifera* (L.) Roth	Caryophyllaceae
207.	*Equisetum telmateia* Ehrh.	Equisetaceae	526.	*Silene flos-cuculi* (L.) Greuter & Burdet	Caryophyllaceae
208.	*Eragrostis minor* Host	Poaceae	527.	*Silene italica* subsp. *nemoralis* (Waldst. & Kit.) Nyman	Caryophyllaceae
209.	*Eragrostis pilosa* (L.) P.Beauv.	Poaceae	528.	*Silene latifolia* subsp. *alba* (Mill.) Greuter & Burdet	Caryophyllaceae
210.	*Erodium cicutarium* (L.) L'Hér.	Geraniaceae	529.	*Silene noctiflora* L.	Caryophyllaceae
211.	*Erophila verna* (L.) DC.	Brassicaceae	530.	*Silene nutans* L.	Caryophyllaceae
212.	*Eryngium campestre* L.	Apiaceae	531.	*Silene viscaria* (L.) Jess.	Caryophyllaceae
213.	*Eryngium planum* L.	Apiaceae	532.	*Silene vulgaris* (Moench) Garcke	Caryophyllaceae
214.	*Erythronium dens-canis* L.	Liliaceae	533.	*Sinapis arvensis* L.	Brassicaceae
215.	*Euonymus europaeus* L.	Celastraceae	534.	*Sisymbrium officinale* (L.) Scop.	Brassicaceae
216.	*Eupatorium cannabinum* L.	Asteraceae	535.	*Solanum dulcamara* L.	Solanaceae
217.	*Euphorbia amygdaloides* L.	Euphorbiaceae	536.	*Solanum nigrum* L.	Solanaceae
218.	*Euphorbia cyparissias* L.	Euphorbiaceae	537.	*Solidago virgaurea* L.	Asteraceae
219.	*Euphorbia esula* L.	Euphorbiaceae	538.	*Sonchus arvensis* L.	Asteraceae
220.	*Euphorbia helioscopia* L.	Euphorbiaceae	539.	*Sonchus asper* (L.) Hill	Asteraceae
221.	*Euphorbia palustris* L.	Euphorbiaceae	540.	*Sonchus oleraceus* (L.) L.	Asteraceae
222.	*Euphorbia platyphyllos* L.	Euphorbiaceae	541.	*Sorbus torminalis* (L.) Crantz	Rosaceae
223.	*Euphorbia salicifolia* Host	Euphorbiaceae	542.	*Sorghum halepense* (L.) Pers.	Poaceae
224.	*Euphorbia stricta* L.	Euphorbiaceae	543.	*Stachys alpina* L.	Lamiaceae
225.	*Euphorbia virgata* Waldst. & Kit.	Euphorbiaceae	544.	*Stachys annua* (L.) L.	Lamiaceae
226.	*Euphrasia stricta D.Wolff*	Orobanchaceae	545.	*Stachys germanica* L.	Lamiaceae
227.	*Fagus sylvatica* L.	Fagaceae	546.	*Stachys officinalis* (L.) Trevis.	Lamiaceae
228.	*Falcaria vulgaris* Bernh.	Apiaceae	547.	*Stachys palustris* L.	Lamiaceae
229.	*Fallopia convolvulus* (L.) Á.Löve	Polygonaceae	548.	*Stachys recta* L.	Lamiaceae
230.	*Fallopia dumetorum* (L.) Holub	Polygonaceae	549.	*Stachys sylvatica* L.	Lamiaceae
231.	*Festuca drymeja* Mert. & W.D.J.Koch	Poaceae	550.	*Staphylea pinnata* L.	Staphyleaceae
232.	*Festuca gigantea* (L.) Vill.	Poaceae	551.	*Stellaria aquatica* (L.) Scop.	Caryophyllaceae
233.	*Festuca heterophylla* Lam.	Poaceae	552.	*Stellaria graminea* L.	Caryophyllaceae
234.	*Festuca pratensis* Huds.	Poaceae	553.	*Stellaria holostea* L.	Caryophyllaceae
235.	*Festuca rupicola* Heuff.	Poaceae	554.	*Stellaria media* (L.) Vill.	Caryophyllaceae
236.	*Festuca valesiaca* Schleich. ex Gaudin	Poaceae	555.	*Stellaria neglecta* Weihe	Caryophyllaceae
237.	*Ficaria verna* Huds.	Ranunculaceae	556.	*Stellaria pallida* (Dumort.) Crép.	Caryophyllaceae
238.	*Filago germanica* (L.) Huds.	Asteraceae	557.	*Symphytum officinale* L.	Boraginaceae
239.	*Filago minima* (Sm.) Pers.	Asteraceae	558.	*Symphytum tuberosum* L.	Boraginaceae
240.	*Filipendula vulgaris* Moench	Rosaceae	559.	*Tanacetum vulgare* L.	Asteraceae
241.	*Fragaria vesca* L.	Rosaceae	560.	*Taraxacum officinale* (L.) Weber ex F.H.Wigg.	Asteraceae
242.	*Fragaria viridis* Weston	Rosaceae	561.	*Teucrium chamaedrys* L.	Lamiaceae
243.	*Frangula alnus* Mill.	Rhamnaceae	562.	*Thalictrum minus* L.	Ranunculaceae
244.	*Fraxinus angustifolia* subsp. *oxycarpa* (Willd.) Franco & Rocha Afonso	Oleaceae	563.	*Thlaspi arvense* L.	Brassicaceae
245.	*Fraxinus excelsior* L.	Oleaceae	564.	*Thlaspi perfoliatum* L.	Brassicaceae
246.	*Fumaria schleicheri* Soy.-Will.	Papaveraceae	565.	*Thymus glabrescens* Willd.	Lamiaceae
247.	*Gagea lutea* (L.) Ker Gawl.	Liliaceae	566.	*Thymus pannonicus* All.	Lamiaceae
248.	*Gagea minima* (L.) Ker Gawl.	Liliaceae	567.	*Thymus pannonicus* subsp. *auctus* (Lyka) Soó	Lamiaceae
249.	*Gagea pratensis* (Pers.) Dumort.	Liliaceae	568.	*Tilia cordata* Mill.	Malvaceae
250.	*Galega officinalis* L.	Fabaceae	569.	*Tilia platyphyllos* Scop.	Malvaceae
251.	*Galeopsis pubescens* Besser	Lamiaceae	570.	*Tilia tomentosa* Moench	Malvaceae
252.	*Galium abaujense* Borbás	Rubiaceae	571.	*Torilis arvensis* (Huds.) Link	Apiaceae
253.	*Galium aparine* L.	Rubiaceae	572.	*Torilis japonica* (Houtt.) DC.	Apiaceae
254.	*Galium glaucum* L.	Rubiaceae	573.	*Tragopogon dubius* Scop.	Asteraceae
255.	*Galium mollugo* L.	Rubiaceae	574.	*Tragopogon orientalis* L.	Asteraceae
256.	*Galium odoratum* (L.) Scop.	Rubiaceae	575.	*Trifolium alpestre* L.	Fabaceae
257.	*Galium pseudoaristatum* Schur	Rubiaceae	576.	*Trifolium campestre* Schreb.	Fabaceae
258.	*Galium schultesii* Vest	Rubiaceae	577.	*Trifolium dubium* Sibth.	Fabaceae

