

Spontaneous Flora of the Urban Areas of Tirana, three new species recorded for the first time in Albania

Original Article

Abstract:

This study investigates the diversity and characteristics of spontaneous flora in urban areas of Tirana, capital of Albania. Field surveys, based on a defined methodology, conducted during the spring-summer period of 2023, revealed a total of 262 plant species belonging to 53 families. The taxonomic distribution highlights Poaceae and Compositae as the most species-rich families. Three new plant species were documented for the first time in Albania, increasing the list of flora diversity of the country. Biogeographical analysis indicates a dominance of Euro-Mediterranean species, reflecting the region's geographical influences. Furthermore, an analysis of flowering periods shows seasonal variations, with summer hosting the highest number of flowering species. These findings contribute to our understanding of urban plant diversity, adaptation strategies, and biogeographical patterns in Tirana. Nevertheless, the surveyed area is rather small, only 125 ha, and further research in the future is needed and might reveal new findings.

Key words:

spontaneous flora, Tirana, new records, urban areas

Apstrakt:

Spontana flora urbanih područja Tirane, tri nove vrste zabeležene u Albaniji

Ova studija istražuje diverzitet i karakteristike spontane flore u urbanim područjima Tirane, Albanija. Terenska istraživanja, zasnovana na definisanoj metodologiji, sprovedena tokom prolećno-letnjeg perioda 2023. godine, otkrila su ukupno 262 biljne vrste koje se mogu svrstati u 53 porodice. Taksonomska distribucija ističe porodice Poaceae i Compositae kao najbogatije vrstama. Tri nove biljne vrste su dokumentovane po prvi put u Albaniji, čime je povećan floristički spisak zemlje. Biogeografska analiza ukazuje na dominaciju evro-mediterranskih vrsta, što odražava geografske uticaje regiona. Analiza perioda cvetanja pokazuje sezonske varijacije, pri čemu je leto period sa najvećim brojem cvetajućih vrsta. Ova saznanja doprinose razumevanju urbane biljne raznovrsnosti, adaptacionih strategija i biogeografskih obrazaca u Tirani. Ipak, istraživano područje je relativno malo, samo 125 ha, te su potrebna dalja istraživanja u budućnosti koja bi mogla otkriti nove nalaze.

Ključne reči:

spontana flora, Tirana, novi nalazi, urbana područja

Introduction

The city of Tirana, as the capital of Albania, stands out as the most urbanized area in the country, boasting a population exceeding 1 million inhabitants as reported by the Institute of Statistics in year 2023. Over the past three decades, rapid urban expansion has been marked by the spread of tall buildings and an increased population density per unit of land. The trend towards urbanization has been associated with a decline in biodiversity within urban landscapes (Malkinson et al., 2018).

Within Tirana's urban areas, the flora predominantly comprises cultivated plants, although spontaneous species also boom in locations such as sidewalks, parks, and building walls. Spontaneous vegetation, characterized by plants not deliberately planted by humans and not native to natural habitats, is a common feature of urban environments (Cervelli, 2013). These spontaneous plants are vital biological assets, harboring a rich diversity of species with varied floral, foliar, and fruit characteristics, as well as biomass. Importantly, spontaneous vegetation exhibits a notably higher proportion of native species

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compared to cultivated varieties (Li et al., 2019).

Despite the significance of urban ecosystems, research on such environments remains limited in Albania. Therefore, the objective of this study is to investigate the diversity of spontaneous flora within Tirana’s urban areas, focusing on various biological aspects of these species.

Materials and Methods

The field work for data collection was carried out during the spring-summer period of 2023. The field trips were carried out in 20 sampling areas defined and selected randomly, according to the selected methodology. The statue of Scanderbeg in Scanderbeg square is taken as the central point. A circular area with a radius of 2 km has been selected from this statue (Fig. 1). Grids of 250 m × 250 m squares were drawn on this layer and within these grids, 20 were selected and sampled using the random selection function in the QGIS 3.4 Madeira program. One of the selected grids is located in the largest park of Tirana city (Tirana Lake Park). This area is different from the 19 other grids which have a typical flora of the urban areas, because in this park are still present some semi-natural and natural habitats.

Field data recording was conducted using the “Teneriffa Topo Maps” application, which facilitates efficient data entry, and point georeferencing with coordinates (Fig. 2). Additionally, this application enables the extraction of collected data in formats compatible with GIS programs, which can then be further processed in Excel for the generation of final lists.

During the fieldwork, plant identification was primarily conducted on-site in most cases. For taxa that posed identification challenges, plant specimens were collected and further analyzed in the laboratory. The identification process in the laboratory involved consulting relevant literature sources such as the “*Flora of Albania*” volumes 1-4 published by the Academy of Sciences between 1988 and 2000 and “*Flora Europaea*” by Tutin et al. (1964-1980). The Euro+Med PlantBase database was utilized to determine the scientific names of the identified species.

For each of the 20 sampling squares, a list is provided of the plants found, including their species name, family, chorology, phenology (flowering period), and biological form.. These elements were thoroughly analyzed as part of the study.

