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FLORA, VEGETATION AND IMPORTANT HABITAT TYPES OF ARID KARST FIELDS IN PIPERI (MONTENEGRO)

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The Kopilje, Radovče, and Gostilje Martiničko are arid karst fields located in the Piperi region of central Montenegro, at altitudes ranging from 600 to 950 meters above sea level. These fields are found within zones of thermophilous hornbeam and oak forests, as well as mesophilous beech forests. Despite covering a relatively small area of approximately 7.4 km², these three fields are home to a rich diversity of plant life, with 480 species and subspecies of vascular plants recorded, belonging to 284 genera and 63 families. The most species-rich families are Asteraceae, Fabaceae, and Poaceae, while the genera *Trifolium*, *Medicago*, *Veronica*, and *Geranium* are among the most diverse. Hemicryptophytes dominate the life forms, with significant participation from therophytes and geophytes. In terms of chorology, Eurimediterranean species predominate. Eighteen species found in the area are of conservation importance, with three species — *Galatella linosyris*, *Crocus weldenii* f. *lutescens*, and *Succisella petteri* — being particularly notable as they occur only in one or a few localities in Montenegro. The semi-natural grassland vegetation of these karst fields is unique, represented by nine plant communities. Three of these communities are exclusive to the karst fields in Piperi: *Armerio canescenti-Festucetum illyricae chrysopogonetosum grylli*, *Ornithogalo comosi-Koelerietum pyramidatae artemisietosum albae*, and *Stipo eriocauli-Caricetum humilis*. With the exception of the ruderalized annual grasslands, the other grassland communities are vegetation equivalents of two NATURA 2000 habitat types: 62A0 and 6510, both of which are of significant ecological value.

Key words: dry grasslands; *Festuco-Brometea*; *Scorzoneretalia villosae*; *Saturejion subspicatae*; *Scorzonerion villosae*; *Arrhenatheretum*

INTRODUCTION

Karst fields are considered one of the most fascinating landscape features of the Dinaric Karst [1], as well as habitats where a unique flora has developed due to the specific geological-biological history and later zooanthropogenic activities [2–5]. In Montenegro, karst fields are found in the southern, western, and central regions. Settlements have mainly developed on their plains (Podgorica on Čemovsko polje, Cetinje on Cetinjsko polje, and Nikšić on Nikšić polje), and due to the fertility of the soil, parts

of these areas are cultivated (vineyards and orchards on Čemovsko polje, arable land on Grahovsko polje, and immortelle plantations on Kopilje) or used for pasture (Dragalj, Lukovo, Radovče). The landscape of these karst fields has been altered due to open-cast mining and the extraction of fluvioglacial sediments (Kopilje, Dragalj). The type of sediments that filled the slopes and formed the plains of the fields (morainic and/or fluvioglacial) links their formation to glaciation [1].

The geological history is reflected in the flora [6], which largely explains the composition of

the current flora and vegetation, as well as the presence of endemic and relict elements, all of which are of great significance for nature conservation [7, 8]. Of particular botanical value to Grahovsko polje are *Haplophyllum patavinum* (L.) G. Don, *Thymus bracteosus* Vis. ex Benth, *Dianthus knappii* (Pant.) Borbás, and from Kopilje, Radovče, Grahovsko polje, and Dragalj, *Hyacinthella dalmatica* Chouard, along with plant communities of East Submediterranean grasslands (*Scorzoneretalia villosae*) – NATURA 2000 habitat type 62A0 [5, 7, 8].

Regarding hydrology, three types of karst fields can be distinguished: dry, periodically flooded, and permanently flooded. Apart from Nikšićko polje, all other Montenegrin karst fields are dry and lack permanent watercourses. However, during autumn and spring, ephemeral watercourses may appear, causing localized and short-term flooding. Generally, the southern, western, and central regions of Montenegro, including Piperi, are characterized by dry and extremely hot summers [9], which promote the development of dry, semi-arid to temperate grassland vegetation. Dry grasslands are considered the most floristically rich yet least studied, particularly in southeastern Europe [10, 11]. To address this gap, this paper presents the characteristics of the flora, vegetation, and habitat types of karst arid grasslands in Piperi, specifically Kopilje, Radovče, and Gostilje Martiničko, and lists the associated threats, along with suggestions for management and sustainable use.

MATERIALS AND METHODS

Study area

In the central part of Montenegro, a typical karst area was formed, bordered by the Prekornica mountain to the north, the Ostroške Grede to the northwest, and the Morača valley to the southeast, as well as the flat karst fields of Kopilje and Radovče and the hilly surface of Gostilje Martiničko (Fig. 1). During the Neogene period, this area was covered by the waters of ancient lakes, which, through post-Neogene drainage, created the plains of today's fields.

Kopilje Polje is situated at its lowest point at 604 m above sea level. It spans an area of 3.42 km² and stretches in a north-south direction. It is bordered by Krivac to the east, Kopiljske Strane to the north, Obruč to the northwest, Kozica to the west, Košutica to the southwest, and Mikulica to the southeast. Through Branjevina, it is connected to the Bjelopavlička Ravnica, through which the Mediterranean climate influence is transmitted

[12]. The geological substrate is of glaciofluvial origin, primarily consisting of a gravelly-pulverized fraction with interlayers of earthy components, occasionally silt, and conglomerate [13].

In the northwest, at an altitude of 800–850 m, lies Gostilje Martiničko. It covers an area of 0.73 km² and, unlike the flat Kopilje Polje, features a hilly terrain with prominent moraines and fluvio-glacial drifts. It stretches from east to west. To the southwest, it borders Kopiljske Strane; to the northeast, it is bounded by Pantelijev Vrh; to the southeast, it opens towards Bjelopavlička Ravnica; and to the northwest, it is separated from Brajovičko Gostilje by moraine ridges.

To the northeast lies the highest (850–900 m) and largest (3.48 km²) field – Radovče. It borders Kopiljske Strane, Radojev Brijeg to the north, Bijela Glava to the southeast, Živa, Jehova Glava, and Lazareva Struna to the east, Crnac Strane to the northeast, the foothills of Konjica to the north, Bradvi to the northwest, Medna Glava to the west, and Pantelijev Vrh to the southwest. The surface is gently undulating and consists of glaciofluvial and moraine deposits [14].

As previously mentioned, the fields were once covered by a lake, and the subsequent drift of glacial rivers contributed to the formation of their plains. Traces of the ancient Kopiljska Rijeka are still visible in the central part of the field. Currently, no surface water, even temporarily, forms on the fields. Due to the higher permeability of the substrate, atmospheric water quickly sinks into the ground and flows through underground channels into the Bjelopavlička Ravnica. However, a small portion remains above the less permeable marl deposits, where wells have been dug. The soil in the fields is of the rendzine type [15].

The climate of Piperi is classified as perhumid sub-Mediterranean, characterized by slightly cooler winters and long, hot, dry summers. The average annual rainfall is 2349 l/m², with the highest amounts (40 %) occurring between November and January. The driest months are June, July, and August, when only 12 % of the annual rainfall is received. The high relative annual fluctuation index of 12 % indicates the uneven distribution of precipitation, with highly contrasting rainy and dry seasons. The amount of precipitation in the rainy quarter exceeds that in the dry quarter by 70 %. The warmest months are July and August, while the coldest are January and February. The average annual temperature is 20 °C, with fluctuations of up to ± 110 %. The prevailing winds come from the north (22 %) and south (14 %), while about a third of the days are windless (Micevski, pers. comm., 2001).