259.	*Galium verum* L.	Rubiaceae	578.	*Trifolium medium* L.	Fabaceae
260.	*Genista tinctoria* L.	Fabaceae	579.	*Trifolium medium* subsp. *banaticum* (Heuff.) Hendrych	Fabaceae
261.	*Geranium columbinum* L.	Geraniaceae	580.	*Trifolium pratense* L.	Fabaceae
262.	*Geranium dissectum* L.	Geraniaceae	581.	*Trifolium repens* L.	Fabaceae
263.	*Geranium divaricatum* Ehrh.	Geraniaceae	582.	*Trifolium rubens* L.	Fabaceae
264.	*Geranium phaeum* L.	Geraniaceae	583.	*Tripleurospermum inodorum* (L.) Sch.Bip.	Asteraceae
265.	*Geranium pratense* L.	Geraniaceae	584.	*Trisetum flavescens* (L.) P.Beauv.	Poaceae
266.	*Geranium pusillum* L.	Geraniaceae	585.	*Turritis glabra* L.	Brassicaceae
267.	*Geranium pyrenaicum* Burm.f.	Geraniaceae	586.	*Tussilago farfara* L.	Asteraceae
268.	*Geranium robertianum* L.	Geraniaceae	587.	*Typha angustifolia* L.	Typhaceae
269.	*Geum urbanum* L.	Rosaceae	588.	*Typha latifolia* L.	Typhaceae
270.	*Glechoma hederacea* L.	Lamiaceae	589.	*Typha laxmannii* Lepech.	Typhaceae
271.	*Glechoma hirsuta* Waldst. & Kit.	Lamiaceae	590.	*Ulmus laevis* Pall.	Ulmaceae
272.	*Glyceria fluitans* (L.) R.Br.	Poaceae	591.	*Ulmus minor* Mill.	Ulmaceae
273.	*Gypsophila muralis* L.	Caryophyllaceae	592.	*Urtica dioica* L.	Urticaceae
274.	*Hedera helix* L.	Araliaceae	593.	*Valeriana officinalis* L.	Caprifoliaceae
275.	*Helianthemum nummularium* subsp. *obscurum* Holub	Cistaceae	594.	*Valerianella dentata* (L.) Pollich	Caprifoliaceae
276.	*Helictotrichon pubescens* (Huds.) Schult. & Schult.f.	Poaceae	595.	*Valerianella locusta* (L.) Laterr.	Caprifoliaceae
277.	*Hepatica nobilis* Mill.	Ranunculaceae	596.	*Verbascum blattaria* L.	Scrophulariaceae
278.	*Heracleum sphondylium* L.	Apiaceae	597.	*Verbascum chaixii* subsp. *austriacum* (Schott ex Roem. & Schult.) Hayek	Scrophulariaceae
279.	*Hibiscus trionum* L.	Malvaceae	598.	*Verbascum nigrum* L.	Scrophulariaceae
280.	*Hieracium maculatum* Schrank	Asteraceae	599.	*Verbascum phlomoides* L.	Scrophulariaceae
281.	*Hieracium racemosum* Waldst. & Kit. ex Willd.	Asteraceae	600.	*Verbascum thapsus* L.	Scrophulariaceae
282.	*Hieracium sabaudum* L.	Asteraceae	601.	*Verbena officinalis* L.	Verbenaceae
283.	*Hieracium umbellatum* L.	Asteraceae	602.	*Veronica anagalloides* Guss.	Plantaginaceae
284.	*Holcus lanatus* L.	Poaceae	603.	*Veronica arvensis* L.	Plantaginaceae
285.	*Hordeum murinum* L.	Poaceae	604.	*Veronica austriaca* L.	Plantaginaceae
286.	*Humulus lupulus* L.	Cannabaceae	605.	*Veronica austriaca* subsp. *teucrium*(L.) D.A.Webb	Plantaginaceae
287.	*Hypericum hirsutum* L.	Hypericaceae	606.	*Veronica chamaedrys* L.	Plantaginaceae
288.	*Hypericum perforatum* L.	Hypericaceae	607.	*Veronica dillenii* Crantz	Plantaginaceae
289.	*Hypericum tetrapterum* Fr.	Hypericaceae	608.	*Veronica hederifolia* L.	Plantaginaceae
290.	*Impatiens noli-tangere* L.	Balsaminaceae	609.	*Veronica officinalis* L.	Plantaginaceae
291.	*Inula britannica* L.	Asteraceae	610.	*Veronica persica* Poir.	Plantaginaceae
292.	*Inula conyza* (Griess.) DC.	Asteraceae	611.	*Veronica polita* Fr.	Plantaginaceae
293.	*Inula ensifolia* L.	Asteraceae	612.	*Veronica prostrata* L.	Plantaginaceae
294.	*Inula salicina* L.	Asteraceae	613.	*Veronica serpyllifolia* L.	Plantaginaceae
295.	*Iris pseudacorus* L.	Iridaceae	614.	*Veronica spicata* L.	Plantaginaceae
296.	*Isopyrum thalictroides* L.	Ranunculaceae	615.	*Veronica spicata* subsp. *orchidea* (Crantz) Hayek	Plantaginaceae
297.	*Jacobaea erratica* (Bertol.) Fourr.	Asteraceae	616.	*Veronica urticifolia* Jacq.	Plantaginaceae
298.	*Jacobaea erucifolia* (L.) P. Gaertn., B. Mey. & Scherb.	Asteraceae	617.	*Viburnum lantana* L.	Adoxaceae
299.	*Jacobaea vulgaris* Gaertn.	Asteraceae	618.	*Viburnum opulus* L.	Adoxaceae
300.	*Juncus articulatus* L.	Juncaceae	619.	*Vicia angustifolia* L.	Fabaceae
301.	*Juncus bufonius* L.	Juncaceae	620.	*Vicia cassubica* L.	Fabaceae
302.	*Juncus compressus* Jacq.	Juncaceae	621.	*Vicia cracca* L.	Fabaceae
303.	*Juncus conglomeratus* L.	Juncaceae	622.	*Vicia dumetorum* L.	Fabaceae
304.	*Juncus effusus* L.	Juncaceae	623.	*Vicia grandiflora* Scop.	Fabaceae
305.	*Juncus inflexus* L.	Juncaceae	624.	*Vicia hirsuta* (L.) Gray	Fabaceae
306.	*Kickxia elatine* (L.) Dumort.	Plantaginaceae	625.	*Vicia sepium* L.	Fabaceae
307.	*Kickxia spuria* (L.) Dumort.	Plantaginaceae	626.	*Vicia tenuifolia* Roth	Fabaceae
308.	*Knautia arvensis* (L.) Coult.	Caprifoliaceae	627.	*Vinca minor* L.	Apocynaceae
309.	*Knautia arvensis* subsp. *rosea* (Baumg.) Soó	Caprifoliaceae	628.	*Vincetoxicum hirundinaria* Medik.	Apocynaceae
310.	*Lactuca saligna* L.	Asteraceae	629.	*Viola arvensis* Murray	Violaceae
311.	*Lactuca serriola* L.	Asteraceae	630.	*Viola collina* Besser	Violaceae
312.	*Lamium album* L.	Lamiaceae	631.	*Viola hirta* L.	Violaceae
313.	*Lamium amplexicaule* L.	Lamiaceae	632.	*Viola odorata* L.	Violaceae
314.	*Lamium galeobdolon* (L.) L.	Lamiaceae	633.	*Viola reichenbachiana* Jord. ex Boreau	Violaceae
315.	*Lamium maculatum* (L.) L.	Lamiaceae	634.	*Viola suavis* M.Bieb.	Violaceae
316.	*Lamium purpureum* L.	Lamiaceae	635.	*Viola tricolor* L.	Violaceae
317.	*Lapsana communis* L.	Asteraceae	636.	*Viscum album* L.	Santalaceae
318.	*Lathraea squamaria* L.	Orobanchaceae	637.	*Vulpia myuros* (L.) C.C.Gmel.	Poaceae
319.	*Lathyrus hirsutus* L.	Fabaceae	638.	*Xanthium strumarium* L.	Asteraceae

Adventive species permanently established in Romanian flora

In strong anthropized and ruderal areas of the botanical garden, among native invasive weeds a number of species coming from other continents settled, finding perfect conditions for adapting. From Table 2. it is remarked a high number of adventive species (38), some of quarantine and common (*Ambrosia artemisiifolia, Helianthus tuberosus, Reynoutria japonica, Solidago canadensis, Solidago gigantea, Amorpha fruticosa, Cuscuta campestris, Robinia pseudacacia*), but also some rare species such as: *Helminthotheca echioides, Euphorbia maculata, Oxalis dillenii* [2, 3, 22]. A number of these species have adapted and are so well integrated into the native flora that they no longer distinguish as unwanted invasive species. Among these can be given as examples: *Physalis alkekengi, Lepidium draba, Portulaca oleracea, Onobrychis viciifolia, Vicia sativa, Euphorbia peplus* [5].