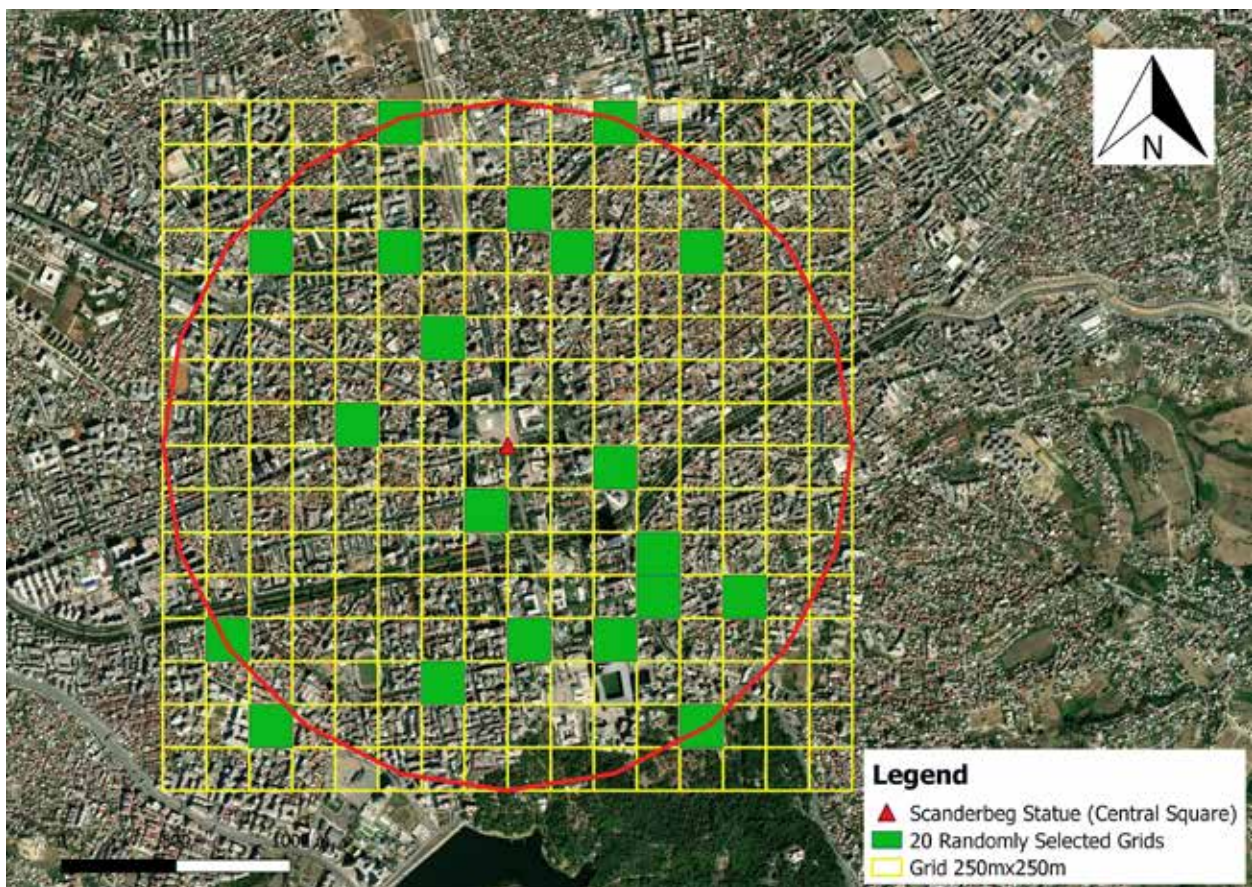


Fig. 1. Map of the sampling stations

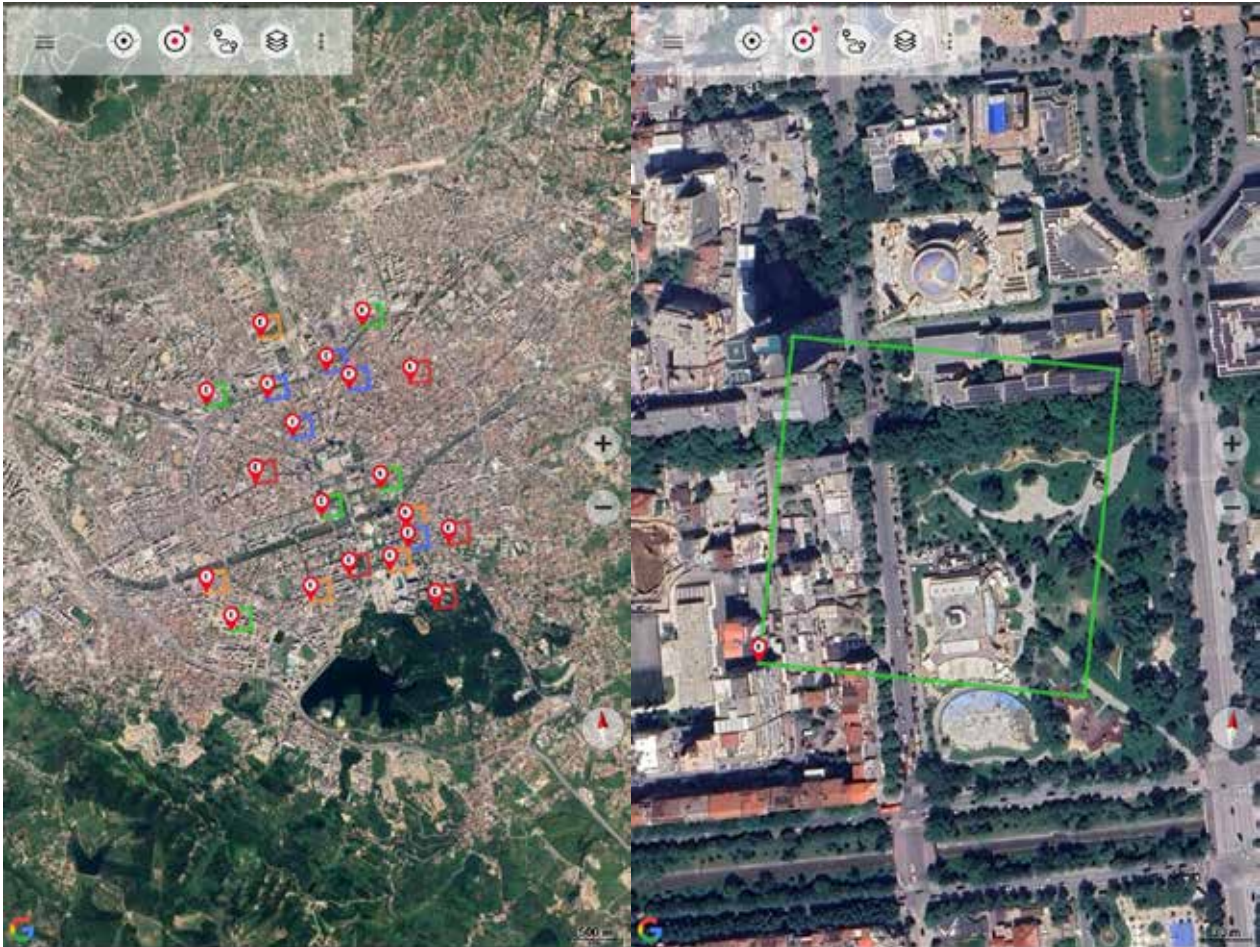


Fig. 2. Pictures from *Tenerife Topo Maps* application

Results and discussion

The survey conducted to investigate the spontaneous flora in the urban areas of Tirana revealed a total of 262 species (Tab. 1), belonging to 53 families (Tab. 2). In Tirana Lake Park, apart from the typical

ruderal flora, species not common for the urban areas such as: *Potentilla micrantha* DC., *Phillyrea latifolia* L., *Quercus pubescens* Willd., *Dorycnium pentaphyllum* Scop., *Carpinus orientalis*, *Rosa sempervirens* L., etc. (Tab. 1) were also found, due to the presence of their natural habitats in the park.

Table 1. List of species found in the surveyed area

No.	Species	No.	Species
1	<i>Amaranthus blitum</i> L.	12	<i>Arum maculatum</i> L.
2	<i>Apium graveolens</i> L.	13	<i>Arum italicum</i> Mill.
3	<i>Orlaya grandiflora</i> (L.) Hoffm.	14	<i>Hedera helix</i> L.
4	<i>Daucus carota</i> L.	15	<i>Aristolochia clematitis</i> L.
5	<i>Eryngium amethystinum</i> L.	16	<i>Asparagus acutifolius</i> L.
6	<i>Eryngium campestre</i> L.	17	<i>Ruscus aculeatus</i> L.
7	<i>Scandix pecten-veneris</i> L.	18	<i>Asplenium adiantum-nigrum</i> L.
8	<i>Tordylium apulum</i> L.	19	<i>Asplenium ceterach</i> L.
9	<i>Torilis arvensis</i> (Huds.) Link	20	<i>Asplenium trichomanes</i> L.
10	<i>Torilis leptophylla</i> (L.) Rchb. f.	21	<i>Cynoglossum officinale</i> L.
11	<i>Vinca major</i> L.	22	<i>Echium italicum</i> L.