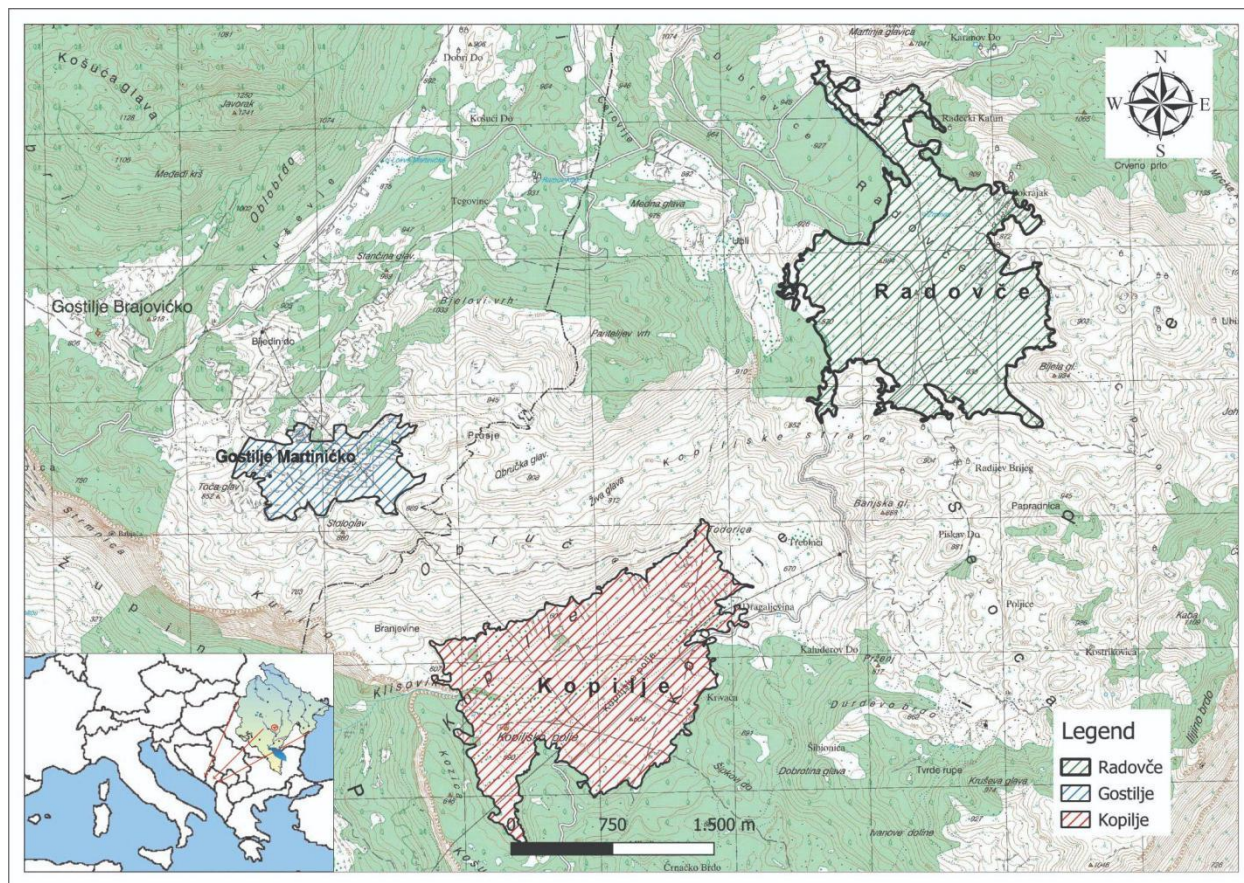


Figure 1. Geographic location of the investigated karst fields: Koplje, Radovče, and Gostilje Martiničko in Montenegro.

Fieldwork

Research on the flora, vegetation, and habitats of the arid karst fields in Piperi was conducted between 2018 and 2024. Data on flora were collected during the spring, summer, and autumn periods. To define the NATURA 2000 habitat types, a phytocenological survey was carried out from June to early July, during the peak of the growing season. A total of 68 phytocenological relevés were made using the Braun-Blanquet method [16], with plots of uniform size (25 m²).

Data analysis

The collected plant material was herbarized and deposited in the herbarium collection of the University of Montenegro (TGU!). The taxa were identified to species or subspecies using the following identification keys [17–19]. The nomenclature is harmonized with EURO+MED (2006–) [20].

Life forms and chorotypes follow Pignatti [21], while the conservation status is based on the Official Gazette of the Republic of Montenegro [22], Stevanović et al. [6], the Council Directive

[23], and CITES [24]. The invasive status of alien species in Montenegro follows Stešević and Petrović [25] and Stešević and Caković [26].

The similarity index of the flora in the karst fields was calculated using Sørensen's formula [27]: $C_s = 2ab / (a + b)$, where 'a' represents the number of taxa found in karst field A, 'b' is the number of taxa in karst field B, and 'ab' is the number of taxa shared by both fields.

The relevés were stored in TURBOVEG [28] and included in Montenegro's national vegetation database (GIVD EU-ME-001) [29].

Habitat mapping was conducted using QGIS [30] in the WGS 84 / UTM zone 34N coordinate system. The following habitat types were mapped: 62A0 – Eastern sub-Mediterranean dry grasslands (*Scorzonera villosa*), 6510 – Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*), and Annual grasslands.

Syntaxonomical concepts and nomenclature treatment of plant communities follow Stanišić-Vujačić [31].

Abbreviations used in the check list: Life forms: T – therophytes, H – hemicrotophytes, Ch – chamaephytes, G – geophytes, P – phanero-

phytes; Chorological element: ADV – alien plant, AS – Asian, ATL – Atlantic, BALK – Balkan, CAUCAS – Caucasian, CIRCUMBOR – Circumboreal, COSM – Cosmopolitan, END – Endemic plant of the Balkan Peninsula, EURO – European, EURIMED – Eurimediterranean, MED – Mediterranean, MONT – Montane, OR – Oriental, OROF – Orophyte, PALEOTEMP – Paleotemperate, PONT – Pontic, SIB – Sibiarian, STENOMED – Stenomediterranean, SUBCOSM – Subcosmopolitan, SUBEND – Subendemic plant, SUBMED – Submediterranean, TUR – Turanian; Sites: G – Gostilje, K – Kopilje, R – Radovče; Habitat: 62A0 – Eastern submediterranean dry grasslands (*Scorzoneratalia villosae*), 6510 – Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*), ANGRAS – Annual grasslands, FOR – Forest, FOREDG – Forest edge, GRAEX – Gravel excavation, RUD – Ruderal; association: AA-FI-TYP – *Armerio canescenti-Festucetum illyricae-typicum*, AA-FI-CG – *Armerio canescenti-Festucetum illyricae-chrysopogonetosum grylii*, GP-AC – *Gladiolo palustri-Agrostietum castellana*, OC-KP-AA – *Ornithogalo comosi-Koelerietum pyramidatae artemisietosum albae*, OC-KP-TYP – *Ornithogalo comosi-Koelerietum pyramidatae typicum*, RB-AE – *Ranunculo bulbosi-Arrhenatheretum elatioris*, SS-ET – *Saturejo subspicatae-Edraianthetum tenuifolii*, SE-CH – *Stipo erio-cauli-Caricetum humilis*; Conservation status: *National legislation, **International legislation: a-Habitat Directiva, b- CITES); ¹Invasive species.

RESULTS

The checklist of vascular plants of the karst fields in Piperi (Montenegro) includes 480 species and subspecies, 284 genera and 63 families. The taxa are arranged alphabetically and grouped by families, which are also arranged alphabetically. The following information is listed for each species: life form, chorotype, occurrence in karst fields, literature source, habitat type, association, conservation status and invasiveness. Not all parameters are available for each species.

Amaranthaceae

¹*Amaranthus retroflexus* L.; T; ADV; K; R; G; RUD

Amaryllidaceae

Allium flavum L.; G; EURIMED; K; R; G; 62A0 GP-AC, SS-ET, SE-CH

Allium guttatum subsp. *dalmaticum* (A.Kern. ex Janch.) Stearn; G; END; K; R; G; 62A0 AC-FI-CG, GP-AC, OC-KP, SS-ET, SE-CH

Allium lusitanicum Lam.; G; SE-S.SIB; R; 62A0 SS-ET, SE-CH

Allium sphaerocephalon L.; G; PALEOTEMP; K; R; G; 62A0 AC-FI-TYP, OC-KP-AA, SS-ET, SE-CH

^{**b}*Galanthus reginae-olgae* subsp. *vernalis* Kama-ri; G; END; K; R; G; FOREDG; FOR

^{***a}*Gladiolus palustris* Gaudin; G; C.EURO; K; R; G; 62A0 AC-FI-CG, GP-AC, SE-CH

^{*}*Narcissus poeticus* subsp. *Radiiflorus* (Salisb.) Baker; G; OROF-S.EURO; K; R; G; 62A0 GP-AC, SE-CH

Apiaceae

Bunium alpinum subsp. *montanum* (W. D. J. Koch) P. W. Ball; G; END; K; R; G; 62A0 AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SE-CH, SS-ET *Bupleurum veronense* Turra; T; EURIMED; K; R; G; 62A0 GP-AC, OC-KP-AA, SS-ET, SE-CH

^{***}*Chaerophyllum coloratum* L.; H; END; K; R; G; ANGRAS; 62A0 AC-FI-CG, OC-KP-AA

Chaerophyllum nodosum (L.) Crantz; H; STENOMED; K; G; FOREDG

Daucus carota L.; H; COSM; K; R; G; RUD; 6510 RB-AE

Eryngium amethystinum L.; H; N.E.MED; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH; 6510 RB-AE

Malabaila aurea (Sm.) Boiss.; H; END; K; ANGRAS

Orlaya grandiflora (L.) Hoffm.; H; END; K; R; G; ANGRAS; 62A0 AC-FI-CG, OC-KP-AA

Peucedanum cervaria (L.) Lapeyr.; H; EUROSIB; R; FOREDG

Pimpinella major (L.) Huds.; H; EURO-CAUCAS; K; FOREDG

Pimpinella saxifraga L.; H; EURO-CAUCAS; K; R; G; FOREDG

Scandix pecten-veneris L.; T; EURIMED; K; R; G; RUD; FOREDG

Seseli montanum subsp. *tommasinii* (Rchb. f.) Arcang.; H; END; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH; 6510 RB-AE