It is noticed, after field observations, the expansion of two species that occur more frequently in several habitats in northwestern Romania: *Phytolacca americana* and *Vitis vulpina.*The first species is listed as a strong invasive species in different countries in Europe [21, 24] and in the coastal forests of China [10].*Vitis vulpina* can be found frequently in moist habitats of water meadows, damp forests, as well as through scrubland and ruderal areas with high humidity.The species is listed as invasive in the alluvial forests of North America, from where it originates [16]. Many species of vine cultived as rootstocks became wild and invasive in many parts of Europe [4, 14].

Table 2

Adventive species permanently established in Romanian flora and are spontaneous in Jibou Botanical Garden

No.	Species	Family	No.	Species	Family
1.	*Acer negundo* L.	Sapindaceae	20.	*Juncus tenuis* Willd.	Juncaceae
2.	*Amaranthus deflexus* L.	Amaranthaceae	21.	*Lepidium virginicum* L.	Brassicaceae
3.	*Amaranthus powellii* S.Watson	Amaranthaceae	22.	*Lycium barbarum* L.	Solanaceae
4.	*Amaranthus retroflexus* L.	Amaranthaceae	23.	*Onobrychis viciifolia* Scop.	Fabaceae
5.	*Ambrosia artemisiifolia* L.	Asteraceae	24.	*Oxalis corniculata* L.	Oxalidaceae
6.	*Amorpha fruticosa* L.	Fabaceae	25.	*Oxalis corniculata* var. *atropurpurea* Planch.	Oxalidaceae
7.	*Artemisia annua* L.	Asteraceae	26.	*Oxalis dillenii* Jacq.	Oxalidaceae
8.	*Cuscuta campestris* Yunck.	Convolvulaceae	27.	*Oxalis stricta* L.	Oxalidaceae
9.	*Datura stramonium* L.	Solanaceae	28.	*Physalis alkekengi* L.	Solanaceae
10.	*Echinocystis lobata* (Michx.) Torr. & A.Gray	Cucurbitaceae	29.	*Phytolacca americana* L.	Phytolaccaceae
11.	*Erigeron annuus* (L.) Pers.	Asteraceae	30.	*Prunus persica* (L.) Batsch	Rosaceae
12.	*Erigeron canadensis* L.	Asteraceae	31.	*Reynoutria japonica* Houtt.	Polygonaceae
13.	*Erigeron strigosus* Muhl. ex Willd.	Asteraceae	32.	*Robinia pseudoacacia* L.	Fabaceae
14.	*Euphorbia maculata* L.	Euphorbiaceae	33.	*Solidago canadensis* L.	Asteraceae
15.	*Euphorbia peplus* L.	Euphorbiaceae	34.	*Solidago gigantean* Aiton	Asteraceae
16.	*Galinsoga parviflora* Cav.	Asteraceae	35.	*Vicia sativa* L.	Fabaceae
17.	*Galinsoga quadriradiata* Ruiz & Pav.	Asteraceae	36.	*Vitis vulpine* L.	Vitaceae
18.	*Helianthus tuberosus* L.	Asteraceae	37.	*Xanthium italicum* Moretti	Asteraceae
19.	*Helminthotheca echioides* (L.) Holub	Asteraceae	38.	*Xanthium spinosum* L.	Asteraceae

Subspontaneous species escaped from the botanical garden cultures

As mentioned above, the study of these species is necessary to monitor their ability to survive and adapt to new environmental conditions and if they can become invasive. In many cases, quarantine native invasive species escaped from agricultural, forest, and gardencrops, such as *Solidago* species, *Reynoutria japonica, Helianthus tuberosus, Acer negundo, Robinia pseudacacia*.

In the Botanical Garden from Jibou, 176 exotic species were found (Table 3.) which continue to spread through external sectors of the garden without human intervention. There are species which accidentally found optimal conditions for survival, but with the disappearance of these conditions, the species disappear aswell; for example the following annual species: *Ageratum houstonianum*, *Lycopersicon esculentum*, *Zea mays*, *Cucurbita pepo*, *Salvia tiliifolia, Gazania ringens*.

Table 3

Subspontaneous plants in external sectors of Jibou Botanical Garden escaped from old cultures (*- species from Romanian flora)

No.	Species	Family	No.	Species	Family
1.	*Acorus calamus* L.	Acoraceae	89.	*Iris sibirica* L.*	Iridaceae
2.	*Actaea cordifolia* DC.	Ranunculaceae	90.	*Iris spuria* L.*	Iridaceae
3.	*Aesculus hippocastanum* L.	Sapindaceae	91.	*Juglans mandshurica* Maxim.	Juglandaceae
4.	*Ageratum houstonianum* Mill.	Asteraceae	92.	*Juglans regia* L.*	Juglandaceae
5.	*Allium cepa* L.	Amaryllidaceae	93.	*Juniperus virginiana* L.	Cupressaceae
6.	*Allium subhirsutum* L.	Amaryllidaceae	94.	*Koelreuteria paniculata* Laxm.	Sapindaceae
7.	*Allium tuberosum* Rottler ex Spreng.	Amaryllidaceae	95.	*Laburnum anagyroides* Medik.*	Fabaceae
8.	*Allium ursinum* L.*	Amaryllidaceae	96.	*Leonurus quinquelobatus* Gilib.*	Lamiaceae
9.	*Alyssum argenteum* All.	Brassicaceae	97.	*Linum alpinum* Jacq.	Linaceae
10.	*Alyssum murale* Waldst. & Kit.*	Brassicaceae	98.	*Linum perenne* L.*	Linaceae
11.	*Amaranthus cruentus* L.	Amaranthaceae	99.	*Lonicera japonica* Thunb.	Caprifoliaceae
12.	*Ampelopsis glandulosa* var. *brevipedunculata* (Maxim.) Momiy.	Vitaceae	100.	*Lycopersicon esculentum* Mill.	Solanaceae
13.	*Anethum graveolens* L.	Apiaceae	101.	*Maclura pomifera* (Raf.) C.K.Schneid.	Moraceae
14.	*Apium graveolens* L.*	Apiaceae	102.	*Malus domestica* Borkh.	Rosaceae
15.	*Aquilegia formosa* Fisch. ex DC.	Ranunculaceae	103.	*Medicago sativa* L.	Fabaceae
16.	*Aquilegia vulgaris* L.	Ranunculaceae	104.	*Mentha spicata* L.	Lamiaceae
17.	*Arum maculatum* L.*	Araceae	105.	*Mirabilis jalapa* L.	Nyctaginaceae
18.	*Aubrieta parviflora* Boiss.	Brassicaceae	106.	*Morus alba* L.	Moraceae
19.	*Aurinia saxatilis* (L.) Desv.*	Brassicaceae	107.	*Morus nigra* L.	Moraceae
20.	*Berberis julianae* C.K.Schneid.	Berberidaceae	108.	*Muscari botryoides* (L.) Mill.*	Asparagaceae
21.	*Beta vulgaris* L.	Amaranthaceae	109.	*Muscari neglectum* Guss. ex Ten.*	Asparagaceae
22.	*Borago officinalis* L.	Boraginaceae	110.	*Myosotis sylvatica* Hoffm. var. *culta* Voss-Vilmorin	Boraginaceae
23.	*Broussonetia papyrifera* (L.) L'Hér. ex Vent.	Moraceae	111.	*Nicotiana alata* Link & Otto	Solanaceae
24.	*Bulbine semibarbata* (R.Br.) Haw.	Xanthorrhoeaceae	112.	*Oenothera biennis* L.	Onagraceae
25.	*Buxus sempervirens* L.	Buxaceae	113.	*Oenothera glazioviana* Micheli	Onagraceae
26.	*Calendula officinalis* L.	Asteraceae	114.	*Oxybaphus nyctagineus* (Michx.) Sweet	Nyctaginaceae
27.	*Campanula grossekii* Heuff.*	Campanulaceae	115.	*Pachysandra terminalis* Siebold & Zucc.	Buxaceae
28.	*Campsis radicans* (L.) Seem.	Bignoniaceae	116.	*Papaver atlanticum* Coss.	Papaveraceae
29.	*Catalpa bignonioides* Walter	Bignoniaceae	117.	*Papaver orientale* L.	Papaveraceae
30.	*Cerastium tomentosum* L.	Caryophyllaceae	118.	*Papaver somniferum* L.	Papaveraceae
31.	*Cercis siliquastrum* L.	Fabaceae	119.	*Parthenocissus inserta* (A.Kern.) Fritsch	Vitaceae
32.	*Chaenomeles japonica* (Thunb.) Lindl. ex Spach	Rosaceae	120.	*Parthenocissus quinquefolia* (L.) Planch.	Vitaceae
33.	*Chaenomeles speciosa* (Sweet) Nakai	Rosaceae	121.	*Parthenocissus tricuspidata* (Siebold & Zucc.) Planch.	Vitaceae
34.	*Consolida ajacis* (L.) Schur	Ranunculaceae	122.	*Paulownia tomentosa* Steud.	Paulowniaceae
35.	*Convallaria majalis* L.*	Asparagaceae	123.	*Pennisetum alopecuroides* (L.) Spreng.	Poaceae
36.	*Coriandrum sativum* L.	Apiaceae	124.	*Petunia axillaris* (Lam.) Britton, Sterns & Poggenb.	Solanaceae
37.	*Cotinus coggygria* Scop.*	Anacardiaceae	125.	*Petunia hybrida* Vilm.	Solanaceae
38.	*Cotoneaster astrophoros* J.Fryer & E.C.Nelson	Rosaceae	126.	*Phellodendron amurense* Rupr.	Rutaceae
39.	*Cotoneaster dammeri* C.K.Schneid.	Rosaceae	127.	*Physocarpus opulifolius* (L.) Maxim.	Rosaceae
40.	*Cotoneaster franchetii* Bois	Rosaceae	128.	*Pinus strobus* L.	Pinaceae
41.	*Cotoneaster horizontalis* Decne.	Rosaceae	129.	*Pinus sylvestris* L.*	Pinaceae
42.	*Cotoneaster racemiflorus* (Desf.) K.Koch	Rosaceae	130.	*Portulaca grandiflora* Hook.	Portulacaceae
43.	*Cotoneaster radicans* (Dammer ex C.K.Schneid.) G.Klotz	Rosaceae	131.	*Potamogeton natans* L.*	Potamogetonacea e
44.	*Crocus chrysanthus* (Herb.) Herb.*	Iridaceae	132.	*Potentilla erecta* (L.) Raeusch.*	Rosaceae
45.	*Crocus flavus* Weston*	Iridaceae	133.	*Primula elatior* (L.) Hill*	Primulaceae
46.	*Crocus vernus* (L.) Hill*	Iridaceae	134.	*Prunus cerasifera* Ehrh.*	Rosaceae
47.	*Cucurbita pepo* L.	Cucurbitaceae	135.	*Prunus cerasifera* subsp. *pissartii* (CarriŠre) Dost l	Rosaceae
48.	*Cyanus segetum* Hill*	Asteraceae	136.	*Prunus domestica* L.	Rosaceae
49.	*Cyclamen coum* Mill.	Primulaceae	137.	*Prunus laurocerasus* L.	Rosaceae
50.	*Cydonia oblonga* Mill.	Rosaceae	138.	*Ptelea trifoliata* L.	Rutaceae
51.	*Cyrtomium falcatum* (L. f.) C. Presl	Dryopteridaceae	139.	*Pterocarya pterocarpa* Kunth ex I. Iljinsk.	Juglandaceae
52.	*Deutzia scabra* Thunb.	Hydrangeaceae	140.	*Pterocarya* × *rehderiana* C.K.Schneid.	Juglandaceae
53.	*Digitalis lutea* L.	Plantaginaceae	141.	*Rhodotypos scandens* (Thunb.) Makino	Rosaceae
54.	*Digitalis purpurea* L.	Plantaginaceae	142.	*Rosa rugosa* Thunb.	Rosaceae
55.	*Dysphania botrys* (L.) Mosyakin & Clemants*	Amaranthaceae	143.	*Rubia tinctorum* L.	Rubiaceae
56.	*Elaeagnus rhamnoides* (L.) A.Nelson*	Elaeagnaceae	144.	*Rubus fruticosus* agg.	Rosaceae
57.	*Eleocharis palustris* (L.) Roem. & Schult.*	Cyperaceae	145.	*Rudbeckia fulgida* Aiton	Asteraceae
58.	*Eriophorum angustifolium* Honck.*	Cyperaceae	146.	*Rudbeckia hirta* L.	Asteraceae
59.	*Eruca vesicaria* (L.) Cav.	Brassicaceae	147.	*Sagittaria latifolia* Willd.	Alismataceae