No.	Species	No.	Species
23	<i>Echium plantagineum</i> L.	65	<i>Filago germanica</i> (L.) Huds.
24	<i>Echium vulgare</i> L.	66	<i>Helminthotheca echioides</i> (L.) Holub
25	<i>Heliotropium europaeum</i> L.	67	<i>Hypochaeris achyrophorus</i> L.
26	<i>Calepina irregularis</i> (Asso) Thell.	68	<i>Hypochaeris glabra</i> L.
27	<i>Sinapis alba</i> L.	69	<i>Lactuca muralis</i> (L.) Gaertn.
28	<i>Capsella bursa-pastoris</i> (L.) Medik.	70	<i>Lactuca saligna</i> L.
29	<i>Diplotaxis muralis</i> (L.) DC.	71	<i>Lactuca serriola</i> L.
30	<i>Rapistrum rugosum</i> (L.) All.	72	<i>Lactuca viminea</i> (L.) J. Presl & C. Presl
31	<i>Rorippa amphibia</i> (L.) Besser	73	<i>Matricaria chamomilla</i> L.
32	<i>Humulus lupulus</i> L.	74	<i>Picris hieracioides</i> L.
33	<i>Arenaria leptoclados</i> (Rchb.) Guss.	75	<i>Scolymus hispanicus</i> L.
34	<i>Sagina apetala</i> Ard.	76	<i>Senecio vulgaris</i> L.
35	<i>Saponaria officinalis</i> L.	77	<i>Sonchus arvensis</i> L.
36	<i>Arenaria serpyllifolia</i> L.	78	<i>Sonchus asper</i> (L.) Hill
37	<i>Cerastium brachypetalum</i> Pers.	79	<i>Sonchus oleraceus</i> L.
38	<i>Cerastium glomeratum</i> Thuill.	80	<i>Taraxacum sect. Taraxacum</i> F. H. Wigg.
39	<i>Herniaria glabra</i> L.	81	<i>Tussilago farfara</i> L.
40	<i>Polycarpon tetraphyllum</i> (L.) L.	82	<i>Urospermum picroides</i> (L.) F. W. Schmidt
41	<i>Stellaria media</i> (L.) Cirillo	83	<i>Pilosella officinarum</i> F. W. Schultz & Sch. Bip.
42	<i>Chenopodiastrum murale</i> (L.) S. Fuentes & al.	84	<i>Lactuca virosa</i> L.
43	<i>Chenopodium album</i> L.	85	<i>Calystegia sepium</i> (L.) R. Br.
44	<i>Hypericum perforatum</i> L.	86	<i>Convolvulus arvensis</i> L.
45	<i>Carduus acanthoides</i> L.	87	<i>Cornus mas</i> L.
46	<i>Cirsium italicum</i> DC.	88	<i>Cornus sanguinea</i> L.
47	<i>Crepis setosa</i> Haller f.	89	<i>Carpinus orientalis</i> Mill.
48	<i>Artemisia absinthium</i> L.	90	<i>Ostrya carpinifolia</i> Scop.
49	<i>Crepis sancta</i> (L.) Bornm.	91	<i>Sedum album</i> L.
50	<i>Picris hieracioides</i> L.	92	<i>Sedum dasyphyllum</i> L.
51	<i>Artemisia annua</i> L.	93	<i>Bryonia alba</i> L.
52	<i>Artemisia vulgaris</i> L.	94	<i>Carex divulsa</i> Stokes
53	<i>Bellis perennis</i> L.	95	<i>Carex flacca</i> Schreb.
54	<i>Bidens tripartita</i> L.	96	<i>Carex hirta</i> L.
55	<i>Centaurea calcitrapa</i> L.	97	<i>Cyperus rotundus</i> L.
56	<i>Centaurea solstitialis</i> L.	98	<i>Scirpoides holoschoenus</i> (L.) Soják
57	<i>Cichorium intybus</i> L.	99	<i>Cystopteris fragilis</i> (L.) Bernh.
58	<i>Cirsium arvense</i> (L.) Scop.	100	<i>Pteridium aquilinum</i> (L.) Kuhn
59	<i>Cirsium vulgare</i> (Savi) Ten.	101	<i>Dioscorea communis</i> (L.) Caddick & Wilkin
60	<i>Coleostephus myconis</i> (L.) Rchb. f.	102	<i>Equisetum arvense</i> L.
61	<i>Crepis foetida</i> L.	103	<i>Euphorbia terracina</i> L.
62	<i>Crepis neglecta</i> L.	104	<i>Chrozophora tinctoria</i> (L.) A. Juss.
63	<i>Crepis pulchra</i> L.	105	<i>Euphorbia chamaesyce</i> L.
64	<i>Dittrichia viscosa</i> (L.) Greuter	106	<i>Euphorbia helioscopia</i> L.