Smyrniolum perfoliatum L.; H; EURIMED; K; G; FOREDG

Torilis arvensis (Huds.) Link; T; SUBCOSM; K; G; RUD; FOREDG

Apocynaceae

^{*}*Vincetoxicum huteri* Vis. & Asch.; H; END; K; R; G; FOREDG; 62A0 SE-CH

Araceae

Arum italicum Mill.; G; STENOMED; K; G; FOREDG

Aristolochiaceae

Aristolochia pallida Willd.; G; EURIMED; K; G; 62A0 AC-FI-TYP

Asparagaceae

Anthericum ramosum L.; G; SUBATL; R; FOREDG

Asparagus acutifolius L.; G; STENOMED; K; FOREDG

Convallaria majalis L.; G; CIRKUMBOR; K; R; G; FOREDG

**Hyacinthella dalmatica* Chouard; G; END; K; R; 62A0 GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH

Muscari botryoides (L.) Mill.; G; EURIMED; K; R; G; 62A0 OC-KP-AA

Muscari comosum (L.) Mill.; G; EURIMED; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-AA, SS-ET, SE-CH

Muscari neglectum Guss. ex Ten.; G; EURIMED; K; 62A0 SS-ET, SE-CH

Ornithogalum comosum L.; G; MED-MONT; K; R; G; ANGRAS; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP, SS-ET, SE-CH

Ornithogalum exscapum Ten.; G; N.EURIMED; K; 62A0 OC-KP-AA

Ornithogalum sphaerocarpum A.Kern.; G; SE-EURO; K; FOREDG

Prospero autumnale (L.) Speta; G; EURIMED; K; R; G; ANGRAS; 62A0 AC-FI-TYP, AC-FI-CG, OC-KP-AA, SS-ET, SE-CH

Ruscus aculeatus L.; G; EURIMED; K; R; G; FOR
Scilla bifolia L.; G; EURO-CAUCAS; K; G; FOREDG

Asteraceae

Achillea millefolium L.; H; EUROSIB; K; R; G; ANGRAS; 62A0 AC-FI-TYP, AC-FI-CG; 6510 RB-AE

Achillea nobilis L.; H; SE-S.SIB; K; 62A0 AC-FI-CG, GP-AC

Anthemis arvensis L.; T; COSM; K; 62A0 AC-FI-CG, OC-KP-AA

Artemisia alba Turra; CH; EURIMED; K; R; G; 2A0 AC-FI-CG, OC-KP-AA, SS-ET, SE-CH

Artemisia vulgaris L.; H; CIRKUMBOR; K; R; G; RUD

Bellis perennis L.; H; EURO-CAUCAS; G; RUD

Bombacilaena erecta (L.) Smoljan.; T; SE-S.SIB; K; 62A0 OC-KP-AA,

Carduus acanthoides L.; H; EURO-CAUCAS; K; R; G; RUD

Carduus collinus Waldst. & Kit.; H; S.EURO; K; 62A0 AC-FI-CG, OC-KP-AA

Carduus nutans subsp. *micropterus* (Borbás) Hayek; H; N.MED-MONT; K; ANGRAS; RUD

Carlina corymbosa L.; H; STENOMED; K; R; G; ANGRAS; RUD

Centaurea calcitrapa L.; H; SUBCOSM; K; RUD

Centaurea deusta Ten.; H; SUBEND; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-AA, SS-ET, SE-CH

Centaurea jacea subsp. *angustifolia* (DC.) Greml.; H; SE-S.SIB; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, SE-CH; 6510 RB-AE

Centaurea nicolai Bald.; H; END; K; R; G; 62A0 AC-FI-CG, SE-CH

Centaurea scabiosa L.; H; EURAS; K; G; 62A0 SE-CH

Centaurea solstitialis L.; H; COSM; K; G; RUD

Chondrilla juncea L.; H; SE-S.SIB; K; R; G; RUD; 62A0 OC-KP-AA; 6510 RB-AE

Cichorium intybus L.; H; COSM; K; R; G; RUD

Cirsium acaulon (L.) Scop.; H; EURO-CAUCAS; R; 62A0 GP-AC

Cirsium arvense (L.) Scop.; H; EURAS; K; R; G; RUD; 62A0 OC-KP-AA; 6510 RB-AE

Cirsium candelabrum Griseb.; H; END; K; G; RUD

Cirsium eriophorum (L.) Scop.; H; C.EURO; R; 62A0 OC-KP-AA

Cirsium vulgare (Savi) Ten.; H; PALEOTEMP; R; G; RUD

Cota segetalis (Ten.) Holub; H; S.EURO; K [32], *Anthemis brachycentros* Asch.); RUD

Crepis foetida L.; T; EURIMED; K; R; G; 62A0 OC-KP-AA

Crepis neglecta L.; T; NE.EURIMED; K; R; G; ANGRAS; 62A0 AC-FI-CG, OC-KP-AA, SS-ET, SE-CH; 510 RB-AE

Crepis sancta (L.) Bornm.; T; EURIMED-TURAN; K; ANGRAS; RUD

Echinops ritro subsp. *ruthenicus* (M. Bieb.) Nyman; H; STENOMED; K; G; 62A0 OC-KP-AA

ⁱ*Erigeron annuus* subsp. *septentrionalis* (Fernald & Wiegand) Wagenitz; T; ADV; K; R; G; RUD; 62A0 AC-FI-CG, OC-KP-AA

ⁱ*Erigeron canadensis* L.; T; ADV; K; G; RUD

ⁱ*Erigeron sumatrensis* Retz.; T; ADV; K; RUD

Eupatorium cannabinum L.; H; PALEOTEMP; R; G; RUD

Filago germanica (L.) Huds.; T; PALEOTEMP; K; G; 62A0 AC-FI-CG, OC-KP-AA, SE-CH

Galatella linoxyris (L.) Rchb. f.; H; SE-S.SIB; R; 62A0 SE-CH

ⁱ*Galinsoga parviflora* Cav.; T; ADV; K; G; RUD

Gelasia villosa (Scop.) Cass.; H; NE.EURIMED; K; 62A0 GP-AC, SE-CH

Hieracium heterogynum (Froel.) Gutermann; H; END; K; R; G; FOREDG

Hieracium tommasianum K. Malý; H; END; K; 62A0 OC-KP-AA

Hieracium umbellatum L.; H; CIRKUMBOR; R; FOREDG, 62A0 GP-AC

Hypochaeris radicata L.; H; EURO-CAUCAS; K; R; G; 62A0 GP-AC

Inula conyzae (Griess.) DC.; H; C.EURO-W.AS; K; R; G; FOREDG; 62A0 OC-KP-AA

Inula ensifolia L.; H; SE.EURO-PONT; K; R; G; 62A0 OC-KP-AA, SE-CH
Inula germanica L.; H; EURO; K; R; G; 62A0 GP-AC
Inula oculus-christi L.; H; S.EURO-W.AS; K; R; G; 62A0 AC-FI-CG, OC-KP-TYP, OC-KP-AA
Inula salicina L.; H; EURO-CAUCAS; K; R; G; FOREDG
Klasea radiata (Waldst. & Kit.) Á. Löve & D. Löve; H; BALK-C.EURO; K; 62A0 SE-CH
Lactuca serriola L.; H; EURIMED-S.SIB; K; R; G; RUD; ANGRAS
Lapsana communis L.; T; PALEOTEMP; K; R; G; FOREDG
Leontodon biscutellifolius DC.; H; BALK-C.EURO; K [32], *Leontodon asper* var. *glabrescens* Beck)
Leontodon crispus Vill.; H; SE-S.SIB; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH
Leucanthemum vulgare Lam.; H; EUROSIB; K; R; G; 62A0 AC-FI-CG
Logfia gallica (L.) Coss. & Germ.; T; EURIMED; K; G; 62A0 AC-FI-CG, OC-KP-AA
Onopordum acanthium L.; H; EURIMED-TURAN; K [32]; RUD
Picris hieracioides L.; H; EUROSIB; K; R; G; 62A0 AC-FI-CG; 6510 RB-AE
Pilosella bauhini (Schult.) Arv.-Touv.; H; SE-S.SIB; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH; 6510 RB-AE
Rhagadiolus stellatus (L.) Gaertn.; T; EURIMED; K; ANGRAS; FOREDG
Scorzonera cana (C. A. Mey.) Griseb.; H; SE.EURO-C.AS; K; 62A0 AC-FI-CG, OC-KP-AA
Scorzonera laciniata L.; H; PALEOTEMP; K; ANGRAS; 62A0 AC-FI-CG, OC-KP-AA
Senecio rupestris Waldst. & Kit.; H; OROF-S.EURO; K; R; G; RUD
Solidago virgaurea L.; H; CIRCUMBOR; R; FOREDG
Sonchus arvensis subsp. *uliginosus* (M. Bieb.) Nyman; H; COSM; K [32], *Sonchus uliginosus* (M. Bieb.) Nyman); G; RUD
Sonchus asper subsp. *glaucescens* (Jord.) Ball; T; COSM; K; R; G; RUD; 62A0 OC-KP-AA
Sonchus oleraceus L.; T; COSM; K; R; G; RUD; 62A0 OC-KP-AA
Taraxacum sect. *Ruderalia* Kirschner & al.; H; COSM; K; R; G; RUD
Tragopogon orientalis L.; R; 62A0 AC-FI-TYP, AC-FI-CG, OC-KP-AA, SE-CH; 6510 RB-AE
Tragopogon tommasinii Sch.Bip.; H; NE.EURIMED; K; R; G; 62A0 AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA

Tussilago farfara L.; H; PALEOTEMP; R; G; RUD

Boraginaceae

Aegonychon purpureocaeruleum (L.) Holub ; H; SE-PONT; K; R; G; FOREDG
Anchusa officinalis L.; H; PONT; R; RUD
Anchusella cretica (Mill.) Bigazzi, E. Nardi & Selvi; T; STENOMED-OR; K; R; G; 62A0 OC-KP-AA
Cerinthe minor subsp. *auriculata* (Ten.) Domac; H; S.EURO; K; 62A0 OC-KP-AA
Cynoglossum columnae Ten.; H; OROF-NE.MED; K; ANGRAS; 62A0 OC-KP-AA
Echium italicum L.; H; EURIMED; K; R; G; RUD; 62A0 AC-FI-CG
Echium vulgare L.; H; EURO; K; R; G; RUD
Heliotropium europaeum L.; T; EURIMED-TURAN; K; G; RUD
Lithospermum officinale L.; H; EUROSIB; R; G; FOREDG
Myosotis arvensis (L.) Hill; T; EURO-W.AS; K; R; G; ANGRAS
Myosotis ramosissima Rochel; T; EURO-CAUCAS; K; 62A0 AC-FI-CG, 6510 RB-AE
Onosma pseudoarenaria subsp. *fallax* (Borbás) Rauschert; H; END; K [33]; R; G; 62A0 GP-AC, OC-KP-AA, SS-ET, SE-CH
Onosma echioides (L.) L.; H; END; K; G; 62A0 OC-KP-AA

Brassicaceae

Aethionema saxatile (L.) W.T.Aiton; CH; MED-MONT; K; G; 62A0 SS-ET, SE-CH
Alliaria petiolata (M.Bieb.) Cavara & Grande; T; SUBCOSM; K; R; G; FOREDG
Alyssum montanum L.; H; C.EURO; K; R; G; Kopilje [32], 62A0 GP-AC, SE-CH
Alyssum simplex Rudolphi ; T; EURIMED; K; 62A0 OC-KP-TYP, OC-KP-AA
Arabis collina Ten.; CH; MED-MONT; K; 62A0 AC-FI-CG, OC-KP-AA
Barbarea intermedia Boreau; H; W.EURO; K; Kopilje [32]; RUD
Berteroa mutabilis (Vent.) DC.; H; NE.MED; K; R; G; ANGRAS; RUD
Bunias erucago L.; T; N.MED; K; G; ANGRAS
Capsella bursa-pastoris (L.) Medik.; T; COSM; K; RUD
Capsella rubella Reut.; T; EURIMED; K; R; G; RUD; 62A0 OC-KP-AA
Cardamine graeca L.; T; N.MED; K; R; G; FOREDG
Diplotaxis tenuifolia DC.; H; SUBMED-SUBATL; K; R; G; RUD
Draba muralis L.; T; N.MED-ATL; K; FOREDG

Draba verna L.; T; COSM; K; R; G; 62A0 OC-KP-AA, SS-ET, SE-CH

Peltaria alliacea Jacq.; H; SE.EURO; K; FOREDG

Pseudoturritis turrita (L.) Al-Shehbaz; H; S.EURO; K; R; G; FOREDG

Rorippa lippizensis (Wulfen) Rchb.; T; END; K; 62A0 OC-KP-AA, SE-CH

Sisymbrium officinale (L.) Scop.; T; COSM; K; R; G; RUD

Thlaspi perfoliatum L.; T; PALEOTEMP; K; G; 62A0 OC-KP-AA

Campanulaceae

Asyneuma limonifolium (L.) Janch.; H; NE.MED; G; FOREDG, 62A0 OC-KP-AA

Campanula bononiensis L.; H; SE-S.SIB; K; R [32]; G; FOREDG

Campanula lingulata Waldst. & Kit.; H; SUB-END; K; 62A0 AC-FI-TYP, OC-KP-AA

Campanula persicifolia L.; H; EUROAS; R; FOREDG

Campanula rapunculus L.; H; PALEOTEMP; K; R; G; 62A0 AC-FI-TYP

Campanula trachelium L.; H; PALEOTEMP; K; R; G; FOREDG

Edraianthus tenuifolius (Waldst. & Kit.) A. DC.; CH; END; K; R; G; 62A0 OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH

Caprifoliaceae

Lonicera etrusca Santi; P; EURIMED; K; G; FOREDG

Caryophyllaceae

Arenaria leptoclados (Rchb.) Guss.; T; PALEOTEMP; K; R; G; ANGRAS; RUD; 62A0 AC-FI-TYP, AC-FI-CG, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH; 6510 RB-AE

Cerastium brachypetalum Pers. subsp. *brachypetalum*; T; EURIMED; K; G; 62A0 OC-KP-TYP, OC-KP-AA; 6501 RB-AE

Cerastium pumilum subsp. *glutinatum* (Fr.) Jals; T; C-MED; K; R; G; ANGRAS; 62A0 AC-FI-TYP, AC-FI-CG, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH

Cerastium ligusticum subsp. *trichogynum* (Möschl) P. D. Sell & Whitehead; T; MED-PONT; K; 62A0 AC-FI-CG

Dianthus armeria L.; H; EURO-CAUCAS; R; ANGRAS

Dianthus carthusianorum aggr.; H; SE.OROF; K; R; G; 62A0 AC-FI-TYP, OC-KP-AA

Dianthus petraeus Waldst. & Kit.; H; END; R; 62A0 OC-KP-AA, SS-ET

Dianthus sylvestris Wulfen; H; MED-MONT; K; R; G; 62A0 GP-AC, OC-KP-AA, SS-ET, SE-CH

Herniaria glabra L.; T; PALEOTEMP; K; R; 62A0 OC-KP-AA, SS-ET, SE-CH

Moenchia mantica (L.) Bartl.; T; N.MED; K; R; G; 62A0 AC-FI-CG, OC-KP-AA

Paronychia kapela (Hacq.) A.Kern.; CH; MED-MONT; R; 62A0 SS-ET, SE-CH

Petrorhagia dubia (Raf.) G.López & Romo; T; STENOMED; K; R; G; ANGRAS, RUD

Petrorhagia prolifera (L.) P. W. Ball & Heywood; T; EURIMED; K; ANGRAS; 62A0 AC-FI-CG, OC-KP-AA

Petrorhagia saxifraga (L.) Link; CH; EURIMED; K; R; G; ANGRAS; 62A0 AC-FI-CG, SS-ET, SE-CH

Silene conica L.; T; PALEOTEMP; K; ANGRAS; 62A0 OC-KP-AA

Silene coronaria (L.) Clairv.; H; EURIMED-TURAN; K; R; FOREDG

Silene italica (L.) Pers.; H; EURIMED; K; R; G; 62A0 AC-FI-CG, OC-KP-AA

Silene latifolia subsp. *alba* (Mill.) Greuter & Burdet; H; PALEOTEMP; K; R; G; FOREDG, RUD

Silene otites (L.) Wibel; H; EUROAS; K; R; G; 62A0 OC-KP-TYP, OC-KP-AA, SE-CH

Silene vulgaris (Moench) Garcke; H; SUBCOSM; K; R; G; ANGRAS; 62A0 AC-FI-CG

Stellaria media (L.) Vill.; T; COSM; K; R; G; RUD, 62A0 AC-FI-CG, OC-KP-AA

Viscaria vulgaris Bernh.; H; EUROSIB; K; FOREDG

Celasteraceae

Euonymus europaeus L.; P; EUROAS; K; R; G; FOR

Chenopodiaceae

Chenopodium album L.; T; SUBCOSM; K; R; G; RUD

Cistaceae

Fumana procumbens (Dunal) Gren. & Godr.; CH; EURIMED-PONT; K; R; G; 62A0 OC-KP-AA, SS-ET, SE-CH

Helianthemum nummularium subsp. *obscurum* (Pers.) Holub; CH; EURO-CAUCAS; K; R; G; 62A0 AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH

Colchicaceae

Colchicum autumnale L.; G; C.EURO; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-AA

Convolvulaceae

Convolvulus arvensis L.; G; COSM; K; R; G; ANGRAS; 62A0 AC-FI-TYP, GP-AC; 6510 RB-AE

Convolvulus cantabrica L.; G; EURIMED; K; R; G; 62A0 OC-KP-AA, SS-ET

Cuscuta epithymum (L.) L.; T; EURAS; K; R; G; 62A0 AC-FI-TYP, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH

Cornaceae

Cornus mas L.; P; SE.EURO-CAUSAS; K; R; G; GRAEX; FOREDG

Corylaceae

Carpinus orientalis Mill.; P; SUBMED; K; G; GRAEX; FOREDG

Ostrya carpinifolia Scop.; P; MED-SUBMED; K; R; G; GRAEX; FOREDG

Crassulaceae

Sedum acre L.; CH; EURO-CAUCAS; R; 62A0 SE-CH

Sedum hispanicum L.; T; SE.EURO; K; R; G; 62A0 AC-FI-CG, OOC-KP-AA

Sedum sexangulare L.; CH; C.EURO; K; R; G; 62A0 AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH

Cupressaceae

Juniperus oxycedrus L.; P; MED-OR; K; R; G; FOR

Cyperaceae

Carex caryophylla Latourr.; H; EURAS; K; R; G; ANGRAS; 62A0 AC-FI-TYP, AC-FI-CG AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH; 6510 RB-AE