60.	*Erysimum* × *cheiri* (L.) Crantz	Brassicaceae	148.	*Salix babylonica* L.	Salicaceae
61.	*Erysimum hungaricum* Zapał.*	Brassicaceae	149.	*Salix matsudana* Koidz.	Salicaceae
62.	*Euonymus fortunei* (Turcz.) Hand.-Mazz.	Celastraceae	150.	*Salvia desoleana* Atzei & V.Picci	Lamiaceae
63.	*Euphorbia epithymoides* L.*	Euphorbiaceae	151.	*Salvia tiliifolia* Vahl	Lamiaceae
64.	*Euphorbia myrsinites* L.*	Euphorbiaceae	152.	*Scandix pecten-veneris* L.*	Apiaceae
65.	*Euphorbia segetalis* L.	Euphorbiaceae	153.	*Scilla luciliae* (Boiss.) Speta	Asparagaceae
66.	*Fagopyrum esculentum* Moench	Polygonaceae	154.	*Scilla siberica* Haw.	Asparagaceae
67.	*Festuca arundinacea* Schreb.*	Poaceae	155.	*Secale montanum* Guss.*	Poaceae
68.	*Foeniculum vulgare* Mill.	Apiaceae	156.	*Sedum rupestre* L.*	Crassulaceae
69.	*Fontanesia phillyreoides* Labill.	Oleaceae	157.	*Sedum telephium* L.*	Crassulaceae
70.	*Forsythia suspensa* (Thunb.) Vahl	Oleaceae	158.	*Silene coronaria* (Desr.) Clairv. ex Rchb.*	Caryophyllaceae
71.	*Fragaria moschata* (Duchesne) Duchesne*	Rosaceae	159.	*Silybum marianum* (L.) Gaertn.	Asteraceae
72.	*Fraxinus americana* L.	Oleaceae	160.	*Sinapis alba* L.	Brassicaceae
73.	*Fraxinus pennsylvanica* Marshall	Oleaceae	161.	*Sium sisarum* L.*	Apiaceae
74.	*Galanthus nivalis* L.*	Amaryllidaceae	162.	*Solanum alatum* Moench*	Solanaceae
75.	*Gazania rigens* (L.) Gaertn.	Asteraceae	163.	*Spiraea japonica* L.f.	Rosaceae
76.	*Geranium sanguineum* L.*	Geraniaceae	164.	*Spiraea salicifolia* L.*	Rosaceae
77.	*Gilia achilleifolia* Benth.	Polemoniaceae	165.	*Spiraea* × *vanhouttei* (Briot) Zabel	Rosaceae
78.	*Gymnocladus dioica* (L.) K.Koch	Fabaceae	166.	*Symphoricarpos albus* (L.) S.F.Blake	Caprifoliaceae
79.	*Gypsophila altissima* L.	Caryophyllaceae	167.	*Symphoricarpos orbiculatus* Moench	Caprifoliaceae
80.	*Helianthemum hirtum* (L.) Mill.	Cistaceae	168.	*Syringa vulgaris* L.*	Oleaceae
81.	*Helianthemum nummularium* (L.) Mill.*	Cistaceae	169.	*Tanacetum parthenium* (L.) Sch.Bip.	Asteraceae
82.	*Hesperis matronalis* L.*	Brassicaceae	170.	*Taxus baccata* L.*	Taxaceae
83.	*Hibiscus syriacus* L.	Malvaceae	171.	*Thuja occidentalis* L.	Cupressaceae
84.	*Iberis amara* L.	Brassicaceae	172.	*Verbascum pulverulentum* Vill.*	Scrophulariaceae
85.	*Inula helenium* L.	Asteraceae	173.	*Veronica beccabunga* L.*	Plantaginaceae
86.	*Ipomoea purpurea* (L.) Roth	Convolvulaceae	174.	*Viola* × *wittrockiana* Gams	Violaceae
87.	*Iris* × *germanica* L.	Iridaceae	175.	*Vitis vinifera* L.	Vitaceae
88.	*Iris graminea* L.*	Iridaceae	176.	*Zea mays* L.	Poaceae

In Table 3. are mentioned species from the Romanian flora, that are not found around the town of Jibou or at least missing from unenriched areas of the garden. These can also be considered species escaped from culture, even if they are found in abundance in the surrounding areas: *Allium ursinum, Convallaria majalis, Cyanus segetum, Festuca arundinacea, Iris sibirica, Potentilla erecta, Elaeagnus rhamnoides*.