No.	Species	No.	Species
107	<i>Euphorbia maculata</i> L.	147	<i>Mentha pulegium</i> L.
108	<i>Euphorbia peplus</i> L.	148	<i>Mentha spicata</i> L.
109	<i>Dorycnium pentaphyllum</i> Scop.	149	<i>Mentha x piperita</i> L.
110	<i>Vicia hybrida</i> L.	150	<i>Origanum vulgare</i> L.
111	<i>Trifolium fragiferum</i> L.	151	<i>Prunella vulgaris</i> L.
112	<i>Trifolium resupinatum</i> L.	152	<i>Stachys germanica</i> L.
113	<i>Colutea arborescens</i> L.	153	<i>Linum trigynum</i> L.
114	<i>Dorycnium hirsutum</i> (L.) Ser.	154	<i>Lythrum salicaria</i> L.
115	<i>Lathyrus annuus</i> L.	155	<i>Malva parviflora</i> L.
116	<i>Lotus angustissimus</i> L.	156	<i>Alcea biennis</i> Winterl
117	<i>Lotus corniculatus</i> L.	157	<i>Malva neglecta</i> Wallr.
118	<i>Medicago arabica</i> (L.) Huds.	158	<i>Malva sylvestris</i> L.
119	<i>Medicago lupulina</i> L.	159	<i>Phillyrea latifolia</i> L.
120	<i>Medicago orbicularis</i> (L.) Bartal.	160	<i>Epilobium dodonaei</i> Vill.
121	<i>Medicago polymorpha</i> L.	161	<i>Epilobium hirsutum</i> L.
122	<i>Trifolium campestre</i> Schreb	162	<i>Epilobium lanceolatum</i> Sebast. & Mauri
123	<i>Trifolium hybridum</i> L.	163	<i>Oxalis corniculata</i> L.
124	<i>Trifolium nigrescens</i> Viv.	164	<i>Veronica polita</i> Fr.
125	<i>Trifolium repens</i> L.	165	<i>Cymbalaria muralis</i> P. Gaertn. , B. Mey. & Scherb.
126	<i>Vicia cracca</i> L.	166	<i>Kickxia elatine</i> (L.) Dumort.
127	<i>Vicia grandiflora</i> Scop.	167	<i>Linaria vulgaris</i> Mill.
128	<i>Vicia hirsuta</i> (L.) Gray	168	<i>Plantago lanceolata</i> L.
129	<i>Vicia sativa</i> L.	169	<i>Plantago major</i> L.
130	<i>Quercus cerris</i> L.	170	<i>Plantago media</i> L.
131	<i>Quercus pubescens</i> Willd.	171	<i>Veronica anagallis-aquatica</i> L.
132	<i>Blackstonia perfoliata</i> (L.) Huds.	172	<i>Veronica arvensis</i> L.
133	<i>Centaureum erythraea</i> Rafn	173	<i>Veronica chamaedrys</i> L.
134	<i>Geranium dissectum</i> L.	174	<i>Veronica prostrata</i> L.
135	<i>Erodium cicutarium</i> (L.) L'Hér.	175	<i>Veronica serpyllifolia</i> L.
136	<i>Geranium molle</i> L.	176	<i>Veronica beccabunga</i> L.
137	<i>Geranium purpureum</i> Vill.	177	<i>Lolium rigidum</i> subsp. <i>lepturoides</i> Sennen & Mauricio
138	<i>Geranium sanguineum</i> L.	178	<i>Alopecurus pratensis</i> L.
139	<i>Ballota nigra</i> L.	179	<i>Brachypodium pinnatum</i> (L.) P. Beauv.
140	<i>Prunella laciniata</i> (L.) L.	180	<i>Achnatherum bromoides</i> (L.) P. Beauv.
141	<i>Clinopodium nepeta</i> (L.) Kuntze	181	<i>Aegilops geniculata</i> Roth
142	<i>Clinopodium vulgare</i> L.	182	<i>Aegilops neglecta</i> Bertol.
143	<i>Marrubium vulgare</i> L.	183	<i>Agrostis capillaris</i> L.
144	<i>Melissa officinalis</i> L.	184	<i>Agrostis stolonifera</i> L.
145	<i>Mentha arvensis</i> L.	185	<i>Anisantha rigida</i> (Roth) Hyl.
146	<i>Mentha longifolia</i> (L.) L.	186	<i>Anisantha sterilis</i> (L.) Nevski

No.	Species	No.	Species
187	<i>Anisantha tectorum</i> (L.) Nevski	225	<i>Polygonum aviculare</i> L.
188	<i>Avena barbata</i> Link	226	<i>Rumex conglomeratus</i> Murray
189	<i>Avena fatua</i> L.	227	<i>Rumex crispus</i> L.
190	<i>Avena sterilis</i> L.	228	<i>Rumex patientia</i> L.
191	<i>Bromus hordeaceus</i> L.	229	<i>Rumex pulcher</i> L.
192	<i>Catapodium rigidum</i> (L.) C. E. Hubb.	230	<i>Portulaca oleracea</i> L.
193	<i>Cynodon dactylon</i> (L.) Pers.	231	<i>Lysimachia nummularia</i> L.
194	<i>Cynosurus echinatus</i> L.	232	<i>Anagallis arvensis</i> L.
195	<i>Dactylis glomerata</i> L.	233	<i>Anagallis foemina</i> Mill.
196	<i>Digitaria sanguinalis</i> (L.) Scop.	234	<i>Adiantum capillus-veneris</i> L.
197	<i>Echinochloa crus-galli</i> (L.) P. Beauv.	235	<i>Clematis vitalba</i> L.
198	<i>Holcus lanatus</i> L.	236	<i>Ranunculus acris</i> L.
199	<i>Hordeum murinum</i> L.	237	<i>Ranunculus muricatus</i> L.
200	<i>Lagurus ovatus</i> L.	238	<i>Ranunculus sardous</i> Crantz
201	<i>Lolium multiflorum</i> Lam.	239	<i>Aremonia agrimonoides</i> (L.) DC.
202	<i>Lolium perenne</i> L.	240	<i>Geum urbanum</i> L.
203	<i>Ochlopoa annua</i> (L.) H. Scholz	241	<i>Potentilla micrantha</i> DC.
204	<i>Phalaris brachystachys</i> Link	242	<i>Potentilla reptans</i> L.
205	<i>Phleum echinatum</i> Host	243	<i>Potentilla supina</i> L.
206	<i>Phragmites australis</i> (Cav.) Steud.	244	<i>Rosa canina</i> L.
207	<i>Piptatherum miliaceum</i> (L.) Coss.	245	<i>Rosa sempervirens</i> L.
208	<i>Poa pratensis</i> L.	246	<i>Rubus ulmifolius</i> Schott
209	<i>Poa trivialis</i> L.	247	<i>Sanguisorba minor</i> Scop.
210	<i>Polypogon viridis</i> (Gouan) Breistr.	248	<i>Galium aparine</i> L.
211	<i>Rostraria cristata</i> (L.) Tzvelev	249	<i>Galium tricorutum</i> Dandy
212	<i>Setaria pumila</i> (Poir.) Roem. & Schult.	250	<i>Sherardia arvensis</i> L.
213	<i>Setaria verticillata</i> (L.) P. Beauv.	251	<i>Verbascum blattaria</i> L.
214	<i>Setaria viridis</i> (L.) P. Beauv.	252	<i>Verbascum sinuatum</i> L.
215	<i>Sorghum halepense</i> (L.) Pers.	253	<i>Verbascum thapsus</i> L.
216	<i>Trisetaria panicea</i> (Lam.) Paunero	254	<i>Solanum nigrum</i> L.
217	<i>Triticum aestivum</i> L.	255	<i>Solanum villosum</i> Mill.
218	<i>Triticum aestivum</i> L. subsp. <i>aestivum</i>	256	<i>Urtica dioica</i> L.
219	<i>Vulpia myuros</i> (L.) C. C. Gmel.	257	<i>Parietaria judaica</i> L.
220	<i>Zea mays</i> L.	258	<i>Verbena officinalis</i> L.
221	<i>Schedonorus arundinaceus</i> (Schreb.) Dumort.	259	<i>Sambucus ebulus</i> L.
222	<i>Schedonorus pratensis</i> (Huds.) P. Beauv.	260	<i>Viola odorata</i> L.
223	<i>Persicaria maculosa</i> Gray	261	<i>Tribulus terrestris</i> L.
224	<i>Fallopia convolvulus</i> (L.) Á. Löve	262	<i>Cenraurea benedicta</i> (L.) L.