Carex distans L.; H; EURIMED; K; R; G; FOREDG

Carex flacca Schreb.; H; EURO; K; R; G; 62A0 GP-AC, OC-KP-AA

Carex humilis Leyss.; H; EURAS; K; R; G; 62A0 GP-AC, OC-KP-AA, SS-ET, SE-CH

Carex liparocarpus Gaudin; H; SE.EURO; K; 62A0 AC-FI-CG, OC-KP-AA, SS-ET

Juncaceae

Luzula campestris (L.) DC. aggr.; H; COSM; K; R; G; 62A0 AC-FI-TYP, GP-AC; 6510 RB-AE

Dennstaedtiaceae

Pteridium aquilinum (L.) Kuhn; G; COSM; R; G; FOREDG, RUD

Dioscoreaceae

Dioscorea communis (L.) Caddick & Wilkin; G; EURIMED; K; FOREDG

Dipsacaceae

Cephalaria leucantha (L.) Roem. & Schult; H; S.EURO; K; R; G; 62A0 OC-KP-TYP, OC-KP-AA, SE-CH

Knautia integrifolia L.; T; EURIMED; K; ANGRAS; 62A0 OC-KP-AA

Knautia purpurea (Vill.) Borbás; H; W.MED-PONT; K; R; G; 62A0 AC-FI-TYP, GP-AC; 6510 RB-AE

Scabiosa columbaria L.; H; EURAS; K; R; G; 62A0 GP-AC, OC-KP

Scabiosa ochroleuca L.; H; S.EURO-S.SIBIR; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, OC-KP-TYP, OC-KP-AA, SS-ET

Scabiosa triniifolia Friv.; H; END; K; R; ANGRAS; 62A0 AC-FI-CG, OC-KP-TYP, OC-KP-AA, SE-CH; 6510 RB-AE

Succisella petteri (Jos. Kern. & Murb.) Beck; H; END; K; RUD

Succisa pratensis Moench; H; EUROSIB; R; 62A0 GP-AC

Euphorbiaceae

Euphorbia cyparissias L.; T; C.EURO; K; R; G; ANGRAS; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SE-CH; 6510 RB-AE

Euphorbia falcata L.; T; EURIMED-TURAN; K; R; G; 62A0 OC-KP-AA

Euphorbia helioscopia L.; T; COSM; K; R; G; ANGRAS, RUD

Euphorbia myrsinites L.; CH; S.EURO-PONT; G; 62A0 SS-ET

Euphorbia spinosa L.; CH; N.MED; R; 62A0 SS-ET

Fabaceae

Anthyllis vulneraria subsp. *polyphylla* (DC.) Nyman; H; EURIMED; K; R; G; 62A0 AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH

Astragalus glycyphyllos L.; H; EURO-S.SIB; K; R; G; FOREDG, RUD

Astragalus monspessulanus subsp. *wulfenii* (W. D. J. Koch) Arcang.; CH; END; K; 62A0 SS-ET, SE-CH

Chamaecytisus hirsutus (L.) Link; CH; EUROSIB; K; GRAEX; FOREDG

Colutea arborescens L.; P; EURIMED; K; GRAEX; FOREDG

Dorycnium pentaphyllum subsp. *germanicum* (Gremli) Gams ; H; S.EURO-S.SIBIR; K; R; G; 62A0 GP-AC, SE-CH, OC-KP-AA

Genista sericea Wulfen ; CH; END; K; R; G; 62A0 GP-AC

Genista sylvestris subsp. *dalmatica* (Bartl.) H. Lindb.; CH; END; K; R; 62A0 GP-AC, OC-KP-AA, SE-CH

Genista tinctoria L.; CH; EURAS; R; Radovče [32], 62A0 GP-AC

Hippocrepis comosa L.; H; S.E.C.EURO; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SE-CH

Hippocrepis emerus subsp. *emeroides* (Boiss. & Spruner) Lassen; P; MED-PONT; K; GRAEX; FOREDG

Lathyrus aphaca L.; T; EURIMED; K; ANGRAS

Lathyrus cicera L.; T; EURIMED; K; R; G; ANGRAS; 62A0 OC-KP-AA

Lathyrus latifolius L.; H; SE.EURO; K; R; G; RUD; 62A0 OC-KP-AA

Lathyrus pratensis L.; H; PALEOTEMP; K; R; G; 6510 RB-AE

Lathyrus sphaericus Retz.; T; EURIMED; K; G; 62A0 AC-FI-CG

Lotus angustissimus L.; H; EURIMED; R; 6510 RB-AE

Lotus corniculatus L.; H; COSM; K; R; G; 62A0 AC-FI-TYP, GP-AC, OC-KP, SE-CH; 6510 RB-AE

Medicago arabica (L.) Huds.; T; EURIMED; K; G; ANGRAS; RUD

Medicago falcata L.; H; EURAS; K; RUD

Medicago lupulina L.; T; PALEOTEMP; K; R; G; 62A0 AC-FI-CG; 6510 RB-AE

Medicago minima (L.) L.; T; COSM; K; R; G; ANGRAS; 62A0 AC-FI-CG; OC-KP

Medicago orbicularis (L.) Bartal.; T; EURIMED; K; R; G; ANGRAS, RUD

Medicago prostrata Jacq.; CH; S.EURO; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, SS-ET, SE-CH; 6510 RB-AE

Medicago rigidula (L.) All.; T; EURIMED; K; ANGRAS

ⁱ*Medicago sativa* L.; H; ADV; K; R; 62A0 GP-AC
Ononis spinosa L.; G; EURIMED; K; R; G; 62A0 AC-FI-TYP, GP-AC; 6510 RB-AE

Securigera varia (L.) Lassen; H; SE.EURO; K; R; G; 62A0 AC-FI-CG

Trifolium incarnatum L.; T; EURIMED; K; R; G; ANGRAS; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC; 6510 RB-AE

Trifolium alpestre L.; H; EURO-CAUCAS; K; R; G; 62A0 GP-AC

Trifolium arvense L.; T; PALEOTEMP; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, OC-KP-AA

Trifolium campestre Schreb.; T; PALEOTEMP; K; R; G; ANGRAS; 62A0 AC-FI-CG, OC-KP, GP-AC, OC-KP-AA, SS-ET, SE-CH; 6510 RB-AE

Trifolium dalmaticum Vis.; T; END; K; ANGRAS; 62A0 AC-FI-TYP, AC-FI-CG, OC-KP-TYP, OC-KP-AA

Trifolium diffusum Ehrh.; T; S.EURO-CAUCAS; K; ANGRAS

Trifolium montanum L.; H; S.EURO-S.SIBIR; K; R; G; 62A0 AC-FI-TYP, GP-AC, OC-KP-AA, SE-CH; 6510 RB-AE

Trifolium nigrescens Viv.; T; EURIMED; K; ANGRAS; 62A0 AC-FI-CG

Trifolium patens Schreb.; T; W.SUBMED-ATL; K; G; ANGRAS

Trifolium patulum Tausch; H; NE.MED-MONT; G; 62A0 AC-FI-CG

Trifolium pratense L.; H; SUBCOSM; K; R; G; 62A0 AC-FI-TYP, GP-AC, OC-KP-AA; 6510 RB-AE

Trifolium repens L.; H; SUBCOSM; K; R; G; 6510 RB-AE

Trifolium scabrum L.; T; EURIMED; K; 62A0 AC-FI-CG, OC-KP-AA

Trifolium striatum L.; T; PALEOTEMP; K; 62A0 AC-FI-CG, OC-KP-AA

Trifolium strictum L.; T; EURIMED; K; R; G; 62A0 AC-FI-CG, OC-KP-AA, SS-ET, SE-CH

Trifolium subterraneum L.; T; EURIMED; K; ANGRAS; 62A0 AC-FI-CG, OC-KP-AA

Vicia cracca L.; H; EURAS; K; RUD

Vicia grandiflora Scop.; T; SE.EURO-PONT; K; R; G; ANGRAS; 62A0 AC-FI-CG, OC-KP-AA

Vicia sativa subsp. *nigra* (L.) Ehrh.; T; SUBCOSM; K; R; G; ANGRAS; 62A0 AC-FI-TYP, AC-FI-CG, OC-KP-AA; 6510 RB-AE

Vicia villosa subsp. *varia* (Host) Corb.; T; EURIMED; K; R; G; 62A0 AC-FI-CG, OC-KP-AA

Fagaceae

Quercus pubescens Willd.; P; SE.EURO-PONT; K; 62A0 AC-FI-CG

Gentianaceae

Blackstonia perfoliata (L.) Huds.; T; EURIMED; K; R; G; 62A0 AC-FI-CG

Centaureum erythraea Rafn; H; PALEOTEMP; K; R; G; ANGRAS; 62A0 AC-FI-CG, SE-CH

Centaureum pulchellum (Sw.) Druce; T; PALEOTEMP; K; 62A0 AC-FI-CG; OC-KP-AA

Gentiana cruciata L.; H; EURAS; R; G; 62A0 AC-FI-CG

Gentiana utriculosa L.; T; OROF-SE.EURO; R; G; 62A0 GP-AC

Geraniaceae

Erodium cicutarium (L.) L'Hér.; H; COSM; K; R; G; 62A0 OC-KP-AA

Geranium columbinum L.; T; EURO-S.SIB; K; ANGRAS; 62A0 AC-FI-TYP, AC-FI-CG, OC-KP-TYP, OC-KP-AA

