

FIRST INVENTORY OF VASCULAR FLORA OF MATOKIT MOUNTAIN (BIOKOVO MASSIF, CROATIA)

PRVA INVENTARIZACIJA VASKULARNE FLORE PLANINE MATOKIT (BIOKOVO MASIV, HRVATSKA)

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SUMMARY SAŽETAK

The vascular flora of Matokit Mt (Biokovo Massif) in southern Croatia was researched in different vegetation periods from 2010–2015, and a total of 604 vascular plant taxa belonging to 86 families and 337 genera were found. The studied area has never been studied in the past and these are the first detailed floristic data about grasslands in different succession stages of Matokit Mt. Collected herbarium specimens (345 sheets) were digitalized and are available at the ZAGR Virtual Herbarium. The most dominant families were legumes (*Fabaceae* 9.9%), grasses (*Poaceae* 9.1%), daisies (*Asteraceae* 7.4%) and mints (*Lamiaceae* 6.8%). The analysis of life forms shows the dominance of hemicryptophytes (39.9%) and therophytes (26.2%) on Matokit Mt that indicates a high influence of the Mediterranean climate. A total of 36 endangered and 17 invasive plant taxa across the whole studied area were recorded. Endemic are 32 plant taxa (26 endemics in a broader sense and 6 stenoendemics) and they represent new site of Croatian flora. The occurrence of some very rare endemics (*Cardamine fialae* Fritsch and *Erysimum croaticum* Polatschek) in the flora of Matokit Mt is of special interest for the national flora.

KEY WORDS: flora diversity, endemic taxa, grassland succession, Vrgorac

INTRODUCTION UVOD

The Dinaric mountain range is the lower chained highland mountain of Southeastern Europe, representing the largest karst area that is known for its extremely high plant richness and biodiversity. The highest mountains in the Croatian Dinarides are Velebit, Dinara and Biokovo Massif. Within Biokovo Massif, Matokit Mt (lat. *Monte Acutum*, translated “the sharp Mountain”) is the mountain ridge located in the surrounding of the town of Vrgorac in Dalmatian hinterland, and represents a wider area of the Biokovo Massif (Fig. 1). Matokit Mt provides the dinaric northwest-

southeast direction with the highest peak (Sv. Rok) at 1062 m a.s.l. and total length of approximately 8.5 km (Vukosav 2006; Vukojević 2011).

Matokit Mt is situated in southern Croatia, next to the Vrgorac Town (Fig. 1). The eastern side of the Matokit Mt has relatively steep slopes, while the western slopes are easily accessible. The climate is a sub-Mediterranean with a great influence of continental climate, with an average annual temperature of 14.3°C (lower than the average of typical Mediterranean climate) and 1720 mm of average annual rainfall measured by National Hydrometeorological Institute from 1981 to 2010 for the Town Vrgorac). The duration of snow cover is short at a lower altitude, but in higher altitudinal zo-

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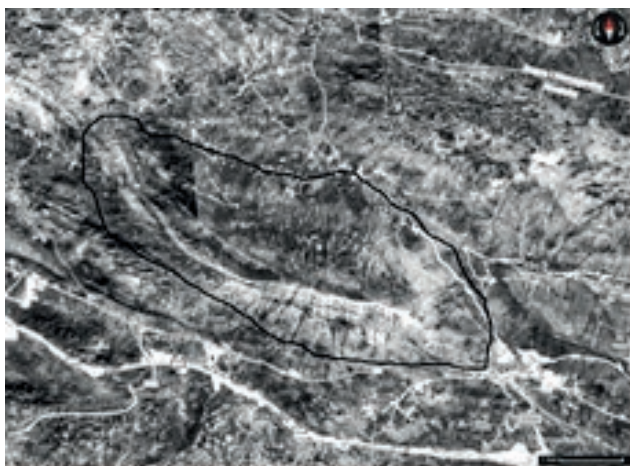


Figure 1. Geographical position of the researched area of Matokit Mt (Biokovo Massif)

Slika 1. Geografski smještaj istraživanog područja planine Matokit (Biokovo masiv)

nes the snow cover can last up to three months. In geological sense the northern slopes of Matokit Mt are composed of well-bedded (20-150 cm thick) Turonian limestone. Prevailing soils are shallow soils, with a significant share of stone fragments. In the areas between 500 and 1000 m a.s.l. there are brown soils (calcocambisol), and above 1000 m black soils on carbonate basis (calcomelanosol) (Martinović 2000).

In spite of the fact that botanical studies of broader area of Biokovo Massif started 60 years ago (Kušan 1956, 1969; Domac 1957; Radić 1974, 1976, 1977; Lovrić and Rac 1987; Rac and Lovrić 1987; Šilić and Šolić 1999, 2002; Pavletić 2002; Trinajstić 2002; Hršak and Alegro 2008; Alegro 2010), still botanical unexplored areas exist, and therefore we founded necessary to fill this gap. The study area of Matokit Mt as a part of Biokovo Massif was chosen because its vascular flora has never been studied systematically in the past. Sporadically floristic records of invasive and threatened plant species of Matokit Mt were published by Vukojević (2011), Vukojević and Vitasović Kosić (2012) and Vukojević et al. (2016). Here we present the original results of the first comprehensive botanical study and flora inventory of Matokit Mt, including its foothills, northern and southern slopes performed from 2010 to 2015.

The aim of this study was to fill the gap in botanical data of Matokit Mt as a part of Biokovo massif and to (a) perform inventory of the vascular flora, (b) to analyse plant diversity, as well as (c) to provide short overview on some interesting endemic and rare species of this mountain for species protection and conservation management of this area. The list of vascular flora includes an overview on some endemic, threatened, and invasive plant taxa of the Croatian flora.

MATERIALS AND METHODS

MATERIJALI I METODE

Study area – Područje istraživanja

Field research of vascular flora was carried out on Matokit Mt, as a part of Biokovo Massif, including its foothills (with nearby settlements), northern and southern slopes, the whole ridge of the mountain, covering different habitats,



Figure 2. Matokit Mt (Biokovo Massif) and its habitats: a) peak ridge, b) submediterranean grasslands *Saturejion subspicatae*, c) rocky crevices with endemic *Moltkia petraea* (Tratt.) Griseb., and *Edraianthus tenuifolius* (Waldst. et Kit.) A. DC., d) rocky grasslands *Saturejion subspicatae* with domination of *Sesleria tenuifolia* Schrad. ssp. *tenuifolia* and *Moltkia petraea* (Tratt.) Griseb., e) submediterranean forest of the alliance *Ostryo-Carpinion orientalis*, f) rocky grasslands and shrubland with stands of *Juniperus oxycedrus* L. (Photos by authors)

Slika 2. Planina Matokit (Biovski masiv) i njegova staništa: a) vršni greben, b) submediteranski travnjaci *Saturejion subspicatae*, c) stjenovite pukotine s endemičnim vrstama *Moltkia petraea* (Tratt.) Griseb. i *Edraianthus tenuifolius* (Waldst. Et Kit.) A. DC., d) kamenjarski travnjaci *Saturejion subspicatae* s dominacijom *Sesleria tenuifolia* Schrad. ssp. *tenuifolia* i *Moltkia petraea* (Tratt.) Griseb., e) submediteranska šuma s veze *Ostryo-Carpinion orientalis*, f) kamenjarski travnjaci i grmovite sastojine *Juniperus oxycedrus* L. (autorske fotografije)

Table 1. Taxonomic analysis of the vascular flora of Matokit Mt (Biokovo Massif)**Tablica 1.** Taksonomska analiza vaskularne flore planine Matokit (Biokovo masiv)

TAXA	PTERIDOPHYTA	Gymnospermae	Angiospermae		Σ
			Magnoliatae	Liliatae	
Families	5	3	67	11	86
Genera	5	4	268	60	337
Species	8	5	456	102	569
Subspecies	0	2	23	10	35
Total no. of taxa	8	5	479	112	604
Total taxa (%)	1.3	0.8	79.3	18.5	100

Table 2. Analysis of life forms and IUCN categories in the vascular flora of Matokit Mt (Biokovo Massif)**Tablica 2.** Analiza životnih oblika i IUCN kategorija vaskularne flore planine Matokit (Biokovo masiv)

Life form Životni oblik	No. of taxa Broj svojti	%	IUCN category IUCN kategorija	No. of taxa Broj svojti	Endangered (%) Ugroženost
H	241	39.90	NT	16	44.44
T	158	26.16	DD	6	16.67
G	75	12.42	LC	6	16.67
Ph	65	10.76	VU	5	13.89
Ch	65	10.76	CR	2	5.56
–	–	–	EN	1	2.78
Total	604	100.00	Total	36	100.00

mostly grasslands in succession, rocky crevices and forest fringes, altogether covering about an area of 15 km².