Although they are native species from Sălaj County, because these plants were brought here from other parts of the country, they cannot be considered indigenous to the archaic vegetation of the botanical garden.

Among the species escaped from culture it must be mentioned some that are listed as invasive or potentially invasive in Romania: *Acorus calamus, Fraxinus americana, Fraxinus pensylvannica, Koelreuteria paniculata, Morus alba, Morus nigra, Oenothera biennis, Oenothera glazioviana, Parthenocissus inserta, Parthenocissus quinquefolia, Parthenocissus tricuspidata, Paulownia tomentosa, Sagittaria latifolia, Symphoricarpos albus*.

Other important species that have escaped in other areas of the country, but without invasive potential, continuing to multiply by themselves are: *Anethum graveolens, Aquilegia vulgaris, Borago officinalis, Calendula officinalis, Consolida ajacis, Cydonia oblonga, Fagopyrum esculentum, Hesperis matronalis, Ipomoea purpurea, Lonicera japonica, Oxybaphus nyctagineus, Petunia axillaris, Rubia tinctorum, Rudbeckia hirta, Salix matsudana, Tanacetum parthenium*.

Subspontaneous species accidentally introduced in the botanical garden greenhouses

A number of native (weeds) and tropical species that escaped from culture were found inside the greenhouses of the botanical garden. Among the exotic species, *Cyrtomium falcatum* fern has a notable expansion on the exterior walls of the greenhouses. In Romania this species is reported in Bacau County in Baile Slanic [5].

The total number of these species is 183, a large number, considering that the greenhouses are very well maintained and most weeds are removed. The majority of indigenous or adventitious weed species found were in a young state, respectively juvenile at trees. The number of native and adventive species that reached inside the greenhouse and are well established in Romanian flora is 102. Some of them entered from outside gardens, and others came when the soil was changed; many species are not found in the garden flora, some examples are mentioned above.

Among the exotic species accidentally introduced are *Pilea microphylla* and *Soleirolia soleirolii,* which are not cultivated and multiply by themselves. Other species that linger through the greenhouses are a number of ferns that are no longer cultivated (*Christella dentata*, *Cyperus eragrostis, Hypoestes phyllostachya, Ruellia caroliniensis, Salvinia minima*).

Table 4

Subspontaneous species in the botanical greenhouses that escaped from old cultures, native and tropical species accidentally introduced (*- species from Romanian flora)

No.	Species	Family	No.	Species	Family
1.	*Achillea millefolium* L.*	Asteraceae	93.	*Lapsana communis* L.*	Asteraceae
2.	*Adiantum capillus-veneris* L.	Pteridaceae	94.	*Lemna minor* L.*	Araceae
3.	*Adiantum polyphyllum* Willd.	Pteridaceae	95.	*Leonurus cardiaca* L.*	Lamiaceae
4.	*Alstroemeria* sp.	Alstroemeriaceae	96.	*Lycopersicon esculentum* Mill.	Solanaceae
5.	*Alyssum repens* Baumg.*	Brassicaceae	97.	*Lysimachia nummularia* L.*	Primulaceae
6.	*Amaranthus retroflexus* L.	Amaranthaceae	98.	*Marsilea quadrifolia* L.*	Marsileaceae
7.	*Anethum graveolens* L.	Apiaceae	99.	*Mestoklema tuberosum* (L.) N.E. Br.	Aizoaceae
8.	*Anredera cordifolia* (Ten.) Steenis	Basellaceae	100.	*Moehringia trinervia* (L.) Clairv.*	Caryophyllaceae
9.	*Antirrhinum majus* L.	Plantaginaceae	101.	*Mycelis muralis* (L.) Dumort.*	Asteraceae
10.	*Apium graveolens* L.*	Apiaceae	102.	*Nephrolepis exaltata* (L.) Schott	Nephrolepidaceae
11.	*Artemisia vulgaris* L.*	Asteraceae	103.	*Oxalis corniculata* L.	Oxalidaceae
12.	*Asparagus sprengeri* Regel	Asparagaceae	104.	*Oxalis corniculata* var. *atropurpurea* Planch.	Oxalidaceae
13.	*Asplenium adiantum-nigrum* L.*	Aspleniaceae	105.	*Oxalis deppei* Lodd. ex Sweet	Oxalidaceae
14.	*Asplenium* sp.	Aspleniaceae	106.	*Oxalis stricta* L.	Oxalidaceae
15.	*Asplenium viviparum* (L. f.) C.Presl	Aspleniaceae	107.	*Oxalis triangularis* A. St.-Hil.	Oxalidaceae
16.	*Begonia cucullata* Willd.	Begoniaceae	108.	*Parietaria officinalis* L.*	Urticaceae
17.	*Bryophyllum calycinum* Salisb.	Crassulaceae	109.	*Paulownia tomentosa* Steud. (juv.)	Paulowniaceae
18.	*Bryophyllum* sp.	Crassulaceae	110.	*Pavonia spinifex* (L.) Cav.	Malvaceae
19.	*Callisia repens* (Jacq.) L.	Commelinaceae	111.	*Perilla frutescens* (L.) Britton	Lamiaceae
20.	*Calluna vulgaris* (L.) Hull*	Ericaceae	112.	*Persicaria lapathifolia* (L.) Delarbre*	Polygonaceae
21.	*Calystegia sepium* (L.) R. Br.*	Convolvulaceae	113.	*Persicaria maculosa* Gray*	Polygonaceae
22.	*Capsella bursa-pastoris* (L.) Medik.*	Brassicaceae	114.	*Petunia hybrida* Vilm.	Solanaceae
23.	*Capsicum annuum* L.	Solanaceae	115.	*Peucedanum carvifolia* Vill.*	Apiaceae
24.	*Cardamine hirsuta* L.*	Brassicaceae	116.	*Phoenix canariensis* Chabaud	Arecaceae
25.	*Carex hirta* L.*	Cyperaceae	117.	*Picea pungens* Engelm. (juv.)	Pinaceae
26.	*Carex* sp.*	Cyperaceae	118.	*Pilea depressa* (Sw.) Blume	Urticaceae
27.	*Centaurium pulchellum* (Sw.) Druce*	Gentianaceae	119.	*Pilea microphylla* (L.) Liebm.	Urticaceae
28.	*Cerastium fontanum* subsp. *vulgare* (Hartm.) Greuter & Burdet*	Caryophyllaceae	120.	*Pinus strobus* L. (juv.)	Pinaceae
29.	*Chamaecyparis lawsoniana* (A.Murray bis) Parl. (juv.)	Cupressaceae	121.	*Pinus sylvestris* L. (juv.)*	Pinaceae
30.	*Chelidonium majus* L.*	Papaveraceae	122.	*Pistia stratiotes* L.	Araceae
31.	*Chenopodium album* L.*	Amaranthaceae	123.	*Plantago lanceolata* L.*	Plantaginaceae
32.	*Chenopodium polyspermum* L.*	Amaranthaceae	124.	*Plantago major* L.*	Plantaginaceae
33.	*Chlorophytum comosum* (Thunb.) Jacques	Asparagaceae	125.	*Pleuropetalum darwinii* Hook. f.	Amaranthaceae
34.	*Chlorophytum filipendulum* subsp. *amaniense* (Engl.) Nordal & A.D.Poulsen	Asparagaceae	126.	*Poa annua* L.*	Poaceae
35.	*Chlorophytum seretii* De Wild.	Asparagaceae	127.	*Poa pratensis* L.*	Poaceae
36.	*Christella dentate* (Forssk.) Brownsey & Jermy	Thelypteridaceae	128.	*Polygonum aviculare* L.*	Polygonaceae
37.	*Christella* sp.	Thelypteridaceae	129.	*Polystichum aculeatum* (L.) Roth ex Mert.*	Dryopteridaceae
38.	*Cirsium arvense* (L.) Scop.*	Asteraceae	130.	*Portulaca oleracea* L.*	Portulacaceae
39.	*Clerodendrum splendens* G.Don	Lamiaceae	131.	*Potentilla reptans* L.*	Rosaceae
40.	*Commelina* sp.	Commelinaceae	132.	*Pteris cretica* L.	Pteridaceae
41.	*Convolvulus arvensis* L.*	Convolvulaceae	133.	*Pteris longifolia* L.	Pteridaceae
42.	*Cuscuta campestris* Yunck.	Convolvulaceae	134.	*Pteris* sp.	Pteridaceae
43.	*Cymbalaria muralis* P.Gaertn., B.Mey. & Scherb.	Plantaginaceae	135.	*Pteris vittata* L.	Pteridaceae
44.	*Cyperus alternifolius* L.	Cyperaceae	136.	*Quercus cerris* L. (juv.)*	Fagaceae
45.	*Cyperus eragrostis* Lam.	Cyperaceae	137.	*Quercus petraea* (Matt.) Liebl. (juv.)*	Fagaceae
46.	*Cyperus* sp.	Cyperaceae	138.	*Ranunculus repens* L.*	Ranunculaceae
47.	*Cyrtomium caryotideum* (Wall. ex Hook. & Grev.) C. Presl	Dryopteridaceae	139.	*Rivina humilis* L.	Phytolaccaceae
48.	*Cyrtomium falcatum* (L. f.) C. Presl	Dryopteridaceae	140.	*Robinia pseudoacacia* L. (juv.)	Fabaceae
49.	*Cystopteris fragilis* (L.) Bernh.*	Cystopteridaceae	141.	*Rubus caesius* L.*	Rosaceae
50.	*Cystopteris* sp.	Cystopteridaceae	142.	*Rubus plicatus* Weihe & Nees*	Rosaceae
51.	*Delosperma crassuloides* (Haw.) L.Bolus	Aizoaceae	143.	*Rudbeckia hirta* L.	Asteraceae
52.	*Delosperma davyi* N.E.Br.	Aizoaceae	144.	*Ruellia caroliniensis* (J.F. Gmel.) Steud.	Acanthaceae
53.	*Delosperma ecklonis* (Salm-Dyck) Schwantes	Aizoaceae	145.	*Rumex crispus* L.*	Polygonaceae
54.	*Delosperma* sp.	Aizoaceae	146.	*Rumex obtusifolius* L.*	Polygonaceae
55.	*Digitaria sanguinalis* (L.) Scop.*	Poaceae	147.	*Sagina procumbens* L.*	Caryophyllaceae
56.	*Disphyma crassifolium* (L.) L.Bolus	Aizoaceae	148.	*Salvinia minima* Baker	Salviniaceae
57.	*Dorstenia contrajerva* L.	Moraceae	149.	*Sedum acre* L.*	Crassulaceae
58.	*Drosera capensis* L.	Droseraceae	150.	*Sedum allantoides* Rose	Crassulaceae