Geranium dissectum L.; T; SUBCOSM; K; G; ANGRAS, RUD

Geranium lucidum L.; T; EURIMED; K; ANGRAS, RUD

Geranium molle L.; T; NE.MED; K; R; G; ANGRAS; 62A0 OC-KP-AA; 6510 RB-AE

Geranium purpureum Vill.; T; EURIMED; K; R; G; ANGRAS, RUD

Geranium rotundifolium L.; T; PALEOTEMP; K; G; ANGRAS; RUD

Geranium sanguineum L.; H; EURO-CAUCAS; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC; 6510 RB-AE

Hypericaceae

Hypericum perforatum L.; H; COSM; K; R; G; ANGRAS; 62A0 AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH; 6510 RB-AE

Iridaceae

Crocus dalmaticus Vis.; G; END; K; R; G; 62A0 GP-AC, SE-CH

Crocus tommasinianus Herb.; G; END; R; FOREDG

Crocus biflorus subsp. *weldenii* (Hoppe & Fürmr.) K. Richt. (*Crocus weldenii* f. *lutescens* Pulević); NE-STENOMED; K [36]; R; 62A0 GP-AC, SE-CH

Iris reichenbachii Heuff.; G; END; K; R; 62A0 GP-AC, SE-CH

Lamiaceae

Ajuga chamaepitys (L.) Schreb.; T; EURIMED; K; 62A0 SS-ET

Ajuga genevensis L.; H; EURAS; K; R; G; ANGRAS; 62A0 OC-KP-AA, SS-ET; 6510 RB-AE

Ballota hispanica (L.) Benth.; H; NE.MED-MONT; K; R; G; RUD

Clinopodium acinos (L.) Kuntze; T; EURIMED; K; R; G; ANGRAS; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET

Clinopodium menthifolium (Host) Stace; CH; EURO-CAUCAS; K; FOREDG

Clinopodium nepeta subsp. *glandulosum* (Req.) Govaerts; CH; MED-MONT; K; R; G; ANGRAS; 62A0 AC-FI-CG

Clinopodium thymifolium (Scop.) Kuntze; CH; END; K; FOREDG

Clinopodium vulgare L.; H; CIRCUMBOR; K; R; G; RUD; 62A0 AC-FI-CG, OC-KP-TYP, OC-KP-AA

Hyssopus officinalis subsp. *aristatus* (Godr.) Nyman; CH; OROF-SE.EURO; R [34]; FOREDG

Lamium maculatum (L.) L.; T; EURAS; K; R; G; FOREDG

Leonurus cardiaca L.; T; EURAS; K; R [32]; G; RUD

Marrubium incanum Desr.; H; SE.MED; K; R; G; ANGRAS; RUD

Mentha longifolia (L.) L.; H; END; K; R; G; RUD

Micromeria juliana (L.) Benth. ex Rchb; CH; STENOMED; K; 62A0 OC-KP-AA, SS-ET

Nepeta cataria L.; H; E.MED-TURAN; K; R; G; 62A0 AC-FI-CG

Origanum vulgare L.; H; EURAS; K; R; G; 62A0 AC-FI-CG

Prunella laciniata (L.) L.; H; EURIMED; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, OC-KP-TYP, OC-KP-AA, SE-CH

Prunella vulgaris L.; H; CIRCUMBOR; K; R; G; ANGRAS; RUD

Salvia pratensis subsp. *bertolonii* (Vis.) Soó; H; EURIMED; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SE-CH

Salvia verbenaca L.; H; MED-ATL; K; ANGRAS;

Salvia verticillata L.; H; SE-CAUSAS; K; R; G; ANGRAS

Satureja subspicata Bartl. ex Vis.; CH; END; K, R [32], *Satureja illyrica* Host); G; 62A0 AC-FI-CG, GP-AC, SS-ET, SE-CH

Stachys annua (L.) L.; T; EURIMED; K; RUD

Stachys germanica L.; H; EURIMED; K; R; G; 62A0 OC-KP-AA

Stachys officinalis (L.) Trevis.; H; EURO-CAUCAS; K; R; G; 62A0 AC-FI-TYP, GP-AC, OC-KP-AA, SE-CH

Teucrium capitatum L.; CH; STENOMED; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH

Teucrium chamaedrys L.; CH; EURIMED; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SE-CH; 6510 RB-AE

Teucrium montanum L.; CH; OROF.SE; K; R; G; 62A0 OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH

Thymus longicaulis C. Presl; CH; EURIMED; K; R; G; 62A0 AC-FI-TYP, GP-AC, OC-KP-AA, SS-ET, SE-CH

Thymus pulegioides L.; CH; EURAS; K; R; G; 62A0 AC-FI-CG, GP-AC; 6510 RB-AE

Vitex agnus-castus L.; P; STENOMED-TURAN; K; R; G; GRAEX

Liliaceae

Erythronium dens-canis L.; G; S.EURO-S.SIBIR; K; R; G; FOREDG

Fritillaria messanensis subsp. *gracilis* (Ebel) Rix; G; END; R; FOREDG

Lilium martagon L.; G; EURAS; R; FOREDG

Tulipa sylvestris L.; G; EURIMED; K; FOREDG

Linaceae

Linum bienne Mill.; H; EURIMED; K; 62A0 AC-FI-CG; OC-KP-TYP, OC-KP-AA

Linum catharticum L.; T; EURIMED; K; R; G; 62A0 GP-AC, SE-CH

Linum tenuifolium L.; H; SUBMED-PONT; K; R; G; 62A0 AC-FI-CG, GP-AC, SS-ET, SE-CH

Malvaceae

Abutilon theophrasti Medik.; T; ADV; K; RUD

Malva sylvestris L.; H; COSM; K; RUD

Oleaceae

Fraxinus ornus L.; P; SE.EURO; K; G; FOR

Ligustrum vulgare L.; P; EURO-W.AS; K; R; G; FOREDG

Onagraceae

Epilobium angustifolium L.; H; CIRCUMBOR; K; R; RUD

Orchidaceae

***^b*Anacamptis coriophora* (L.) R.M.Bateman, Pridgeon & M.W.Chase; G; EURIMED; K; R; G; 62A0 AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SE-CH

***^b*Anacamptis laxiflora* (Lam.) R. M. Bateman & al.; G; EURIMED; K; R; FOREDG

***^b*Anacamptis morio* (L.) R.M.Bateman, Pridgeon & M.W.Chase; G; EURO-CAUCAS; K; R; G; 62A0 AC-FI-CG, SS-ET, SE-CH

*,**^b*Anacamptis pyramidalis* (L.) Rich.; G; EURIMED; K; R; G; 62A0 AC-FI-CG

***^b*Gymnadenia conopsea* (L.) R.Br.; G; EURAS; K; 62A0 AC-FI-CG, GP-AC

**^b*Himantoglossum jankae* Somlyay & al; G; END; K; FOREDG

***^b*Neotinea ustulata* (L.) R. M. Bateman & al.; G; EURO-CAUCAS; K; R; G; 62A0 AC-FI-CG, GP-AC, SE-CH

***^b*Ophrys scolopax* subsp. *cornuta* (Steven) E.G.Camus; G; SE.EURO; K; R; G; FOREDG

***^b*Orchis provincialis* Balb. ex Lam. & DC.; G; STENOMED; K; R; G; 62A0 AC-FI-CG, GP-AC

***^b*Platanthera chlorantha* (Custer) Rchb.; G; EUROSIB; K; FOREDG

***^b*Serapias bergonii* E. G. Camus; G; STENOMED; K; G; 62A0 OC-KP-AA, SE-CH

***^b*Spiranthes spiralis* (L.) Chevall.; G; EURO-CAUCAS; K; FOREDG

Orobanchaceae

Euphrasia liburnica Wettst. ; T; OROF-S.EURO; K; R; G; 62A0 AC-FI-TYP, GP-AC, OC-KP-TYP, OC-KP-AA, SE-CH

Melampyrum barbatum subsp. *carstiense* Ronniger; R; T; SE.EURO; K; G; 62A0 AC-FI-CG, SE-CH

Odontites luteus (L.) Clairv.; T; EURIMED; K; R; G; ANGRAS; 62A0 AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SE-CH

Odontites vulgaris Moench; T; EURAS; K; R; G; ANGRAS; 6510 RB-AE

Orobanche minor Sm.; G; COSM; R; 6510 RB-AE

Orobanche gracilis Sm.; G; EURO-CAUCAS; K; R; G; 62A0 SE-CH

Orobanche ramosa L.; G; PALEOTEMP; K; ANGRAS; 62A0 OC-KP-AA

Orobanche reticulata Wallr.; G; C.EURO; K; R; 62A0 GP-AC

Rhinanthus alectorolophus subsp. *freyinii* (Sterneck) Hartl; T; MED-MONT; K; R; 62A0 AC-FI-CG, OC-KP-AA; 6510 RB-AE