The researched area belongs to the Submediterranean zone (Fig. 2) with a high influence of the mountain climate and the vegetation is vertically divided according to altitude (from 250–1062 m a.s.l.). The dominant vegetation communities of Matokit Mt southern slopes, difficult to access, are dense maquis of alliance *Fraxino orni-Quercion ilicis* Biondi, Casavecchia et Gigante in Biondi et al. (2013), and large stands of *Juniperus oxycedrus* L., rising up to 600 m a.s.l. On the northern side the Matokit Mt is covered with forest vegetation that belongs to the thermophilous coastal forest and scrub alliance *Fraxino orni-Ostryion* Tomažič 1940, with predominance of *Quercus-Carpinetum orientalis* H-ic 1939 in lower parts (up to 400 m a.s.l.) (Vukosav 2006; Trinajstić 2008; Vukojević et al. 2016).

Data sources – Izvori podataka

Data on plant taxa from Matokit Mt and its surroundings were collected during field researches from 2010 to 2015, throughout each vegetation season, using the standard methods for flora mapping in Croatia according to Nikolić (2006). Plant taxa were collected on two different transects (east-west and north-south) along the Matokit Mt, as well as in different types of habitats during four vegetation seasons on the same transects e.g. mountain routes. Herbar-

ium specimens were collected, digitalized and deposited in the Herbarium ZAGR and are accessible through the Virtual Herbarium ZAGR on <http://herbarium.agr.hr> (Bogdanović et al. 2016).

Taxa were determined according to Pignatti (1982, 1984), Tutin et al. (1964–1980, 1993), and Nikolić (2019a). The plant nomenclature follows Flora Croatica Database (Nikolić 2019b). The plant taxa listed in Tab. 3 are given in alphabetical order where the families and life forms were attributed to each taxon, IUCN category, endemic status, or invasiveness are also provided. The attributed life forms were denoted according to classification of Raunkiaer (1934) and Horvat (1949). In the floristic list (Tab. 3) they were marked with the following abbreviations Ch (*Chamaephyta*), G (*Geophyta*), H (*Hemicryptophyta*), Ph (*Phanerophyta*), and T (*Therophyta*). The status of endangered plant taxa was analysed according to IUCN criteria and categories that are implemented in the Flora Croatica Database (Nikolić 2019b), thereby the following abbreviations were used: CR (Critically endangered), EN (Endangered), VU (Vulnerable), LC (Least Concern), NT (Near Threatened), and DD (Data Deficient). Endemic status of plant taxa, endemic (E) and stenoendemic (sE) was denoted according to Nikolić et al. (2015) and the Flora Croatica Database (Nikolić 2019b). The status of invasive alien species (Inv) was denoted according to Boršić et al. (2008) and Nikolić et al. (2014).

RESULTS AND DISCUSSION

REZULTATI I RASPRAVA

During the floristic research of Matokit Mt, a total of 604 vascular plant taxa were found (Tab. 3). In taxonomic analysis 569 species and 35 subspecies of native and naturalised vascular plants were noted, altogether from 86 families and 337 genera. Eight taxa of *Pteridophyta*, five taxa of *Gymnospermae*, and 591 taxa of *Angiospermae* (*Magnoliatae* 479 and *Liliatae* 112 taxa) were recorded (Tab. 1). The most represented families were *Fabaceae* (9.9%), *Poaceae* (9.1%), *Asteraceae* (7.4%), *Lamiaceae* (6.8%), *Brassicaceae* (5.0%) and *Rosaceae* (4.8%). A total of 345 herbarium sheets were collected and deposited at the ZAGR herbarium (206 of them have been digitalized till now).

The analysis of life forms (Tab. 2) indicate that dominant life forms on Matokit Mt are hemicryptophytes (39.9%) and therophytes (26.2%). Geophytes are represented with 12.4%, while phanerophytes and chamaephytes with 10.8% respectively.

Table 3. Alphabetical list of vascular flora of Matokit Mt (Biokovo Massif).
Tablica 3. Abecedni popis vaskularne flore planine Matokit (Biokovo masiv)

1. *Acanthus balcanicus* Heywood et I. Richardson, Acanthaceae, H
2. *Acer monspessulanum* L., Aceraceae, Ph
3. *Achillea millefolium* L., Asteraceae, H
4. *Acinos arvensis* (Lam.) Dandy, Lamiaceae, Ch
5. *Aegilops geniculata* Roth, Poaceae, T
6. *Aegilops neglecta* Req. ex Bertol., Poaceae, T, NT
7. *Aethionema saxatile* (L.) R. Br., Brassicaceae, Ch
8. *Agrimonia eupatoria* L., Rosaceae, H
9. *Agrostemma githago* L., Caryophyllaceae, T
10. *Ailanthus altissima* (Mill.) Swingle, Simaroubaceae, Ph, Inv
11. *Aira elegantissima* Schur, Poaceae, T
12. *Ajuga chamaepitys* (L.) Schreb., Lamiaceae, T
13. *Ajuga genevensis* L., Lamiaceae, H
14. *Ajuga reptans* L., Lamiaceae, H
15. *Alliaria petiolata* (M. Bieb.) Cavara et Grande, Brassicaceae, H
16. *Allium ampeloprasum* L., Amaryllidaceae, G
17. *Allium carinatum* L., Amaryllidaceae, G
18. *Allium deutiferum* Webb et Berthel., Amaryllidaceae, G
19. *Allium flavum* L., Amaryllidaceae, G
20. *Allium lusitanicum* Lam., Amaryllidaceae, G
21. *Allium moschatum* L., Amaryllidaceae, G
22. *Allium pallens* L. ssp. *tenuiflorum* (Ten.) Stearn, Amaryllidaceae, G
23. *Allium roseum* L., Amaryllidaceae, G
24. *Allium sphercephalon* L., Amaryllidaceae, G
25. *Alyssoides utriculata* (L.) Medik., Brassicaceae, Ch
26. *Alyssum murale* Waldst. et Kit., Brassicaceae, Ch
27. *Amaranthus retroflexus* L., Amaranthaceae, T, Inv
28. *Ambrosia artemisiifolia* L., Asteraceae, T, Inv
29. *Amelanchier ovalis* Medik., Rosaceae, N
30. *Anacamptis pyramidalis* (L.) Rich., Orchidaceae, G, NT
31. *Anagallis arvensis* L., Primulaceae, T
32. *Anagallis coerulea* Schreb., Primulaceae, T
33. *Anchusella cretica* (Mill.) Bigazzi, E.Nardi et Salvi, Boraginaceae, T
34. *Anthericum liliago* L., Asparagaceae, G
35. *Anthoxanthum odoratum* L., Poaceae, H
36. *Anthriscus sylvestris* (L.) Hoffm., Apiaceae, H
37. *Anthyllis vulneraria* L., Fabaceae, H
38. *Anthyllis vulneraria* L. subsp. *pulchella* (Vis.) Bornm., Fabaceae, H
39. *Aposeria foetida* (L.) Less., Asteraceae, H
40. *Arabis collina* Ten., Brassicaceae, H
41. *Arabis glabra* (L.) Bernhardt, Brassicaceae, H
42. *Arabis hirsuta* (L.) Scop., Brassicaceae, H
43. *Arabis turrita* L., Brassicaceae, H
44. *Arabis verna* (L.) R. Br., Brassicaceae, T
45. *Argyrobolium zanonii* (Turra) P. W. Ball, Fabaceae, Ch
46. *Aristolochia rotunda* L., Aristolochiaceae, G
47. *Artemisia vulgaris* L., Asteraceae, Ch
48. *Arum italicum* Mill., Araceae, G
49. *Asparagus acutifolius* L., Asparagaceae, N
50. *Asperula aristata* L.f., Rubiaceae, H
51. *Asperula scutellaris* Vis., Rubiaceae, Ch, E
52. *Asphodeline lutea* (L.) Reichenb., Xanthorrhoeaceae, G
53. *Asplenium ceterach* L., Aspleniaceae, H
54. *Asplenium onopteris* L., Aspleniaceae, H
55. *Asplenium ruta-muraria* L., Aspleniaceae, H
56. *Asplenium trichomanes* L., Aspleniaceae, H
57. *Astragalus muelleri* Steud. et Hochst., Fabaceae, H, NT, E
58. *Astragalus vesicarius* L., Fabaceae, Ch
59. *Asyneuma limonifolium* (L.) Janch., Campanulaceae, H
60. *Athyrium filix-femina* (L.) Roth, Woodsiaceae, H
61. *Avena barbata* Pott ex Link, Poaceae, T
62. *Bellis annua* L., Asteraceae, T
63. *Bellis perennis* L., Asteraceae, H
64. *Bellis sylvestris* Cirillo, Asteraceae, H
65. *Berteroa mutabilis* (Vent.) DC., Brassicaceae, H
66. *Betonica officinalis* L., Lamiaceae, H
67. *Bituminaria bituminosa* (L.) Stirton, Fabaceae, H
68. *Blackstonia perfoliata* (L.) Huds., Gentianaceae, T
69. *Bombycilaena erecta* (L.) Smoljan., Asteraceae, T
70. *Brachypodium distachyon* (L.) P. Beauv., Poaceae, T
71. *Brachypodium pinnatum* (L.) P. Beauv., Poaceae, H
72. *Brachypodium sylvaticum* (Huds.) P. Beauv., Poaceae, H
73. *Brassica oleracea* L. ssp. *acephala* (DC.) O. Schwarz, Brassicaceae, Ch
74. *Briza maxima* L., Poaceae, T
75. *Briza minor* L., Poaceae, T
76. *Bromus commutatus* Schrad., Poaceae, T
77. *Bromus erectus* Huds., Poaceae, H
78. *Bromus hordeaceus* L., Poaceae, T
79. *Bromus squarrosus* L., Poaceae, T
80. *Bromus sterilis* L., Poaceae, T
81. *Broussonetia papyrifera* (L.) Vent., Moraceae, Ph, Inv
82. *Bryonia dioica* Jacq., Cucurbitaceae, H
83. *Bunium alpinum* Waldst. et Kit. ssp. *montanum* (W. D. J. Koch) P. W. Ball, Apiaceae, Ch
84. *Bupleurum praealtum* L., Apiaceae, T
85. *Bupleurum veronense* Turra, Apiaceae, T
86. *Calamagrostis epigejos* (L.) Roth, Poaceae, H
87. *Calamintha grandiflora* (L.) Moench, Lamiaceae, H
88. *Calamintha nepetoides* Jord., Lamiaceae, H
89. *Calamintha sylvatica* Bromf., Lamiaceae, H
90. *Campanula bononiensis* L., Campanulaceae, H
91. *Campanula lingulata* Waldst. et Kit., Campanulaceae, H
92. *Campanula persicifolia* L., Campanulaceae, H
93. *Campanula pyramidalis* L., Campanulaceae, H
94. *Campanula rapunculoides* L., Campanulaceae, H
95. *Campanula rapunculus* L., Campanulaceae, H
96. *Campanula sibirica* L., Campanulaceae, H
97. *Capsella bursa-pastoris* (L.) Medik., Brassicaceae, H
98. *Capsella rubella* Reut., Brassicaceae, T
99. *Capsicum annuum* L., Solanaceae, T
100. *Cardamine fialae* Fritsch, Brassicaceae, T, SE