59.	*Dryopteris* sp.	Dryopteridaceae	151.	*Sedum stahlii* Solms	Crassulaceae
60.	*Echeveria amoena* De Smet ex E.Morren	Crassulaceae	152.	*Selaginella kraussiana* (Kunze) A. Braun	Selaginellaceae
61.	*Echinochloa crus-galli* (L.) P.Beauv.*	Poaceae	153.	*Senecio vulgaris* L.*	Asteraceae
62.	*Elymus repens* (L.) Gould*	Poaceae	154.	*Setaria pumila* (Poir.) Roem. & Schult.*	Poaceae
63.	*Epilobium hirsutum* L.*	Onagraceae	155.	*Setaria verticillata* (L.) P.Beauv.*	Poaceae
64.	*Epilobium tetragonum* subsp. *lamyi* (F.W.Schultz) Nyman*	Onagraceae	156.	*Setaria viridis* (L.) P.Beauv.*	Poaceae
65.	*Epilobium* sp.*	Onagraceae	157.	*Silybum marianum* (L.) Gaertn.	Asteraceae
66.	*Equisetum arvense* L.*	Equisetaceae	158.	*Sinocrassula densirosulata* (Praeger) A. Berger	Crassulaceae
67.	*Erica* sp.	Ericaceae	159.	*Sinocrassula yunnanensis* (Franch.) A. Berger	Crassulaceae
68.	*Erigeron strigosus* Muhl. ex Willd.	Asteraceae	160.	*Solanum nigrum* L.*	Solanaceae
69.	*Euphorbia maculata* L.	Euphorbiaceae	161.	*Soleirolia soleirolii* (Req.) Dandy	Urticaceae
70.	*Euphorbia peplus* L.*	Euphorbiaceae	162.	*Sonchus arvensis* L.*	Asteraceae
71.	*Fallopia convolvulus* (L.) Á.Löve*	Polygonaceae	163.	*Sonchus oleraceus* (L.) L.*	Asteraceae
72.	*Festuca rupicola* Heuff.*	Poaceae	164.	*Stellaria aquatica* (L.) Scop.*	Caryophyllaceae
73.	*Ficus pumila* L.	Moraceae	165.	*Stellaria media* (L.) Vill.*	Caryophyllaceae
74.	*Fragaria vesca* L.*	Rosaceae	166.	*Syngonium podophyllum* Schott	Araceae
75.	*Galium aparine* L.*	Rubiaceae	167.	*Taraxacum officinale* (L.) Weber ex F.H.Wigg.*	Asteraceae
76.	*Geranium robertianum* L.*	Geraniaceae	168.	*Tectaria subtriphylla* (Hook. & Arn.) Copel.	Tectariaceae
77.	*Geum urbanum* L.*	Rosaceae	169.	*Tradescantia elegans* Pritz.	Commelinaceae
78.	*Gladiolus* sp.	Iridaceae	170.	*Tradescantia fluminensis* Vell.	Commelinaceae
79.	*Glechoma hederacea* L.*	Lamiaceae	171.	*Tradescantia zebrina* Bosse	Commelinaceae
80.	*Gnaphalium uliginosum* L.*	Asteraceae	172.	*Trifolium pratense* L.*	Fabaceae
81.	*Gypsophila muralis* L.*	Caryophyllaceae	173.	*Trifolium repens* L.*	Fabaceae
82.	*Hibiscus trionum* L.*	Malvaceae	174.	*Tripleurospermum inodorum* (L.) Sch.Bip.*	Asteraceae
83.	*Hypericum perforatum* L.*	Hypericaceae	175.	*Urtica dioica* L.*	Urticaceae
84.	*Hypoestes phyllostachya* Baker	Acanthaceae	176.	*Valeriana officinalis* L.*	Caprifoliaceae
85.	*Iris* × *norrisii* (L.W.Lenz) C.Whitehouse	Iridaceae	177.	*Verbascum chaixii* subsp. *austriacum* (Schott ex Roem. & Schult.) Hayek*	Scrophulariaceae
86.	*Juncus effuses* L.*	Juncaceae	178.	*Veronica anagalloides* Guss.*	Plantaginaceae
87.	*Juncus tenuis* Willd.	Juncaceae	179.	*Veronica persica* Poir.	Plantaginaceae
88.	*Kalanchoe blossfeldiana* Poelln.	Crassulaceae	180.	*Vicia grandiflora* Scop.*	Fabaceae
89.	*Kalanchoe daigremontiana* Raym.-Hamet & H. Perrier	Crassulaceae	181.	*Vicia hirsuta* (L.) Gray*	Fabaceae
90.	*Kalancho enyikae* Engl.	Crassulaceae	182.	*Viola* × *wittrockiana* Gams	Violaceae
91.	*Lamium purpureum* L.*	Lamiaceae	183.	*Zantedeschia aethiopica* (L.) Spreng.	Araceae
92.	*Laphangium luteoalbum* (L.) Tzvelev*	Asteraceae			

In the microproduction greenhouses many species have been introduced for cut flowers or as decorative leaves for bouquets. Many of these species are also found in areas where they were cultivated or entered in other greenhouses (*Alstroemeria* sp*., Polystichum aculeatum, Zantedeschia aethiopica, Syngonium podophyllum, Gladiolus* sp*., Viola* x *wittrochiana, Antirrhinum majus*). Among the exotic species arrived in greenhouses, other than those which were cultivated are: *Cyperus alternifolius, Oxalis deppei, Oxalis triangularis, Chlorophytum* spp. and all ferns. Of course some species are strictly connected to soil, water conditions, and cannot exceed this limit, but in an ideal perimeter they can become invasive (*Selaginella kraussiana, Drosera capensis, Marsilea quadrifolia, Pistia stratiotes*).