The results of this study give new data of the distribution area of some species, not mentioned in previous publications. *Epilobium lanceolatum* Sebast. & Mauri, a typical mountain species (beech

woods, shady rocks) (Barina et al., 2017), is found only once in one of the selected stations of the urban areas of Tirana (Fig. 3). *Malva parviflora* L., is another finding of this study, which according to Barina et al. (2017, 2018), is the species erroneously

Table 2. List of families to which the plant species belong and the number of species per family

Family	Species	Family	Species
Amaranthaceae Juss.	1	Gentianaceae Juss.	2
Apiaceae Lindl.	9	Geraniaceae Juss.	5
Apocynaceae Juss.	1	Lamiaceae Lindl.	14
Araceae	2	Linaceae Perleb.	1
Araliaceae Juss.	1	Lythraceae J. St.-Hil.	1
Aristolochiaceae Juss.	1	Malvaceae Juss.	4
Asparagaceae	2	Oleaceae Hoffmanns. & Link	1
Aspleniaceae Newman	3	Onagraceae Juss.	3
Boraginaceae Juss.	5	Oxalidaceae R. Br.	1
Brassicaceae Burnett	6	Plantaginaceae Juss.	13
Cannabaceae Martinov	1	Poaceae Barnhart	46
Caryophyllaceae Juss.	9	Polygonaceae Juss.	7
Chenopodiaceae Vent.	2	Portulacaceae Juss.	1
Clusiaceae Lindl.	1	Primulaceae Vent.	3
Compositae Giseke	41	Pteridaceae E. D. M. Kirchn.	1
Convolvulaceae Juss.	2	Ranunculaceae Juss.	4
Cornaceae (Dumort.) Dumort.	2	Rosaceae	9
Corylaceae Mirb.	2	Rubiaceae Juss.	3
Crassulaceae DC.	2	Scrophulariaceae Juss.	3
Cucurbitaceae Juss.	1	Solanaceae	2
Cyperaceae Juss.	5	Urticaceae Juss.	2
Cystopteridaceae Schmakov	1	Verbenaceae	1
Dennstaedtiaceae Lotsy	1	Viburnaceae Raf.	1
Dioscoreaceae	1	Violaceae Batsch	1
Equisetaceae DC.	1	Zygophyllaceae R. Br.	1
Euphorbiaceae Juss.	6		
Fabaceae Lindl.	21		
Fagaceae Dumort.	2	Total	262

reported for the country (**Fig. 3**).

The casual finding of *Hypochaeris achyrophorus* L. during the fieldwork, represents a new distribution area of this species, previously reported only in the southern part of the country (Delvinë, Gjirokastër, Kolonjë, Saranda) (Vangjeli, 2018).

The findings indicate that the two most well-represented families are Poaceae, with 46 species, and Compositae, with 41 species. Interestingly, these two families also rank among the most species-rich families in the “Flora of Albania” 4th edition (Vangjeli et al., 2000).

Additionally, approximately 21 families, namely Amaranthaceae, Apocynaceae, Araliaceae, Aristolochiaceae, Cannabaceae, Clusiaceae, Cucurbitaceae, Cystopteridaceae, Dennstaedtiaceae, Di-

oscoreaceae, Equisetaceae, Linaceae, Lythraceae, Oleaceae, Oxalidaceae, Portulacaceae, Pteridaceae, Verbenaceae, Viburnaceae, Violaceae and Zygophyllaceae, are each represented by only one species in the surveyed area.