101. *Cardamine graeca* L., Brassicaceae, T
 102. *Cardamine hirsuta* L., Brassicaceae, H
 103. *Cardaria draba* (L.) Desv., Brassicaceae, H
 104. *Carduus micropterus* (Borbás) Teyber, Asteraceae, H
 105. *Carduus pycnocephalus* L., Asteraceae, T
 106. *Carex caryophyllea* Latourr., Cyperaceae, H
 107. *Carex divulsa* Stokes, Cyperaceae, H
 108. *Carex flacca* Schreb., Cyperaceae, G
 109. *Carex hallerana* Asso, Cyperaceae, H
 110. *Carex humilis* Leyss., Cyperaceae, H
 111. *Carex muricata* L. agg., Cyperaceae, H
 112. *Carex spicata* Huds., Cyperaceae, H
 113. *Carlina corymbosa* L., Asteraceae, H
 114. *Carpinus orientalis* Mill., Corylaceae, Ph
 115. *Celtis australis* L., Ulmaceae, Ph
 116. *Centaurea cyanus* L., Asteraceae, T
 117. *Centaurea deusta* Ten., Asteraceae, H
 118. *Centaurea deusta* Ten. ssp. *concolor* (DC.) Hayek, Asteraceae, H
 119. *Centaurea glaberrima* Tausch, Asteraceae, H, NT, sE
 120. *Centaurea pannonica* (Heuff.) Simonk., Asteraceae, H
 121. *Centaurea rupestris* L., Asteraceae, H
 122. *Centaurium erythraea* Rafn, Gentianaceae, T
 123. *Cephalaria leucantha* (L.) Roem. et Schult., Dipsacaceae, H
 124. *Cerastium dubium* (Bast.) Guépin, Caryophyllaceae, T
 125. *Cerastium grandiflorum* Waldst. et Kit., Caryophyllaceae, Ch, E
 126. *Cerastium pumilum* Curtis, Caryophyllaceae, T
 127. *Cerastium pumilum* Curtis ssp. *glutinatum* (Fries) Jalas, Caryophyllaceae, T
 128. *Cercis siliquastrum* L., Fabaceae, Ph
 129. *Chaenorhinum minus* (L.) Lange, Scrophulariaceae, T
 130. *Chaenorhinum minus* (L.) Lange ssp. *litorale* (Willd.) Hayek, Scrophulariaceae, T
 131. *Chaerophyllum coloratum* L., Scrophulariaceae, T, NT, E
 132. *Chaerophyllum temulum* L., Scrophulariaceae, T
 133. *Cheilanthes acrostica* (Balbis) Tod., Adiantaceae, H
 134. *Chelidonium majus* L., Papaveraceae, H
 135. *Chenopodium album* L., Chenopodiaceae, T
 136. *Chenopodium vulvaria* L., Chenopodiaceae, T, DD
 137. *Chondrilla juncea* L., Cichoriaceae, H
 138. *Chrysopogon gryllus* (L.) Trin., Poaceae, H
 139. *Cichorium intybus* L., Cichoriaceae, H
 140. *Cirsium acaule* Scop., Asteraceae, H
 141. *Cirsium arvense* (L.) Scop., Asteraceae, G
 142. *Cirsium vulgare* (Savi) Ten., Asteraceae, H
 143. *Cistus incanus* L., Fabaceae, N
 144. *Cistus salvifolius* L., Fabaceae, N
 145. *Cleistogenes serotina* (L.) Keng, Poaceae, H
 146. *Clematis flammula* L., Ranunculaceae, Ph
 147. *Clematis recta* L., Ranunculaceae, H
 148. *Clematis vitalba* L., Ranunculaceae, Ph
 149. *Clematis viticella* L., Ranunculaceae, H
 150. *Clinopodium vulgare* L., Lamiaceae, H
 151. *Colchicum autumnale* L., Colchicaceae, G
 152. *Colchicum hungaricum* Janka, Colchicaceae, G
 153. *Colutea arborescens* L., Fabaceae, N
 154. *Consolida ajacis* (L.) Schur, Ranunculaceae, T, CR
 155. *Convolvulus arvensis* L., Convolvulaceae, G
 156. *Convolvulus cantabrica* L., Convolvulaceae, H
 157. *Convolvulus tricolor* L., Convolvulaceae, T
 158. *Conyza canadensis* (L.) Cronquist, Asteraceae, T, Inv
 159. *Cornus mas* L., Cornaceae, Ph
 160. *Cornus sanguinea* L., Cornaceae, Ph
 161. *Coronilla emerus* L. ssp. *emeroides* Boiss. et Spruner, Fabaceae, N
 162. *Coronilla scorpioides* (L.) Koch, Fabaceae, T
 163. *Coronilla varia* L., Fabaceae, H
 164. *Corydalis solida* (L.) Swartz, Papaveraceae, G
 165. *Cotinus coggygria* Scop., Anacardiaceae, N
 166. *Crataegus monogyna* Jacq., Rosaceae, Ph
 167. *Crepis biennis* L., Cichoriaceae, H
 168. *Crepis capillaris* (L.) Wallr., Cichoriaceae, T
 169. *Crepis sancta* (L.) Babc., Cichoriaceae, T
 170. *Crepis vesicaria* L., Cichoriaceae, T
 171. *Crocus reticulatus* Steven ex Adams, Iridaceae, G
 172. *Crocus vernus* (L.) Hill, Iridaceae, G
 173. *Crocus vernus* (L.) Hill ssp. *albiflorus* (Kit.) Asch. et Graebn., Iridaceae, G
 174. *Cruciata glabra* (L.) Ehrend., Rubiaceae, H
 175. *Cruciata laevipes* Opiz, Rubiaceae, H
 176. *Cupressus sempervirens* L., Cupressaceae, Ph
 177. *Cuscuta campestris* Yuncker, Cuscutaceae, T, Inv
 178. *Cyclamen hederifolium* Aiton, Primulaceae, G
 179. *Cyclamen repandum* Sibth. et Sm., Primulaceae, G, NT
 180. *Cymbalaria muralis* P. Gaertn., B. Mey. et Scherb., Scrophulariaceae, T
 181. *Cynara scolymus* L., Asteraceae, H
 182. *Cynodon dactylon* (L.) Pers., Poaceae, G
 183. *Cynoglossum columnae* Ten., Boraginaceae, T
 184. *Cynoglossum officinale* L., Boraginaceae, H
 185. *Cynosurus echinatus* L., Poaceae, T
 186. *Dactylis glomerata* L., Poaceae, H
 187. *Dactylis glomerata* L. ssp. *hispanica* (Roth) Nyman, Poaceae, H
 188. *Dasyphyrum villosum* (L.) P.Candargy, Poaceae, T
 189. *Daucus carota* L., Apiaceae, H
 190. *Desmazeria rigida* (L.) Tutin, Poaceae, T
 191. *Dianthus ciliatus* Guss. ssp. *dalmaticus* (Čelak.) Hayek, Caryophyllaceae, H, E
 192. *Dianthus sylvestris* Wulfen in Jacq., Caryophyllaceae, H
 193. *Dianthus sylvestris* Wulfen in Jacq. ssp. *tergestinus* (Rchb.) Hayek, Caryophyllaceae, H, E
 194. *Dichanthium ischaemum* (L.) Roberty, Poaceae, H
 195. *Dictamnus albus* L., Rutaceae, H
 196. *Digitaria sanguinalis* (L.) Scop., Poaceae, T
 197. *Diplotaxis viminea* (L.) DC., Brassicaceae, T
 198. *Dorycnium germanicum* (Gremli) Rikli, Fabaceae, Ch
 199. *Draba muralis* L., Brassicaceae, T
 200. *Ecballium elaterium* (L.) A. Rich., Cucurbitaceae, G, DD
 201. *Echium italicum* L., Boraginaceae, T
 202. *Edraianthus tenuifolius* (Waldst. et Kit.) A. DC., Campanulaceae, Ch, E
 203. *Elymus repens* (L.) Gould, Poaceae, G
 204. *Ephedra fragilis* Desf. ssp. *campylopoda* (C. A. Mayer) Asch. et Graeb., Epherdeaceae, N, NT
 205. *Epilobium angustifolium* L., Onagraceae, H
 206. *Epilobium ciliatum* Raf., Onagraceae, H, Inv
 207. *Epilobium dodonaei* Vill., Onagraceae, H
 208. *Erigeron annuus* (L.) Pers., Asteraceae, H, Inv
 209. *Eriobotrya japonica* (Thunb.) Lindl., Rosaceae, N
 210. *Erodium cicutarium* (L.) Ĺ Hér., Geraniaceae, T
 211. *Eryngium amethystinum* L., Apiaceae, H
 212. *Eryngium campestre* L., Apiaceae, H
 213. *Erysimum croaticum* Polatschek, Brassicaceae, H, sE
 214. *Erythronium dens-canis* L., Liliaceae, G
 215. *Euonymus verrucosa* Scop., Celastraceae, N
 216. *Euphorbia characias* L. ssp. *wulfenii* (Hoppe ex Koch) A. M. Sm., Euphorbiaceae, N
 217. *Euphorbia cyparissias* L., Euphorbiaceae, H
 218. *Euphorbia falcata* L., Euphorbiaceae, T
 219. *Euphorbia fragifera* Jan, Euphorbiaceae, Ch
 220. *Euphorbia myrsinites* L., Euphorbiaceae, Ch
 221. *Euphorbia prostrata* Aiton, Euphorbiaceae, T
 222. *Euphorbia spinosa* L., Euphorbiaceae, Ch
 223. *Fallopia convolvulus* (L.) Á.Löve, Polygonaceae, T
 224. *Ficus carica* L., Moraceae, Ph
 225. *Filago lutescens* Jord. agg., Asteraceae, T
 226. *Filipendula vulgaris* Moench, Rosaceae, H
 227. *Foeniculum vulgare* Mill., Apiaceae, G
 228. *Fragaria vesca* L., Rosaceae, H