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Mosses and mushrooms

Mosses identified in the botanical garden perimeter are listed in Table 5. Some of them entered inside greenhouses (*Amblystegium serpens, Brachythecium rutabulum, Leptodictyum riparium, Tortula muralis, Marchantia polymorpha, Lunularia cruciata*). Other fungi identified in the Botanical Garden are: *Coprinus comatus* (Coprinaceae), *Lacrymaria lacrymabunda* (Coprinaceae), *Lepiota cristata* (Agaricaceae), *Marasmius alliaceus* (Marasmiaceae), *Mycena galericulata* (Mycenaceae), *Mycena pura* (Mycenaceae), *Psathyrella conopilus* (Coprinaceae), *Xerula radicata* (Marasmiaceae), *Agaricus campestris* (Agaricaceae), *Auricularia auricula-judae* (Auriculariaceae), *Phellinus pomaceus* (Hymenochaetaceae), *Schizophyllum commune* (Schizophyllaceae), *Stereum hirsutum* (Stereaceae), *Macrotyphula filiformis* (Typhulaceae), *Trametes hirsuta* (Polyporaceae), *Trametes versicolor*

(Polyporaceae), *Puccinia lagenophorae* (Pucciniaceae) having as host *Senecio vulgaris.*

Table 5

Moss species identified in the botanical garden sectors and greenhouses

No.	Species	Family
1.	*Amblystegium serpens* (Hedw.) Schimp.	Amblystegiaceae
2.	*Atrichum undulatum* (Hedw.) P. Beauv.	Polytrichaceae
3.	*Barbula convoluta* Hedw.	Pottiaceae
4.	*Barbula unguiculata* Hedw.	Pottiaceae
5.	*Brachythecium rutabulum* (Hedw.) Schimp.	Brachytheciaceae
6.	*Bryum argenteum* Hedw.	Bryaceae
7.	*Fissidens taxifolius* Hedw.	Fissidentaceae
8.	*Funaria hygrometrica* Hedw.	Funariaceae
9.	*Grimmia pulvinata* (Hedw.) Sm.	Grimmiaceae
10.	*Isothecium alopecuroides* (Lam. ex Dubois) Isov.	Brachytheciaceae
11.	*Leptodictyum riparium* (Hedw.) Warnst.	Amblystegiaceae
12.	*Lunularia cruciata* (L.) Dumort. ex Lindb.	Lunulariaceae
13.	*Marchantia polymorpha* L.	Marchantiaceae
14.	*Orthotrichum anomalum* Hedw.	Orthotrichaceae
15.	*Plagiomnium cuspidatum* (Hedw.) T.J. Kop.	Mniaceae
16.	*Pohlia nutans* (Hedw.) Lindb.	Bryaceae
17.	*Preissia quadrata* (Scop.) Nees	Marchantiaceae
18.	*Ptychostomum capillare* (Hedw.) D. T. Holyoak & N. Pedersen	Bryaceae
19.	*Syntrichia ruralis* (Hedw.) F. Weber & D. Mohr	Pottiaceae
20.	*Tortula muralis* Hedw.	Pottiaceae

Conclusions

As shown in the Figure 1. graph, spontaneous species occupy the highest percentage of studied flora (60%), which highlights that archaic flora is still well preserved. These are then followed in equal percentage (17%) by subspontaneous species escaped in the botanical garden sectors, ruderal areas, and greenhouses. Among these a large number of species from the botanical garden exterior sectors (53) are species from Romanian flora that were brought here and cultivated, eventually escaped and occupied new areas in the garden, standing out especially *Sedum rupestre, Veronica beccabunga* or *Convallaria majalis.* Although many of these species are found in Sălaj County or near Jibou they are species introduced in the botanical garden. *Agrostis canina,* a native species in the wetlands of the botanical garden, came from other areas of the country with peat plants, and currently spreads rapidly in the area specially designed for them. Notable are some species of peat moss (*Sphagnum* spp.), that were brought in "Peat bog", and quickly occupy empty areas. A percentage that cannot be neglected is the one of adventive species (4%), which are not part of spontaneous flora nor were planted intentionally.

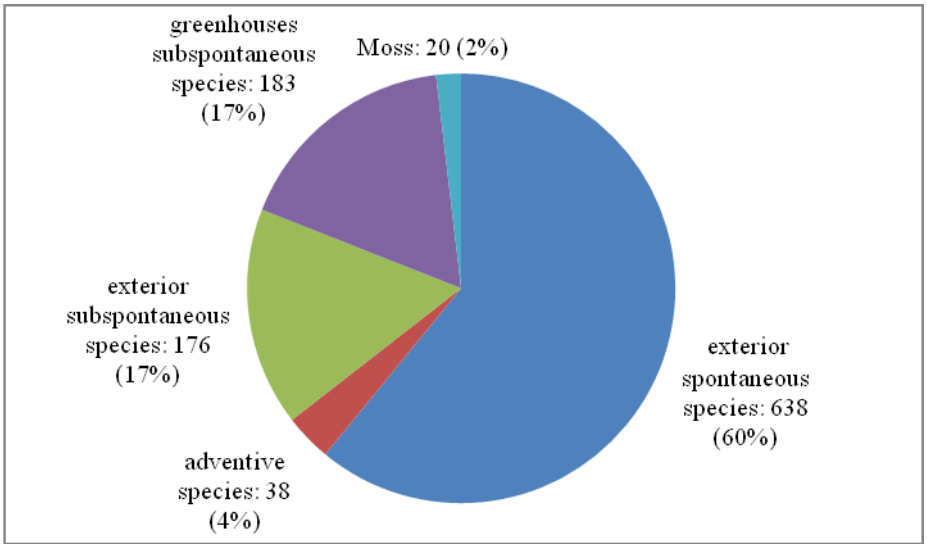

Fig. 1. Percentages of different categories of plant species uncultivated in the Botanical Garden Jibou

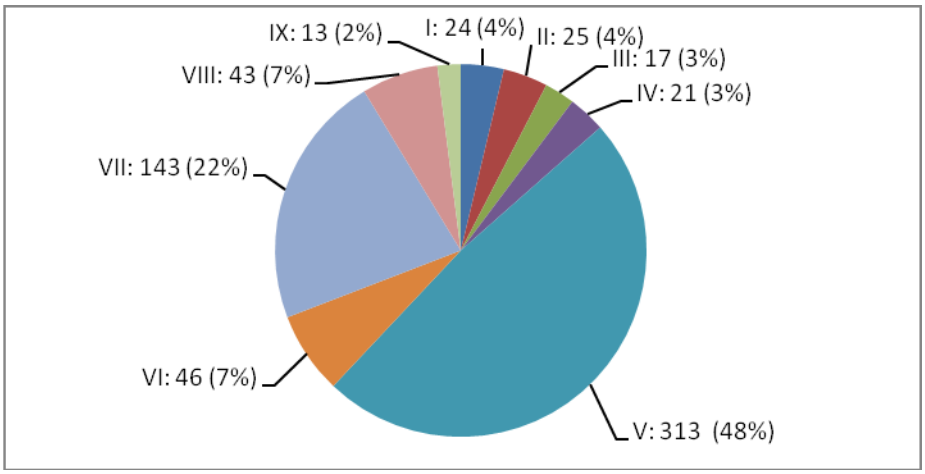

Fig. 2. Bioforms spectrum for wild flora of Jibou Botanical Garden
Explanations: I – megaphanerophytes (MM), II – mezophanerophytes (M), III – nanophanerophytes (N), IV – chamaephytes (Ch), V – hemicryptophytes (H), VI – geophytes (G), VII – annual terrophytes(Th), VIII – biannual terrophytes(TH), IX – helohidatophytes (HH).

Floristic analysis for the spontaneous flora of the botanical garden (645 species) indicates some interesting aspects. From the bioforms analysis (Fig. 2.) the following observations can be made:

Hemicryptophytes (H) are by far the most numerous species of spontaneous flora in the botanical garden - 313 species (48%). They are found in all types of habitats around the garden. They are specific to the temperate climate the botanical garden is located [6].