Rhinanthus rumelicus Velen.; T; BALK-EURO; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-AA

Papaveraceae

Corydalis pumila (Host) Rchb.; G; C.EURO; K; R; G; FOREDG

Plantaginaceae

Globularia meridionalis (Podp.) O. Schwarz; CH; OROF.SE; K; R; G; 62A0 GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH

Linaria pelisseriana (L.) Mill.; T; MED-ATL; K; R; G; ANGRAS; 62A0 AC-FI-CG, OC-KP-AA

Linaria vulgaris Mill.; H; EURAS; K; R; G; ANGRAS; 62A0 AC-FI-TYP; 6510 RB-AE

Chaenorhinum minus (L.) Lange; T; EURIMED; K; R; G; GRAEX

Plantago argentea Chaix.; H; S.EURO-S.SIBIR; R; 62A0 GP-AC, SE-CH

Plantago holosteum Scop.; H; SE.EURO; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP, SS-ET, SE-CH

Plantago lanceolata L.; H; EURAS; K; R; G; ANGRAS; 62A0 AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA; 6510 RB-AE

Plantago major L.; H; EURAS; K; R; G; RUD

Plantago media L.; H; EURAS; K; R; G; 62A0 AC-FI-TYP, GP-AC, OC-KP-TYP; 6510 RB-AE

Veronica arvensis L.; T; PALEOTEMP; K; G; ANGRAS; 62A0 AC-FI-CG, GP-AC, OC-KP-AA; 6510 RB-AE

Veronica austriaca subsp. *dentata* (F. W. Schmidt) Watzl; H; SE.EURO; K; R; G; ANGRAS; 62A0 OC-KP-AA; 6510 RB-AE

Veronica austriaca subsp. *jacquinii* (Baumg.) Eb. Fisch.; H; SE.EURO; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-AA, SE-CH; 6510 RB-AE

Veronica chamaedrys L.; H; EUROSIB; K; R; G; 62A0 AC-FI-CG

Veronica officinalis L.; H; EURAS; K; R; FOREDG

ⁱ*Veronica persica* Poir.; T; ADV; K; R; G; RUD; ANGRAS

Veronica serpyllifolia subsp. *humifusa* (Dicks.) Syme; CH; COSM; K; RUD

Veronica spicata L.; H; EURAS; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, SS-ET, SE-CH

Poaceae

Achnatherum calamagrostis (L.) P.Beauv.; CH; OROF-S.EURO; K; R; G; GRAEX

Aegilops geniculata Roth; T; EURIMED-TURAN; K; R; G; 62A0 SS-ET

Aegilops neglecta Req. ex Bertol.; T; EURIMED-TURAN; K; 62A0 AC-FI-CG, OC-KP-AA,

Aegilops triuncialis L.; T; EURIMED; K; 62A0 AC-FI-CG

Aegilops uniaristata Vis.; T; END; K; 62A0 AC-FI-CG, OC-KP-AA

Agrostis castellana Boiss. & Reut.; H; EURIMED; K; R; G; 62A0 GP-AC, OC-KP-AA

Aira elegantissima Schur; T; EURIMED; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC

Anthoxanthum odoratum L.; T; EURAS; K; R; G; ANGRAS, 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SE-CH; 6510 RB-AE

Arrhenatherum elatius (L.) P. Beauv. ex J. Presl & C. Presl; H; PALEOTEMP; K; G; 6510 RB-AE
Avena barbata Pott ex Link; T; EURIMED-TURAN; K; R; G; ANGRAS; RUD
Bothriochloa ischaemum (L.) KenG; H; COSM; K; 62A0 OC-KP-AA
Brachypodium rupestre (Host) Roem. & Schult.; H; SUBATL; K; R; G; FOREDG
Brachypodium sylvaticum (Huds.) P. Beauv.; H; PALEOTEMP; K; R; G; FOREDG; 62A0 AC-FI-CG
Briza media L.; T; EUROSIB; K; R; G; 62A0 GP-AC
Bromus condensatus Hack.; H; END; R; 62A0 OC-KP-AA
Bromus hordeaceus L.; T; SUBCOSM; K; R; G; ANGRAS; 62A0 AC-FI-CG, OC-KP-AA
Bromus pannonicus Kumm. & Sendtn.; H; S.EURO; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG GP-AC, OC-KP-AA, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH
Bromus squarrosus L.; T; PALEOTEMP; K; R; G; 62A0 OC-KP-AA
Bromus sterilis L.; T; EURIMED-TURAN; K; R; G; ANGRAS; RUD
Chrysopogon gryllus (L.) Trin.; H; S.EURO-S.SIBIR; K; R; G; 62A0 AC-FI-CG, OC-KP-AA
Cleistogenes serotina (L.) Keng; T; MED-S.SIB; K; R; G; 62A0 AC-FI-CG, OC-KP-AA
Cynodon dactylon (L.) Pers.; G; COSM; K; R; G; 62A0 AC-FI-CG, OC-KP-TYP, OC-KP-AA
Cynosurus echinatus L.; T; EURIMED; K; R; G; 62A0 OC-KP-AA
Dactylis glomerata L.; H; PALEOTEMP; K; R; G; ANGRAS; 62A0 AC-FI-TYP, GP-AC, OC-KP-AA; 6510 RB-AE
Danthonia alpina Vest; H; SE.EURO; R; 62A0 GP-AC
Dasypyrum villosum (L.) Borbás; T; EURIMED-TURAN; K; G; ANGRAS; 62A0 AC-FI-CG, OC-KP-AA
Elymus repens (L.) Gould; G; COSM; K; R; G; ANGRAS; 62A0 AC-FI-CG
Eragrostis minor Host; T; COSM; K; R; G; RUD
Eragrostis pilosa (L.) P. Beauv.; T; COSM; K; RUD
Festuca hercegovinica Markgr.-Dann.; H; END; R; 62A0 SS-ET, SE-CH
Festuca rupicola Heuff.; H; S.EURO; K; R; G; ANGRAS; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH; 6510 RB-AE
Hordeum murinum L.; T; EURIMED; K; R; G; ANGRAS, RUD

Koeleria pyramidata (Lam.) P. Beauv.; H; N.C.EURO; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SE-CH
Koeleria splendens C. Presl; H; MED-MONT; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH
Lolium perenne L.; H; COSM; K; R; G; RUD
Melica ciliata L.; H; EURIMED-TURAN; K; R; G; 62A0 SE-CH
Phleum bertolonii DC.; H; EURIMED; K; R; G; 6510 RB-AE
Poa annua L.; T; COSM; K; R; G; RUD, ANGRAS
Poa angustifolia L.; H; EURAS; K; 62A0 AC-FI-CG; 6510 RB-AE
Poa bulbosa L.; H; PALEOTEMP; K; R; ANGRAS; 62A0 AC-FI-TYP, AC-FI-CG, OC-KP-TYP, OC-KP-AA, SE-CH
Poa nemoralis L.; H; CIRCUMBOR; K; R; G; FOREDG
Poa pratensis L.; H; CIRCUMBOR; K; R; G; ANGRAS; 62A0 AC-FI-TYP, AC-FI-CG
Poa trivialis subsp. *sylvicola* (Guss.) H. Lindb.; H; EURIMED; K; R; G; 62A0 OC-KP-TYP
Sesleria autumnalis (Scop.) F. W. Schultz; H; S.EURO; K; R; G; FOREDG
Setaria viridis (L.) P. Beauv.; T; COSM; K; R; G; RUD; 62A0 OC-KP-AA
Stipa eriocalis Borbás; H; EURIMED; K; R; G; 62A0 GP-AC, SS-ET, SE-CH
Ventenata dubia (Leers) Coss.; T; EURIMED; K; R; G; 62A0 GP-AC
Vulpia myuros (L.) C. C. Gmel.; T; COSM; K; R; G; ANGRAS; 62A0 OC-KP-AA, SS-ET, SE-CH; 6510 RB-AE

Polygalaceae

Polygala comosa Schkuh; R; H; C.EURO-S.SIB; K; R; G; 62A0 SE-CH
Polygala monspeliaca L.; T; STENOMED; K; 62A0 AC-FI-TYP, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH
Polygala vulgaris L.; H; EURAS; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH

Polygonaceae

Fallopia convolvulus (L.) Á. Löve; T; CIRCUMBOR; K; G; RUD
Polygonum arenastrum Boreau; T; COSM; K; R; G; RUD; 62A0 SE-CH
Rumex acetosella L.; H; SUBCOSM; K; R; G; ANGRAS; 62A0 AC-FI-CG, OC-KP-AA
Rumex pulcher L.; H; EURIMED; K; R; G; RUD