229. *Frangula alnus* Mill., Rhamnaceae, Ph
 230. *Frangula rupestris* (Scop.) Schur., Rhamnaceae, N
 231. *Fraxinus ornus* L., Oleaceae, Ph
 232. *Fritillaria orientalis* Adams, Liliaceae, G
 233. *Fumana ericifolia* Wallr., Cistaceae, Ch
 234. *Fumana procumbens* (Dunal) Gren. et Godr., Cistaceae, Ch
 235. *Fumaria officinalis* L., Fumariaceae, T
 236. *Gagea spathacea* (Hayne) Salisb., Liliaceae, G
 237. *Galeopsis angustifolia* Hoffm., Lamiaceae, T
 238. *Galinsoga parviflora* Cav., Asteraceae, T
 239. *Galium album* Mill., Rubiaceae, H
 240. *Galium aparine* L., Rubiaceae, T
 241. *Galium corrudifolium* Vill., Rubiaceae, H
 242. *Galium firmum* Tausch, Rubiaceae, H, E
 243. *Galium mollugo* L., Rubiaceae, H
 244. *Galium verum* L., Rubiaceae, H
 245. *Genista januensis* Viv., Fabaceae, Ch
 246. *Genista pilosa* L., Fabaceae, Ch
 247. *Genista sericea* Wulfen, Fabaceae, Ch, E
 248. *Genista sylvestris* Scop., Fabaceae, Ch
 249. *Genista sylvestris* Scop. ssp. *dalmatica* (Bartl.) H. Lindb., Fabaceae, Ch, E
 250. *Geranium columbinum* L., Geraniaceae, T
 251. *Geranium dissectum* L., Geraniaceae, T
 252. *Geranium lucidum* L., Geraniaceae, T
 253. *Geranium macrorrhizum* L., Geraniaceae, H
 254. *Geranium molle* L., Geraniaceae, T
 255. *Geranium robertianum* L., Geraniaceae, T
 256. *Geranium sanguineum* L., Geraniaceae, H
 257. *Geum urbanum* L., Rosaceae, H
 258. *Gladiolus communis* L., Iridaceae, G
 259. *Gladiolus illyricus* W. D. J. Koch, Iridaceae, G
 260. *Gladiolus italicus* Mill., Iridaceae, G
 261. *Glechoma hirsuta* Waldst. et Kit., Lamiaceae, H
 262. *Globularia cordifolia* L., Globulariaceae, Ch
 263. *Globularia cordifolia* L. ssp. *bellidifolia* (Ten.) Wettst., Globulariaceae, Ch
 264. *Haplophyllum patavinum* (L.) G. Don, Rutaceae, Ch
 265. *Hedera helix* L., Araliaceae, Ph
 266. *Helianthemum canum* (L.) Baumg., Cistaceae, Ch
 267. *Helianthemum nummularium* (L.) Mill., Cistaceae, Ch
 268. *Helianthemum nummularium* (L.) Mill. ssp. *grandiflorum* (Scop.) Schinz et Thell., Cistaceae, Ch
 269. *Helianthemum oelandicum* (L.) DC. ssp. *alpestre* (Jacq.) Breistr., Cistaceae, Ch
 270. *Helianthus tuberosus* L., Asteraceae, G, Inv
 271. *Helichrysum italicum* (Roth) G. Don, Asteraceae, Ch
 272. *Heliotropium europaeum* L., Boraginaceae, T
 273. *Hemodactylus tuberosus* (L.) Mill., Iridaceae, G
 274. *Herniaria glabra* L., Caryophyllaceae, T
 275. *Hesperis laciniata* All., Brassicaceae, H
 276. *Hibiscus trionum* L., Malvaceae, T, EN
 277. *Hieracium pilosella* L., Cichoriaceae, H
 278. *Hieracium praealtum* Vill. ex Gochnat ssp. *bauhinii* (Besser) Petunn., Cichoriaceae, H
 279. *Hordeum murinum* L., Poaceae, T
 280. *Hordeum murinum* L. ssp. *leporinum* (Link) Arcang., Poaceae, T
 281. *Hypericum perforatum* L., Clusiaceae, H
 282. *Inula britannica* L. agg., Asteraceae, H
 283. *Inula conyza* DC., Asteraceae, H
 284. *Inula ensifolia* L., Asteraceae, H
 285. *Inula oculus-christi* L., Asteraceae, H
 286. *Inula salicina* L., Asteraceae, H
 287. *Inula spiraeifolia* L., Asteraceae, H
 288. *Inula verbascifolia* (Willd.) Hausskn., Asteraceae, Ch
 289. *Iris illyrica* Tomm., Iridaceae, G, LC, E
 290. *Iris pseudopallida* Trinajstić, Iridaceae, G, E
 291. *Juncus articulatus* L., Juncaceae, H
 292. *Juniperus oxycedrus* L., Cupressaceae, N
 293. *Jurinea mollis* (L.) Rchb., Asteraceae, H
 294. *Kickxia commutata* (Bernh. ex Rchb.) Fritsch agg., Scrophulariaceae, Ch
 295. *Knautia arvensis* (L.) Coult., Dipsacaceae, H
 296. *Koeleria pyramidata* (Lam.) P.Beauv., Poaceae, H
 297. *Koeleria splendens* C. Presl, Poaceae, H
 298. *Lactuca perennis* L., Cichoriaceae, H
 299. *Lactuca saligna* L., Cichoriaceae, T
 300. *Lactuca serriola* L., Cichoriaceae, H
 301. *Lactuca viminea* (L.) J. et C. Presl, Cichoriaceae, H
 302. *Lactuca virosa* L., Cichoriaceae, T
 303. *Lamium amplexicaule* L., Lamiaceae, T
 304. *Lamium maculatum* L., Lamiaceae, H
 305. *Lamium orvala* L., Lamiaceae, H
 306. *Lapsana communis* L., Cichoriaceae, T
 307. *Laserpitium siler* L., Apiaceae, H
 308. *Lathyrus aphaca* L., Fabaceae, T
 309. *Lathyrus cicera* L., Fabaceae, T
 310. *Lathyrus latifolius* L., Fabaceae, H
 311. *Lathyrus sphaericus* Retz., Fabaceae, T
 312. *Lathyrus vernus* (L.) Bernhardt, Fabaceae, H
 313. *Legousia speculum-veneris* (L.) Chaix, Campanulaceae, T
 314. *Ligustrum vulgare* L., Oleaceae, N
 315. *Lilium martagon* L., Liliaceae, G, VU
 316. *Lilium martagon* L. ssp. *cattaniae* (Vis.) Degen, Liliaceae, G, SE
 317. *Limodorum abortivum* (L.) Sw., Orchidaceae, G
 318. *Linaria microsepala* A. Kern., Scrophulariaceae, G, DD, SE
 319. *Linaria vulgaris* Mill., Scrophulariaceae, G, E
 320. *Linum nodiflorum* L., Linaceae, T
 321. *Linum perenne* L., Linaceae, H
 322. *Linum tenuifolium* L., Linaceae, Ch
 323. *Lithospermum purpurocaeruleum* L., Boraginaceae, Ch
 324. *Lobularia maritima* (L.) Desv., Brassicaceae, H
 325. *Lolium multiflorum* Lam., Poaceae, T
 326. *Lolium perenne* L., Poaceae, H
 327. *Lonicera etrusca* Santi, Caprifoliaceae, N
 328. *Lotus corniculatus* L., Fabaceae, H
 329. *Lunaria annua* L., Brassicaceae, T
 330. *Lunaria rediviva* L., Brassicaceae, H
 331. *Luzula campestris* (L.) DC. agg., Poaceae, H
 332. *Luzula forsteri* (Sm.) DC., Poaceae, H
 333. *Malus domestica* Borkh., Rosaceae, Ph
 334. *Malva alcea* L., Malvaceae, H
 335. *Malva moschata* L., Malvaceae, H
 336. *Malva nicaeensis* All., Malvaceae, T
 337. *Malva sylvestris* L., Malvaceae, H
 338. *Marrubium incanum* Desr., Lamiaceae, H
 339. *Marrubium vulgare* L., Lamiaceae, Ch
 340. *Matricaria perforata* Mérat, Asteraceae, T
 341. *Matthiola incana* (L.) R. Br., Brassicaceae, Ch, NT
 342. *Medicago arabica* (L.) Huds., Fabaceae, T
 343. *Medicago falcata* L., Fabaceae, H
 344. *Medicago lupulina* L., Fabaceae, T
 345. *Medicago minima* (L.) Bartal, Fabaceae, T
 346. *Medicago orbicularis* (L.) Bartal., Fabaceae, T
 347. *Medicago prostrata* Jacq., Fabaceae, H
 348. *Medicago sativa* L., Fabaceae, H
 349. *Melica ciliata* L., Poaceae, H
 350. *Melilotus italica* (L.) Lam., Fabaceae, T
 351. *Melissa officinalis* L., Lamiaceae, H
 352. *Melittis melissophyllum* L., Lamiaceae, H
 353. *Mentha longifolia* (L.) Huds., Lamiaceae, H
 354. *Mercurialis annua* L., Euphorbiaceae, T
 355. *Meum athamanticum* Jacq., Apiaceae, H
 356. *Micromeria juliana* (L.) Benth. ex Rchb., Lamiaceae, Ch