Three new species have been documented for the first time in Albania as a result of this study (**Fig. 4**):

1. Compositae family - *Lactuca virosa* L. (Coordinates: 19.826632, 41.322492)
2. Lamiaceae family - *Mentha arvensis* L. (Coordinates: 19.82493639, 41.32649646)
3. Poaceae family - *Trisetaria panicea* (Lam.) Paunero (Coordinates: 19.8130488, 41.340192)

The distribution map of *Mentha arvensis* L.



Fig. 3. Photographs of *Epilobium lanceolatum* Sebast. & Mauri (left) and *Malva parviflora* L. (right)



Fig. 4. Photographs of *Trisetaria panicea* (Lam.) Paunero (left) and *Lactuca virosa* L. (right)

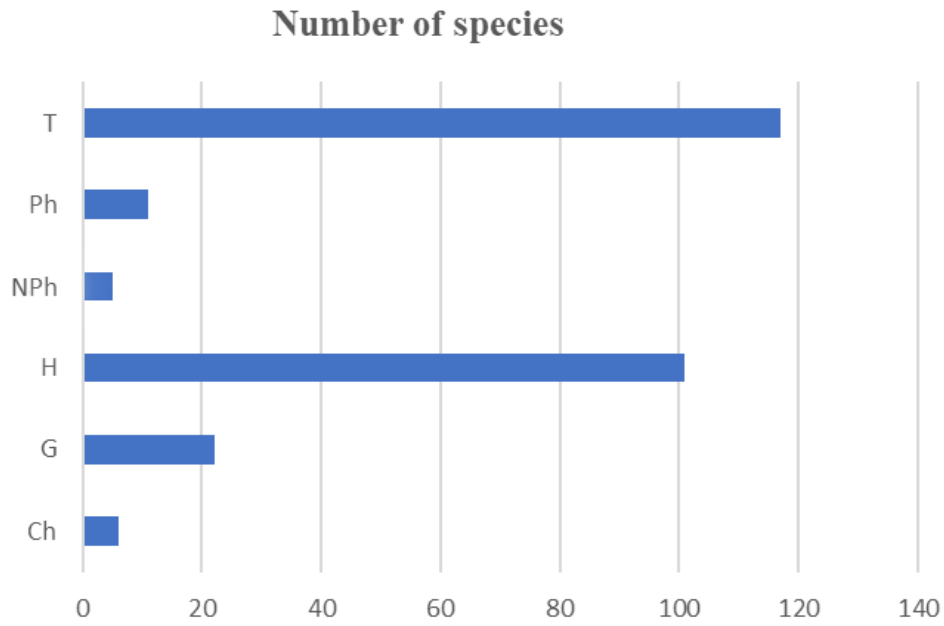


Fig. 5. Classification of life forms/species

indicates that this species is native to all European countries and western Asia, except for Albania. *Lactuca virosa* L. is distributed across most of Europe, being native to countries such as Greece, North Macedonia, and Italy (as per Euro Plus Med data base). *Trisetaria panicea* (Lam.) Paunero is native to the western and central parts of Europe, including Italy. With these new findings, the European distribution maps for these species are now completed with new data.

Based on Raunkiaer’s (1934) classification of plant adaptation strategies, the spontaneous flora of urban areas in Tirana is predominantly composed of therophytes and hemicryptophytes, with 117 and 101 species, respectively. Geophytes represent the next most abundant group with 22 species, followed by phanerophytes with 11 species. Nanophanerophytes and chamaephytes exhibit the lowest species count, with only 5 and 6 species respectively (**Fig. 5**).