On the second place are situated the annual terrophytes (Th) with 143 species (22%) and biannual terrophytes (TH) with 43 species (7%).They indicate an intense anthropization of the respective area because of human activity, normal for a botanical garden. Some of these are found through hayfields with xerophylous character or through deforested areas.

Third place is occupied by fanerophytes taken together (megaphanerophytes - MM (24 species - 4%), mezophanerophytes - M (25 species - 4%) and nanophanerophytes - N (17 species - 3%)), in total 66 spontaneous species, a very important number that highlights the fact that the remaining forests inside the garden still retain the old forest vegetation.

At a very short distance is remarked the high number of geophytes (G) with 46 species - 7%. Most of them are found in the forests of European beech, and European beech mixed with Turkey oak and sessile oak. They indicate habitats with low human impact. In smaller proportion are chamaephytes (Ch) with 21 species - 3% and helohidatophytes (HH): 13 species - 2%, the latter being characteristic toponds and areas with standing water.

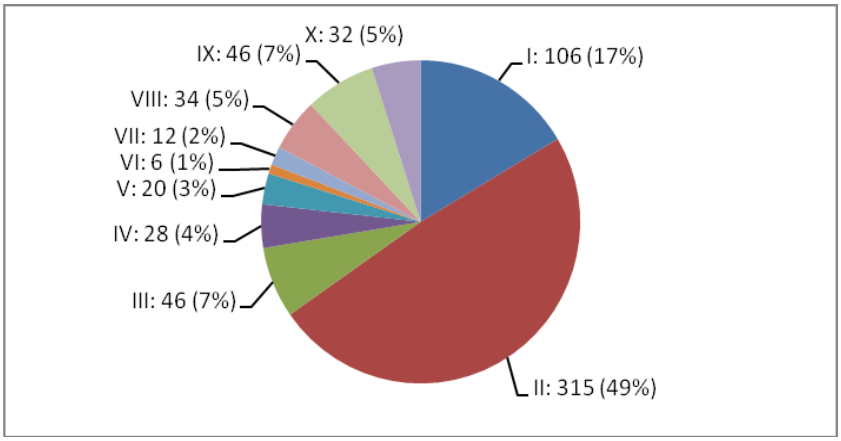

Fig. 3. Geoelements spectrum for the spontaneous flora of Jibou Botanical Garden
Explanation: I - European (EUR), II - Eurasian (Eua), III - Central European (EUC), IV - Mediterranean (Med), V - Central European-Mediterranean (EUC-Med, Med-EUC), VI - Atlantic-Mediterranean (Atl-Med), VII - Ponto-Mediterranean (Pont-Med), VIII –Circumpolar (Circ), IX - Cosmopolitan (Cosm), X - other categories (explanations in text).

Geo-elements analysis (Fig. 3.) provided the following information: the largest percentage (49%) and the largest number of species (315) is the one of Eurasian (Eua), followed by European species (Eur) - 106 species (17%) and Central Europe (EUC) - 46 species (7%). All this indicates that the botanical garden wild flora complies with the specific geographical character namely Central Europe.

Another important percentage is the one of Cosmopolitan species (Cosm) - 46 (7%) indicating increased human activity. At short distance are the Circumpolar species (Circ) - 34 (5%) which are more characteristic to the mountain zones. Many of these are found exclusively in the "Vine Valley" sector where humid European beech forests still preserve the archaic vegetation, including species that remained there during the domination of European beech forests in those areas; forests that mostly retreated to higher regions with the climate aridisation [15]. Also the study observed a high number of Mediterranean species (Med) - 28 (4%), Central European-Mediterranean (EUC-Med, Med-EUC) - 20 (3%), Ponto-Mediterranean (Pont-Med) - 12 (2%), Atlanto-Mediterranean (Atl-Med) - 6 (1%), and other thermophyte and subtermophyte species in lower percentages coming from the southern regions, Balkan, Anatolian, Caucasian, Pontic. The presence of these geoelements categories in the studied area highlights the peculiarities offered by the limestone substrate, which is responsible for achieving a favorable microclimate for their survival. At the same time it underlines once again the thermophilic character of the Western Hills and Mediterranean influences from south to north [13].

The rest of the categories are represented by only 1, 2 or 3 species, but taken together represent a total of 5% (32 species). These are: Atlantic-Central European (Atl-EUC): 3 species, Pontic-Pannonian (Pont-Pan): 3, Pontic-Pannonian-Balkan (Pont-Pan-Balc): 3, Balkan-Pannonian (Balc-Pan): 2 Pontic (Pont): 2, Pontic-Mediterranean-Central European (Pont-Med-EUC): 2, Carpathian-Balkan (Carp-Balc): 2, Daco-Balkan (If-Balc): 2, Balkan (Balc): 1, Balkan-Pontic-Caucasian (Balc-Pont-Cauc): 1, Atlatic-Mediterranean-Central European(Atl-Med-EUC): 1, Pannonian-Carpathian (Pan-Carp): 1, Carpathian (endemic) (Carp): 1, Central European-Pontic (EUC-Pont): 1, European-Mediterranean (Euro-Med): 1, Carpathian-Balkan-Caucasus (Carp-Balc-Cauc): 1, Daco-Pannonian (Dac-Pan): 1, Alps-Carpathian-Balkan (Alp-Carp-Balc): 1, Pontic-Balkan (Pont-Balc): 1, Daco-Balkan-Anatolian (Dac-Balc-Anat): 1, Dacian (endemic) (Dac): 1.

For adventive species (Adv), including species introduced in the garden, but adventive in Romania, in terms of bioforms prevail as expected annual terrophytes (Th): 22, followed by fanerophytes (MM, M): 12 and hemicriptophytes (H): 8 biannual terrophytes(TH): 3 and helohidatophytes (HH): 2.

Spontaneous and subspontaneous flora from the botanical gardens is often considered an interesting research topic, providing information about the human impact on species and how they adapt to new environmental conditions. It is, however, a subject hardly addressed, especially if we consider that many of the exotic species become invasive in regions where they were introduced by the botanical gardens.

Spontaneous flora of the Botanic Garden in Jibou is extremely rich and diverse, offering surprises at every turn. So far the study identified 650 vascular spontaneous species that grow naturally, both in the external sectors and greenhouses. Among these prevail hemicryptophytes (48%) and annual terrophytes (22%), but also a significant number of woody species (11%). From a geographical point of view Eurasian species dominate (Eua) - 49%, European (17%) and Central European (7%). The study remarked a high percentage of Circumpolar species (5%) and Mediterranean (4%) together with other thermophyte species. The two groups require exactly opposite conditions. The Circumpolar group needs high humidity, low temperatures, shade, while the thermophytes one require high heat, mostly are xerophyte, and also a specific limestone bedrock. It seems that the botanical garden landscape perfectly fulfills both conditions for the survival of these species, with both limestone rockery exposed to direct sunlight and a valley with swamps that maintain humidity and low temperatures. More than that, rare and endemic or very interesting species managed to survive (*Cephalaria radiata, Cardamine glanduligera, Crocus banaticus, Linum flavum, Galium abaujense, Linum tenuifolium, Crepis nicaeensis, Berberis vulgaris, Cerastium sylvaticum, Ornithogalum pyramidale, Carex pendula*).

Adventive species are also well represented (38 species), and the number of subspontaneous species from all the sectors of the garden, including the greenhouses is probably among the highest in Romania (359 species), a number that will likely continue to rise with the enrichment of exotic and local plant collections. The total number of species that multiply by themselves in the garden is 1055.

Among the observations conducted there were no cases of subspontaneous species from the garden that reached outside of it and continued their expansion. However it is likely that some species will become locally adventive such as *Nonea lutea* in Cluj-Napoca [9] or *Bothriochloa bladhii* in Bucharest Botanical Garden [22]. It is worth noting the expansion of the indoor fern *Cyrtomium falcatum* on the outside walls of the greenhouses. But the vast majority of species escaped from culture does not pose any problems in the future because they either accidentally spread into limited areas, or are not capable of withstanding several consecutive years. Of course, a large amount of them are removed by the personnel in charge with the care of the botanical garden.

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