357. *Moenchia mantica* (L.) Bartl., Caryophyllaceae, T
 358. *Moltkia petraea* (Tratt.) Griseb., Boraginaceae, H, E
 359. *Morus alba* L., Moraceae, Ph
 360. *Morus nigra* L., Moraceae, Ph
 361. *Muscari botryoides* (L.) Mill., Asparagaceae, G
 362. *Muscari comosum* (L.) Mill., Asparagaceae, G
 363. *Muscari neglectum* Guss. ex Ten., Asparagaceae, G
 364. *Mycelis muralis* (L.) Dumort., Cichoriaceae, H
 365. *Myosotis arvensis* (L.) Hill, Boraginaceae, T
 366. *Myosotis ramosissima* Rochel, Boraginaceae, T
 367. *Myrrhoides nodosa* (L.) Cannon, Apiaceae, T
 368. *Narcissus radiiflorus* Salisb., Amaryllidaceae, G
 369. *Neottia nidus-avis* (L.) Rich., Orchidaceae, G
 370. *Nigella damascena* L., Ranunculaceae, T
 371. *Odontites lutea* (L.) Clairv., Scrophulariaceae, T
 372. *Oenothera biennis* L., Onagraceae, H, Inv
 373. *Ononis pusilla* L., Fabaceae, H
 374. *Ononis spinosa* L., Fabaceae, Ch
 375. *Onopordum illyricum* L., Asteraceae, H
 376. *Onosma echioides* (L.) L. ssp. *dalmatica* (Scheele) Peruzziet N. G. Passal., Boraginaceae, Ch, E
 377. *Ophrys sphegodes* Mill., Orchidaceae, G, VU
 378. *Opopanax chironium* (L.) Koch, Apiaceae, H
 379. *Orchis coriophora* L., Orchidaceae, G, VU
 380. *Orchis morio* L., Orchidaceae, G, NT
 381. *Orchis provincialis* Balb. ssp. *pauciflora* (Ten.) Camus, Orchidaceae, G
 382. *Orchis quadripunctata* Cirillo ex Ten., Orchidaceae, G, VU
 383. *Orchis tridentata* Scop., Orchidaceae, G, VU
 384. *Origanum majorana* L., Lamiaceae, H
 385. *Origanum vulgare* L., Lamiaceae, Ch
 386. *Orlaya grandiflora* (L.) Hoffm., Apiaceae, T
 387. *Ornithogalum comosum* L., Asparagaceae, G
 388. *Ornithogalum pyramidale* L., Asparagaceae, G
 389. *Ornithogalum umbellatum* L., Asparagaceae, G
 390. *Orobanche* sp., Orobanchaceae, G
 391. *Ostrya carpinifolia* Scop., Corylaceae, Ph
 392. *Ostrya alba* L., Santalaceae, N
 393. *Paliurus spina-christi* Mill., Rhamnaceae, N
 394. *Papaver argemone* L., Papaveraceae, T, CR
 395. *Papaver rhoeas* L., Papaveraceae, T
 396. *Parietaria judaica* L., Urticaceae, H
 397. *Paronychia kapela* (Hacq.) A. Kerner, Caryophyllaceae, H
 398. *Parthenocissus quinquefolia* (L.) Planchon, Vitaceae, Ph, Inv
 399. *Peltaria alliacea* Jacq., Brassicaceae, H, NT, E
 400. *Petrorhagia prolifera* (L.) P.W. Ball et Heywood, Caryophyllaceae, T
 401. *Petrorhagia saxifraga* (L.) Link, Caryophyllaceae, H
 402. *Peucedanum oreoselinum* (L.) Moench, Apiaceae, H
 403. *Peucedanum ostruthium* (L.) Koch, Apiaceae, H
 404. *Phalaris paradoxa* L., Poaceae, T, DD
 405. *Phillyrea latifolia* L., Oleaceae, Ph
 406. *Phleum echinatum* Host, Poaceae, T
 407. *Phleum subulatum* (Savi) Asch. et Graebn., Poaceae, T
 408. *Physalis alkekengi* L., Solanaceae, H
 409. *Phytolacca americana* L., Phytolaccaceae, G, Inv
 410. *Picris echioides* L., Cichoriaceae, T
 411. *Picris hieracioides* L., Cichoriaceae, H
 412. *Pimpinella major* (L.) Huds., Apiaceae, H
 413. *Pinus halepensis* Mill., Pinaceae, Ph
 414. *Pinus nigra* Arnold ssp. *dalmatica* (Vis.) Franco, Pinaceae, Ph, NT, sE
 415. *Pistacia terebinthus* L., Anacardiaceae, Ph
 416. *Plantago lanceolata* L., Plantaginaceae, H
 417. *Plantago media* L., Plantaginaceae, H
 418. *Platanthera chlorantha* (Custer) Rchb., Orchidaceae, G, NT
 419. *Plumbago europaea* L., Plumbaginaceae, Ch
 420. *Poa angustifolia* L., Poaceae, G
 421. *Poa bulbosa* L., Poaceae, H
 422. *Poa compressa* L., Poaceae, H
 423. *Poa pratensis* L., Poaceae, G
 424. *Poa trivialis* L., Poaceae, Ch
 425. *Poa trivialis* L. ssp. *sylvicola* (Guss.) H.Lindb., Poaceae, H, LC
 426. *Polygala monspeliaca* L., Polygalaceae, T
 427. *Polygala nicaeensis* Risso ex Koch, Polygalaceae, H
 428. *Polygala nicaeensis* Risso ex Koch ssp. *mediterranea* Chodat, Polygalaceae, H
 429. *Polygonum aviculare* L., Polygonaceae, T
 430. *Polypodium vulgare* L., Polypodiaceae, H
 431. *Portenschlagiella ramosissima* (Port.) Tutin, Apiaceae, H, E
 432. *Portulaca oleracea* L., Portulacaceae, T
 433. *Potentilla argentea* L., Rosaceae, H
 434. *Potentilla australis* Krašan, Rosaceae, H
 435. *Potentilla heptaphylla* L., Rosaceae, H
 436. *Potentilla hirta* L., Rosaceae, H
 437. *Potentilla inclinata* Vill., Rosaceae, H
 438. *Potentilla micrantha* Ramond ex DC., Rosaceae, H
 439. *Potentilla recta* L., Rosaceae, H
 440. *Primula veris* L. ssp. *columnae* (Ten.) Ludi, Primulaceae, H, NT
 441. *Prunella laciniata* L., Lamiaceae, H
 442. *Prunella vulgaris* L., Lamiaceae, H
 443. *Prunus avium* L., Rosaceae, Ph
 444. *Prunus cerasus* L., Rosaceae, Ph
 445. *Prunus dulcis* (Mill.) D. A. Webb, Rosaceae, Ph
 446. *Prunus mahaleb* L., Rosaceae, Ph
 447. *Prunus spinosa* L., Rosaceae, Ph
 448. *Pseudolysimachion barrelieri* (Schott ex Roem. et Schult.) Holub, Scrophulariaceae, H
 449. *Pteridium aquilinum* (L.) Kuhn, Hypolepidaceae, G
 450. *Pulmonaria officinalis* L., Boraginaceae, H
 451. *Pulsatilla grandis* Wender., Ranunculaceae, H, LC
 452. *Punica granatum* L., Punicaceae, N
 453. *Pyrus amygdaliformis* Vill., Rosaceae, Ph
 454. *Quercus cerris* L., Fagaceae, Ph
 455. *Quercus ilex* L., Fagaceae, Ph
 456. *Quercus pubescens* Willd., Fagaceae, Ph
 457. *Ranunculus acris* L., Ranunculaceae, H
 458. *Ranunculus arvensis* L., Ranunculaceae, T
 459. *Ranunculus ficaria* L., Ranunculaceae, G
 460. *Ranunculus illyricus* L., Ranunculaceae, G
 461. *Ranunculus millefoliatus* Vahl., Ranunculaceae, H
 462. *Ranunculus muricatus* L., Ranunculaceae, T
 463. *Reseda phyteuma* L., Resedaceae, T
 464. *Rhagadiolus stellatus* (L.) Gaertn., Cichoriaceae, T
 465. *Rhamnus intermedius* Steud. et Hohst., Rhamnaceae, N, NT, E
 466. *Robinia pseudacacia* L., Fabaceae, Ph, Inv
 467. *Rorippa lippizensis* (Wulfen) Rchb., Brassicaceae, H, E
 468. *Rorippa sylvestris* (L.) Besser, Brassicaceae, H
 469. *Rosa arvensis* Huds., Rosaceae, N
 470. *Rosa canina* L., Rosaceae, Ch
 471. *Rubia peregrina* L., Rubiaceae, Ph
 472. *Rubus ulmifolius* Schott., Rosaceae, N
 473. *Rumex acetosella* L., Polygonaceae, G
 474. *Rumex crispus* L., Polygonaceae, H
 475. *Ruscus aculeatus* L., Liliaceae, Ch, LC
 476. *Ruta graveolens* L., Rutaceae, Ch
 477. *Salvia officinalis* L., Lamiaceae, Ch
 478. *Salvia pratensis* L., Lamiaceae, H
 479. *Salvia sclarea* L., Lamiaceae, T
 480. *Sambucus ebulus* L., Caprifoliaceae, N
 481. *Sanguisorba minor* Scop., Rosaceae, H
 482. *Satureja montana* L., Lamiaceae, Ch
 483. *Satureja subspicata* Vis., Lamiaceae, Ch, LC
 484. *Saxifraga paniculata* Mill., Saxifragaceae, H