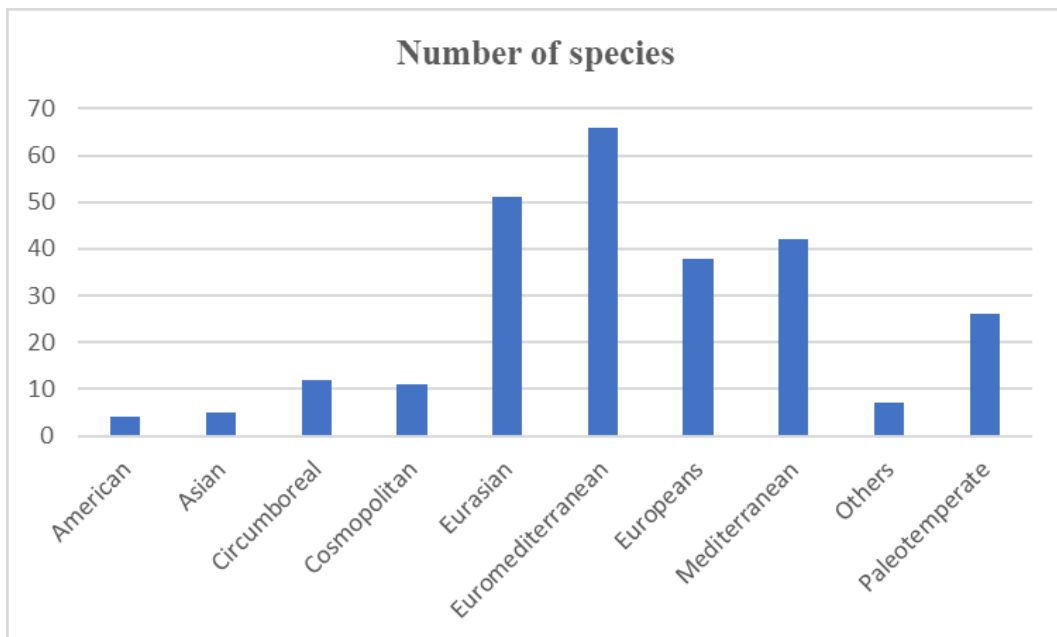


Fig. 6. Chorological types of spontaneous species recorded in urban Tirana

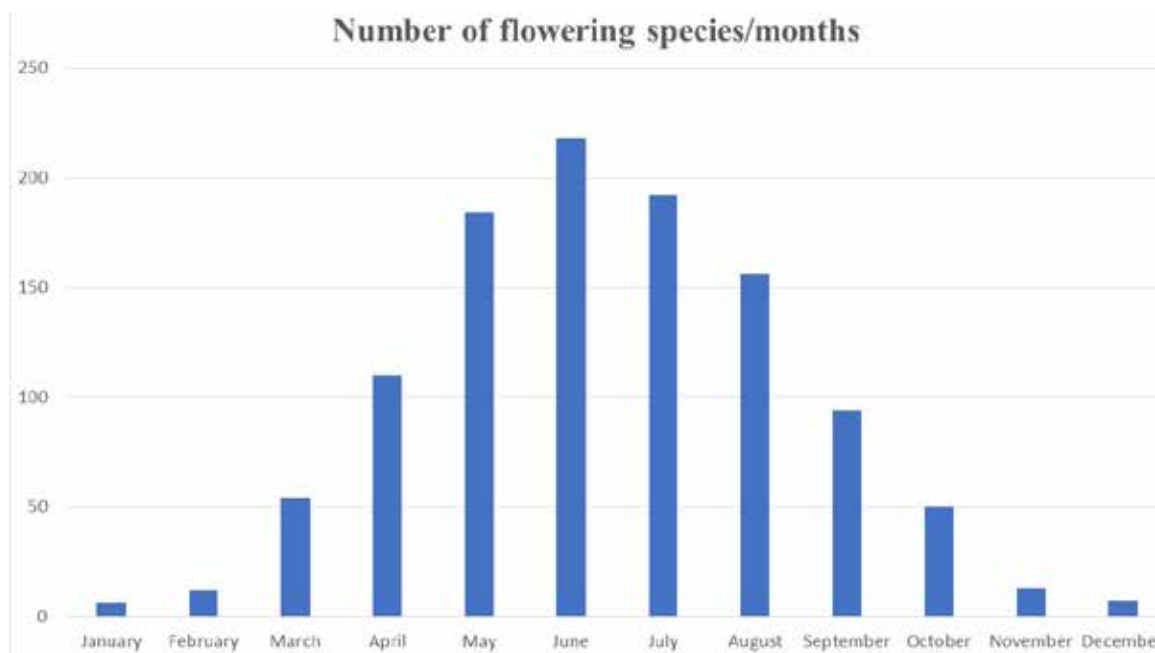


Fig. 7. The analyses of flowering species per months

In terms of chorological types, the spontaneous flora of Tirana is characterized by a dominance of Euro-Mediterranean element, comprising 66 species, followed by Eurasian element with 51 species, European element with 38 species, Mediterranean element with 42 species, Palearctic element with 26 species (Fig. 6). These findings align with Albania’s geographical location, explaining the prevalence of these biogeographical types. Other chorological types exhibit fewer than 15 representative species each.

We examined the flowering patterns of plant species over the course of a year, based on literature review for autumn and winter season (“Flora of Albania”, vol I-IV, 1988-2000) and from the field observation during spring-summer season. In January, 6 species from our survey are in flower, followed by an increase to 12 species in February. March marked a substantial rise, with 54 species flowering. April and May exhibited a significant surge in flowering, with 110 and 184 species respectively, showcasing the peak of floral diversity and activity during the spring season. As the summer months progressed, the number of flowering species remained relatively high, with June, July, and August recording 218, 192, and 156 species, respectively. The transition to autumn saw a gradual decline in flowering, yet September and October still boasted 94 and 50 species respectively. By November and December, the number of flowering species decreased to 13 and 7, marking the end of the flowering season for many plants in our study area (Fig. 7).

Conclusion

This study highlights the diverse flora found within urban areas of Tirana, Albania, showing a total of 262 species from 53 different families, with Poaceae and Compositae emerging as the most species-rich families. Three plant species *Lactuca virosa* L., *Mentha arvensis* L., *Trisetaria panicea* (Lam.) Paunero are reported for the first time in Albania, adding to the botanical diversity of the country. The dominance of Euro-Mediterranean species in Tirana’s urban flora features the influence of the region’s geographical position on plant distribution. The analysis of flowering periods reveals seasonal variations, with summer hosting the highest number of flowering species, followed by spring, autumn, and winter. Raunkiaer’s classification highlights the prevalence of therophytes and hemicryptophytes in Tirana’s urban flora, indicating specific adaptation strategies to urban environments.

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