485. *Saxifraga rotundifolia* L., Saxifragaceae, H
 486. *Saxifraga tridactylites* L., Saxifragaceae, T
 487. *Scandix pecten-veneris* L., Apiaceae, T
 488. *Scilla autumnalis* L., Liliaceae, G
 489. *Scilla bifolia* L., Liliaceae, G
 490. *Scrophularia canina* L., Scrophulariaceae, H
 491. *Sedum acre* L., Crassulaceae, Ch
 492. *Sedum album* L., Crassulaceae, Ch
 493. *Sedum ochroleucum* Chaix, Crassulaceae, Ch
 494. *Sedum stellatum* L., Crassulaceae, T
 495. *Sempervivum marmorum* Griseb., Crassulaceae, Ch
 496. *Senecio jacobaea* L., Asteraceae, H
 497. *Senecio vulgaris* L., Asteraceae, H
 498. *Serratula radiata* (Waldst. et Kit.) M.Bieb., Asteraceae, H
 499. *Seseli montanum* L., Apiaceae, H
 500. *Seseli montanum* L. ssp. *tommasinii* (Rchb. f.) Arcang., Apiaceae, H, E
 501. *Seseli pallasii* Besser, Apiaceae, H
 502. *Seseli tomentosum* Vis., Apiaceae, H, NT, sE
 503. *Sesleria autumnalis* (Scop.) F. W. Schutz, Poaceae, H
 504. *Sesleria robusta* Schott, Nyman et Kotschy, Poaceae, H
 505. *Sesleria tenuifolia* Schrad., Poaceae, H
 506. *Sesleria tenuifolia* Schrad. ssp. *tenuifolia*, Poaceae, H
 507. *Setaria viridis* (L.) Beauv., Poaceae, T
 508. *Sideritis romana* L., Lamiaceae, T
 509. *Silene italica* (L.) Pers., Caryophyllaceae, H
 510. *Silene latifolia* Poir. ssp. *alba* (Mill.) Greuter et Bourdet, Caryophyllaceae, H
 511. *Silene nutans* L., Caryophyllaceae, H
 512. *Silene pendula* L., Caryophyllaceae, T
 513. *Silene vulgaris* (Moench) Garcke, Caryophyllaceae, H
 514. *Sisymbrium officinale* (L.) Scop., Brassicaceae, T
 515. *Smyrnium perfoliatum* L., Apiaceae, H
 516. *Solanum nigrum* L., Solanaceae, T
 517. *Solanum villosum* Mill., Solanaceae, T
 518. *Solidago gigantea* Aiton, Asteraceae, G, Inv
 519. *Sonchus asper* (L.) Hill, Cichoriaceae, T
 520. *Sorbus aria* (L.) Crantz, Rosaceae, Ph
 521. *Sorbus domestica* L., Rosaceae, Ph
 522. *Sorbus torminalis* (L.) Crantz, Rosaceae, Ph
 523. *Sorghum halepense* (L.) Pers., Poaceae, G
 524. *Spartium junceum* L., Fabaceae, N
 525. *Spergula arvensis* L., Caryophyllaceae, T
 526. *Spiraea cana* Waldst. et Kit., Rosaceae, Ch, DD
 527. *Stachys germanica* L., Lamiaceae, H
 528. *Stachys maritima* Gouan, Lamiaceae, H
 529. *Stellaria media* (L.) Vill., Caryophyllaceae, T
 530. *Stipa bromoides* (L.) Dörf., Poaceae, H
 531. *Stipa pennata* L. ssp. *ericaulis* (Borbás) Martinovský et Skalický, Poaceae, H
 532. *Tagetes minuta* L., Asteraceae, T, Inv
 533. *Tamus communis* L., Dioscoreaceae, G
 534. *Tanacetum cinerariifolium* (Trevir.) Sch. Bip., Asteraceae, H, E
 535. *Tanacetum corymbosum* (L.) Sch. Bip., Asteraceae, H
 536. *Taraxacum officinale* Weber, Cichoriaceae, H
 537. *Teucrium arduini* L., Lamiaceae, H, DD, E
 538. *Teucrium chamaedrys* L., Lamiaceae, Ch
 539. *Teucrium montanum* L., Lamiaceae, Ch
 540. *Teucrium polium* L., Lamiaceae, Ch
 541. *Teucrium polium* L. ssp. *capitatum* (L.) Arcang., Lamiaceae, Ch
 542. *Thalictrum aquilegifolium* L., Ranunculaceae, H
 543. *Thalictrum minus* L., Ranunculaceae, H
 544. *Thesium arvense* Horv., Santalaceae, H
 545. *Thesium linophyllon* L., Santalaceae, G
 546. *Thlaspi praecox* Wulfen, Brassicaceae, Ch
 547. *Thymus bracteosus* Vis. ex Benth., Lamiaceae, Ch, E
 548. *Thymus longicaulis* C. Presl, Lamiaceae, Ch
 549. *Thymus striatus* Vahl., Lamiaceae, Ch
 550. *Thymus vulgaris* L., Lamiaceae, Ch
 551. *Tordylium apulum* L., Apiaceae, T
 552. *Tordylium maximum* L., Apiaceae, T
 553. *Torilis nodosa* (L.) Gaertn., Apiaceae, T
 554. *Tragopogon dubius* Scop., Cichoriaceae, H
 555. *Trifolium alpestre* L., Fabaceae, H
 556. *Trifolium angustifolium* L., Fabaceae, T
 557. *Trifolium arvense* L., Fabaceae, T
 558. *Trifolium aureum* Pollich, Fabaceae, T
 559. *Trifolium campestre* Schreber, Fabaceae, T
 560. *Trifolium dalmaticum* Vis., Fabaceae, T, E
 561. *Trifolium incarnatum* L., Fabaceae, T
 562. *Trifolium montanum* L., Fabaceae, H
 563. *Trifolium nigrescens* Viv., Fabaceae, T
 564. *Trifolium pratense* L., Fabaceae, H
 565. *Trifolium repens* L., Fabaceae, Ch
 566. *Trifolium subterraneum* L., Fabaceae, T
 567. *Tulipa sylvestris* L., Liliaceae, G, NT
 568. *Tussilago farfara* L., Asteraceae, G
 569. *Ulmus minor* Miller, Ulmaceae, Ph
 570. *Urtica dioica* L., Urticaceae, H
 571. *Valantia muralis* L., Rubiaceae, T
 572. *Valeriana montana* L., Valerianaceae, H
 573. *Valeriana officinalis* L., Valerianaceae, H
 574. *Valeriana tuberosa* L., Valerianaceae, H
 575. *Valerianella locusta* (L.) Laterrade, Valerianaceae, T
 576. *Valerianella rimosa* Bastard, Valerianaceae, T
 577. *Verbascum chaixii* Vill., Scrophulariaceae, H
 578. *Verbascum lanatum* Schrad., Scrophulariaceae, H
 579. *Verbascum macrurum* Ten., Scrophulariaceae, H
 580. *Verbascum phoeniceum* L., Scrophulariaceae, H
 581. *Veronica austriaca* L. ssp. *austriaca*, Scrophulariaceae, H
 582. *Veronica chamaedrys* L., Scrophulariaceae, H
 583. *Veronica persica* Poir., Scrophulariaceae, T, Inv
 584. *Veronica teucrium* L., Scrophulariaceae, Ch
 585. *Vicia cracca* L., Fabaceae, H
 586. *Vicia faba* L., Fabaceae, T
 587. *Vicia grandiflora* Scop., Fabaceae, T
 588. *Vicia hybrida* L., Fabaceae, T
 589. *Vicia lathyroides* L., Fabaceae, T
 590. *Vicia lutea* L., Fabaceae, T
 591. *Vicia melanops* Sm., Fabaceae, T
 592. *Vicia narbonensis* L., Fabaceae, T
 593. *Vicia ochroleuca* Ten. ssp. *dinara* (K. Malý) Rohlena, Fabaceae, H, E
 594. *Vicia sativa* L., Fabaceae, T
 595. *Vicia tetrasperma* (L.) Schreber, Fabaceae, T
 596. *Vincetoxicum hirundinaria* Medik., Asclepiadaceae, H
 597. *Vincetoxicum hirundinaria* Medik. ssp. *adriaticum* (Beck) Markgr., Asclepiadaceae, H, E
 598. *Viola arvensis* Murray, Violaceae, T
 599. *Viola odorata* L., Violaceae, H
 600. *Viola tricolor* L., Violaceae, T
 601. *Vitex agnus-castus* L., Verbenaceae, Ph
 602. *Vitis vinifera* L. ssp. *sylvestris* (C. C. Gmel.) Hegi, Vitaceae, Ph, LC
 603. *Vulpia ciliata* Dumort., Poaceae, T
 604. *Xanthium strumarium* L. ssp. *italicum* (Moretti) D. Löve, Poaceae, T, Inv

Abbreviations used for life forms: Ch (*Chamaephyta*), G (*Geophyta*), H (*Hemicryptophyta*), Ph (*Phanerophyta*), T (*Therophyta*); for IUCN categories: CR (Critically endangered), EN (Endangered), VU (Vulnerable), LC (Least Concern), NT (Near Threatened), DD (Data Deficient); for endemic status: endemic (E), stenoendemic (sE); and for invasiveness (Inv).

Kratice koje se koriste za životne oblike: Ch (*Chamaephyta*), G (*Geophyta*), H (*Hemicryptophyta*), Ph (*Phanerophyta*), T (*Therophyta*); za IUCN kategorije: CR (kritično ugroženi), EN (ugroženi), VU (ranjivi), LC (najmanje zabrinjavajući), NT (gotovo ugroženi), DD (nedostatak podataka); za endemični status: endemski (E), stenoendemski (sE); i za invazivnost (Inv).



Figure 3. Some of endemic taxa of Matokit Mt: a) *Seseli tomentosum* Vis., b) *Lilium martagon* L. ssp. *cattaniae* (Vis.) Degen, c) *Vicia ochroleuca* Ten. ssp. *dinara* (K. Malý) Rohlena, d) *Cardamine fialae* Fritsch, e) *Centaurea glaberrima* Tausch, f) *Linaria microsepala* A. Kern. (Photos by authors)

Slika 3. Neke endemične svojite planine Matokit: a) *Seseli tomentosum* Vis., b) *Lilium martagon* L. ssp. *cattaniae* (Vis.) Degen, c) *Vicia ochroleuca* Ten. ssp. *dinara* (K. Malý) Rohlena, d) *Cardamine fialae* Fritsch, e) *Centaurea glaberrima* Tausch, f) *Linaria microsepala* A. Kern. (autorske fotografije)

According to the Croatian Red List (Nikolić 2019b) a total of 36 taxa were found (Tab. 3). Two species (*Papaver argemone* and *Consolida ajacis*) are Critically Endangered (CR), one species (*Hibiscus trionum*) is Endangered (EN), while five species are classified as Vulnerable (VU). From the other IUCN categories, 16 taxa have been classified as Nearly Threatened (NT), 6 are of Least Concern (LC) and 6 were found to be Data Deficient (DD). Seventeen invasive and 32 endemic vascular plant taxa were recorded, of which 26 endemics in a broader sense and 6 stenoendemics (Tab. 3, Fig. 3).

The vascular flora of Matokit Mt was studied for the first time systematically and here is presented the first comprehensive floristic list of 604 vascular plant taxa, of different habitats, mostly grasslands in succession, rocky crevices and forest fringes, as well as a short overview on some interesting taxa in the flora Matokit Mt as a part of Biokovo massif. Floristic richness of the studied area is high, in comparison to several Croatian mountains along the eastern Adriatic coast especially considering the size of the area (Nikolić et al. 2008). The number of recorded plant taxa in comparison with similar floristic researches of the Dalmatian littoral mountains is quite similar. According to Kamenjarin (1996) in the flora of Kozjak Mt above Split 604 plant taxa were recorded, about 600 taxa were recorded in the flora of Mosor Mt (Bedalov and Šegulja 1987; Vladović and Ilijanić 1992, 1993, 1995). For Biokovo Mt the number of more than 1400 recorded taxa is result of more intensive and detailed floristic studies performed in the past (Hršak and Alegro 2008).

The occurrence of families *Fabaceae* (9.9%), *Poaceae* (9.1%), *Asteraceae* (7.4%) and *Lamiaceae* (6.8%) in the flora of Matokit Mt is quite normally distributed according to Nikolić (2001). The domination of hemicryptophytes (39.9%) and therophytes (26.2%) in the flora of Matokit Mt, as well as moderate present of geophytes (12.4%), phanerophytes and chamaephytes (10.8%) indicates high influence of the Mediterranean climate according to Horvat (1949).

In the flora of Matokit Mt a total of 32 endemic taxa were found (Tab. 3). Majority of endemic taxa were found within the vegetation of Natura 2000 grasslands and pastures in different succession stages e.g. a combination of rocky pastures of *Chrysopogono grylli-Saturejion subspicatae* Horvat & Horvatić ex Černjavski, Grebenščikov & Pavlović 1949 and grasslands of *Saturejion subspicatae* Tomić-Stanković 1970, as well as within chasmophytic vegetation of the *Centaureo cuspidatae-Portenschlagiellion ramosissimae* Trinajstić ex Terzi et Di Pietro 2016. Especially interesting for the Croatian flora are the findings of recently recorded *Cardamine fialae* in the flora of Matokit Mt (Vukojević et al. 2016). The species grows on lower altitudes in rocky ground within the vegetation of forest fringes and secondary also in ruderal places, in arable fields, on shady screes and very rarely in rock crevices (Vukojević et al. 2016). All new localities in Croatia are close to Klobuk (*locus classicus*) in Bosnia and Herzegovina. Another Balkan endemic taxon, *Erysimum croaticum*, recently described by Polatschek (2013) from Zadvarje in Croatia was found in the flora of Matokit Mt there were a few individuals on screes of southern slopes. According to Polatschek (2013) this species is distributed in West Kosovo and Dalmatia (Mosor, Omiš, Brela region, Zadvarje and Makarska) and the new locality on Matokit Mt within Biokovo massif contributes to a better understanding of species distribution.

A spontaneous hybridogenic *Iris* population, evidently hybrid between *I. illyrica* and *I. pseudopallida* was recorded. Several populations with a few individuals growing within rocky grassland at higher altitudes (approximately 900-1000 m a.s.l.) were found. In the Flora Croatica Database (Nikolić 2019a) this taxon is not listed, and the occurrence of this *Iris* hybrid is not surprising because Matokit Mt represents the overlapping distribution area of *I. illyrica* and *I. pseudopallida*, and it could be found anywhere along the Adriatic littoral where parental species occur. Although those hybrids are known from literature in Croatian flora (Mitić et al. 2000, 2001, 2013; Biljaković 2002) taxonomical status of this hybrid is questionable and was not a subject of this research.

Some narrowly distributed species of the Croatian flora were also found in the flora of Matokit Mt e.g. *Thymus bracteosus* and *Linaria microsepala*. For endemic taxon *Vicia ochroleuca* ssp. *dinara*, the Matokit Mt represents the

southernmost limit of its distribution. In addition, the northern slopes of Matokit Mt are the southernmost sites for the following taxa: *Myrrhoides nodosa*, *Centaurea pannonica*, and *Saxifraga rotundifolia*.

Within this floristic research we recorded 17 invasive plant taxa (Tab. 3) that were previously recorded by Vukojević (2011), Vukojević and Vitasović Kosić (2012). The tendency of uncontrolled spread indicates *Ailanthus altissima* and *Ambrosia artemisiifolia*, and limited expansion show: *Amaranthus retroflexus*, *Xanthium strumarium* ssp. *italicum*, *Robinia pseudoacacia* and *Broussonetia papyrifera*. All inventoried invasive species are in the habitat of abandoned arable land except for *Robinia pseudoacacia*, which spreads from the forest edge to the rocky grasslands. Some of the inventoried invasive plant species, are used as ornamental trees and shrubs in gardens in the studied area; e.g. *Broussonetia papyrifera*, *Robinia pseudoacacia*, *Phytolacca americana*, *Parthenocissus quinquefolia*, *Oenothera biennis*, *Solidago gigantea* and *Ailanthus altissima* (Tab. 3). They could be replaced by planting attractive plant species, naturalized in the Mediterranean area, such as *Celtis australis*, *Cercis siliquastrum* and *Ficus carica* (Vukojević and Vitasović Kosić 2012).

The main problem in studied area is a high degree of vegetation degradation which is mostly present in lower zones (up to 400 meters). Because of strong human emigration from mountainous areas cattle-raising in northern settlements is almost completely abandoned (Vukosav 2006) and that endangered grassland habitats. Invasive species and grasslands in different stages of succession (mostly in a form of maquis and garrigue communities) occupy increasingly large areas mostly on abandoned arable land (Vukojević and Vitasović Kosić 2012). Grassland habitats succession and consequently the loss of endangered and endemic taxa contributes to the long-lasting succession of *Juniperus oxycedrus* L., which is a consequence of reduced grazing (sheep and goat) in this area.

During the year 2014 the reforestation of Aleppo pine (*Pinus halepensis*) was noticed. This management of reforestation resulted in an additional reduction of the grassland surface and significant loss of natural flora and vegetation, additionally threatening endemic and endangered taxa. Similarly, it has already happened in the nearby area of Orah Hill (on its southern slopes), that was afforested approximately 25 years ago, and already has today lost its natural grassland vegetation and flora diversity.

The flora diversity depends on human (non)activity (agriculture, urbanization). Therefore, proper management (regular mowing of meadows, pasture grazing, and maintenance of arable land) will help to create better conditions for the development of agriculture and sheep farming, while it can also reduce the spread of invasive plant taxa

and contribute to conservation of plant diversity. In order to preserve the grassland habitats for endangered and endemic taxa we suggest the introduction of educational workshops for local residents and hunting associations.

To keep plant richness in this area, special attention in the future should be paid to its protection and conservation through management measures, such as maintaining a general low pressure of grazing by means of grazing rotation, to prevent the process of secondary succession and the spread of unpalatable competitive tall grasses at a landscape level (Vitasović Kosić et al. 2014). Here presented results are very important, because this is the first inventory of flora here, even though the area is a part of the Biokovo *sensu lato* and Dinaric mountains, which are known for extremely high plant diversity. Species inventories presented here are the basic information needed for conservation of flora and habitats. It also represents a background for future monitoring especially the decline of grasslands area, and harbouring habitats for rare species found on Matokit Mt. Therefore, we hope this information should become accessible for broader audience and future conservation planning.

CONCLUSIONS ZAKLJUČCI

The first detailed floristic study for Matokit Mt recorded a total of 604 vascular plant taxa on grasslands in different succession stages, rocky crevices and forest fringes habitats. Herbarium specimens (345 sheets) were collected, digitalized (206), deposited and are accessible in on-line ZAGR Herbarium. The results of this study point to the high plant richness in the study area as a result of various biotic and abiotic factors, conditioned further by geological variety, soil, topography and microclimatic factors. The Matokit Mt represents a new site for the Flora of Croatia, especially for endemic (32), and endangered (36) taxa. The occurrence of some very rare endemics (*Erysimum croaticum* and *Cardamine fialae* (until now the only known site in Croatia)) in the flora of Matokit Mt is of special interest for the national flora. In addition, the north slopes of the Matokit Mt are the southernmost findings for some taxa: *Myrrhoides nodosa*, *Centaurea pannonica*, and *Saxifraga rotundifolia*. The reduction of the area of rocky grasslands in the studied area as a result of the strong human emigration, rapid abandonment of agriculture and livestock breeding, reforestation of *Pinus halepensis*, and a long-lasting succession of *Juniperus oxycedrus* has been evident. Such loss of grassland habitats leads to endangerment of some protected (CR, EN, and VU) and endemic plant species, at the same time abandoning of agricultural habitats around Town Vrgorac.

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SAŽETAK

Istraživana je vaskularna flora planine Matokita (Biokovo masiv) u južnoj Hrvatskoj u različitim vegetacijskim razdobljima od 2010.-2015., a pronađene su ukupno 604 vaskularne biljne svojte, iz 86 porodica i 337 rodova. Proučavano područje nikada nije istraženo u prošlosti i ovo su prvi detaljni floristički podaci za travnjake u različitim stadijima zarastanja. Sakupljeni herbarijski uzorci (345 listova) digitalizirani su i dostupni su na ZAGR herbariju on-line (<http://herbarium.agr.hr>). Dominantne porodice su mahunarke (*Fabaceae* 9,9%), trave (*Poaceae* 9,1%), glavočike cjevnjače (*Asteraceae* 7,4%) i usnjače (*Lamiaceae* 6,8%). Analiza životnih oblika pokazuje da su na planini Matokit dominantni hemikriptofiti (39,9%) i terofiti (26,2%) što ukazuje na veliki utjecaj mediteranske klime. Na istraživanom području zabilježeno je 36 ugroženih i 17 invazivnih biljnih svojti. Ukupno 32 biljne svojte su endemične (26 endema u širem smislu i 6 stenoendema) i predstavljaju nova nalazišta u flori Hrvatske. Pojava nekih vrlo rijetkih endema (*Cardamine fialae* Fritsch i *Erysimum croaticum* Polatschek) u flori Matokita od posebnog su interesa za nacionalnu floru.

KLJUČNE RIJEČI: biljna raznolikost, endemične vrste, sukcesija travnjaka, Vrgorac