Primulaceae

Anagallis arvensis L.; T; COSM; K; R; G; 62A0 OC-KP-AA

Anagallis foemina Mill.; T; SUBCOSM; K; 62A0 OC-KP-AA

*,**^b*Cyclamen hederifolium* Aiton; G; N.MED; K; FOREDG

Primula vulgaris Huds.; H; EURO-CAUCAS; K; G; FOREDG

Ranunculaceae

Adonis aestivalis L.; T; EURO; K; RUD

Clematis vitalba L.; P; EURO-CAUCAS; K; R; G; RUD; FOREDG

Delphinium fissum Waldst. & Kit.; H; OROF-EURAS; K; FOREDG

Nigella arvensis L.; T; EURIMED; K; 62A0 OC-KP-AA

Nigella damascena L.; T; EURIMED; K; G; ANGRAS

Ranunculus bulbosus L.; H; NE.MED; K; R; G; 62A0 AC-FI-TYP; 6510 RB-AE

Ranunculus ficaria subsp. *calthifolius* (Rchb.) Arcang.; G; SUBMED-PAN; K; R; G; FOREDG

Ranunculus illyricus L.; H; END; R; 62A0 GP-AC

Ranunculus millefoliatus Vahl.; G; MED-MONT; K; R; G; ANGRAS; 62A0 AC-FI-CG, GP-AC, OC-KP-AA

Ranunculus neapolitanus Ten.; T; MED-MONT; K; G; 62A0 AC-FI-CG

Thalictrum minus L.; H; EURAS; K; R; G; 62A0 GP-AC, SE-CH, OC-KP-AA

Resedaceae

Reseda phyteuma L.; T; EURIMED; K; R; RUD

Rosaceae

Agrimonia eupatoria L.; H; COSM; K; R; G; 6510 RB-AE

Aremonia agrimonoides (L.) DC.; H; NE.STENOMED; R; FOREDG

Crataegus monogyna Jacq.; P; PALEOTEMP; K; R; G; FOREDG

Filipendula vulgaris Moench; H; C.EURO-S.SIB; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET; 6510 RB-AE

Fragaria vesca L.; H; COSM; K; R; G; FOREDG

Geum urbanum L.; H; CIRCUMBOR; K; R; G; RUD; FOREDG

Potentilla argentea L.; H; CIRCUMBOR; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA; 6510 RB-AE

Potentilla recta subsp. *pilosa* (Poir.) Jáv.; H; MED-PONT; K [32]; R; G; ANGRAS; 62A0 AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH

Potentilla reptans L.; H; COSM; K; R; G; RUD

Prunus cerasifera Ehrh.; P; ADV; K; R; G; 62A0 AC-FI-CG

Pyrus spinosa Forssk.; P; EURO-CAUCAS; K; R; G; FOREDG

Rosa corymbifera Borkh.; P; S.EURO-S.SIBIR; K; G; 62A0 AC-FI-TYP

Rosa gallica L.; P; S.EURO-S.SIBIR; K; FOREDG

Rubus aetnicus Weston; P; EURIMED; K; RUD

Rubus ulmifolius Schott; P; EURIMED; K; G; RUD

Sanguisorba minor subsp. *balearica* (Bourg. ex Nyman) Muñoz Garm. & C. Navarro; H; PALEOTEMP; K; R; G; ANGRAS; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH; 6510 RB-AE

Rubiaceae

Asperula aristata subsp. *scabra* (J. Presl & C. Presl) Nyman; CH; MED-MONT; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-AA, SS-ET, SE-CH

Asperula purpurea (L.) Ehrend.; CH; OROF-SE.EURO; K; R; G; 62A0 SS-ET, SE-CH

Asperula scutellaris Vis.; CH; END; K; R; G; 62A0 OC-KP-AA

Cruciata laevipes Opiz; H; EURAS; K; R; G; 62A0 AC-FI-CG

Galium aparine L.; T; COSM; K; R; G; 62A0 OC-KP-TYP

Galium divaricatum Lam.; T; STENOMED; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, OC-KP-AA

Galium lucidum All.; H; EURIMED; K; R; G; 62A0 GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH, 6510 RB-AE

Galium mollugo L.; H; EURIMED; K; R; G; RUD; 6510 RB-AE

Galium verum L.; H; EURAS; K; R; G; 62A0 AC-FI-TYP, GP-AC

Sherardia arvensis L.; T; COSM; K; R; G; ANGRAS; 62A0 AC-FI-CG, OC-KP-TYP, OC-KP-AA

Rutaceae

Dictamnus albus L.; H; EURO-S.SIB; K; FOREDG

Salicaceae

Salix eleagnos Scop.; P; OROF-S.EURO; K; R; G; GRAEX

Saxifragaceae

Saxifraga tridactylites L.; T; EURIMED; K; R; G; 62A0 OC-KP-AA, SS-ET, SE-CH

Scrophulariaceae

Scrophularia canina L.; CH; EURIMED; K; R; G; 62A0 OC-KP-AA

Verbascum blattaria L.; H; COSM; K [32]; R; G; RUD

Verbascum lychnitis L.; H; EURO-CAUCAS; K; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP; 6510 RB-AE

Verbascum nigrum L.; H; S.EURO-S.SIBIR; K; R; FOREDG

Verbascum phoeniceum L.; H; SE.EURO-S.SIBIR; K; RUD

Verbascum pulverulentum Vill.; H; C.EURO; K; R; G; ANGRAS; 6510 RB-AE

Solanaceae

Datura stramonium L.; T; ADV; K; RUD

Solanum nigrum L.; T; COSM; K; R; G; RUD

Santalaceae

Thesium divaricatum Jan ex Mert. & W. D. J. Koch; H; EURIMED; K; R; G; 62A0 AC-FI-CG, GP-AC, OC-KP-TYP, OC-KP-AA, SS-ET, SE-CH

Thesium ramosum Hayne; H; BALK-EUROP; K; R; G; 62A0 AC-FI-CG, SS-ET, SE-CH

Thymelaeaceae

Daphne alpina L.; CH; NE.MED-MONT; R [32]; 62A0 OC-KP-AA

Thymelaea passerine (L.) Coss. & Germ.; T; EURIMED; K; R; 62A0 AC-FI-CG, SS-ET, SE-CH

Urticaceae

Urtica dioica L.; H; COSM; K; R; G; RUD

Valerianaceae

Valeriana tuberosa L.; G; MED-MONT; K; R; G; 62A0 OC-KP-AA

Valerianella dentata (L.) Pollich; T; SUBMED-SUBATL; K; 62A0 AC-FI-TYP, AC-FI-CG, OC-KP-AA; 6510 RB-AE

Valerianella eriocarpa Desv.; T; EURIMED; K; G; ANGRAS; RUD

Valerianella locusta (L.) Laterr.; T; EURIMED; K; R; G; ANGRAS; RUD

Valerianella rimosa Bastard; T; EURIMED; K; 62A0 AC-FI-CG, OC-KP-AA

Verbenaceae

Verbena officinalis L.; H; COSM; K; R; G; RUD

Viburnaceae

Sambucus ebulus L.; G; EURIMED; K; R; G; RUD

Violaceae

Viola arvensis Murray; T; EURAS; K; R; G; ANGRAS; RUD

Viola riviniana Rchb.; H; EURAS; K; R; G; FOREDG; 6510 RB-AE

Viola kitaibeliana Schult.; T; MED-CAUCAS; K; R; G; 62A0 AC-FI-TYP, AC-FI-CG, GP-AC, OC-KP-AA

Viola tricolor L.; T; EURAS; K; R; G; ANGRAS; RUD

Vitaceae

Vitis vinifera L.; P; ADV; K; G; GRAEX

According to the expected taxonomic spectra, the following families are the richest in species number: *Asteraceae*, *Fabaceae*, and *Poaceae*. Among the genera, the richest are *Trifolium*, *Medicago*, *Veronica*, and *Geranium*. The predominant life form is hemicryptophytic, with significant participation of therophytes and geophytes. In terms of chorological spectra, Eurimediterranean species prevail (Tab. 1).

Table 1. Dominant or significant families and genera, life forms and chorological elements in terms of number of species in the flora of the studied karst fields: Kopilje, Radovče, Gostilje Martiničko.

	Kopilje	Radovče	Gostilje Martiničko
Total number of species and subspecies (%)	437 (100 %)	337 (100 %)	337 (100 %)
Families			
<i>Asteraceae</i>	58 (13.3 %)	68 (20.2 %)	45 (13.4 %)
<i>Fabaceae</i>	57 (13.0 %)	48 (14.2 %)	30 (8.9 %)
<i>Poaceae</i>	45 (10.3 %)	48 (14.2 %)	38 (11.3 %)
Genera			
<i>Trifolium</i>	15 (3.4 %)	16 (4.7 %)	10 (3.0 %)
<i>Medicago</i>	8 (1.8 %)	8 (2.4 %)	5 (1.5 %)
<i>Veronica</i>	8 (1.8 %)	8 (2.4 %)	6 (1.8 %)
<i>Geranium</i>	7 (1.6 %)	7 (2.1 %)	5 (1.5 %)
Life forms			
<i>Hemicryptophytes</i>	289 (66.1 %)	169 (50.1 %)	158 (46.9 %)
<i>Therophytes</i>	143 (32.7 %)	84 (24.9 %)	101 (30.0 %)
<i>Geophytes</i>	53 (12.1 %)	44 (13.1 %)	38 (11.3 %)
<i>Chamaephytes</i>	30 (6.9 %)	28 (8.3 %)	23 (6.8 %)
Chorological types			
<i>Eurimediterranean</i>	102 (23.3 %)	65 (19.3 %)	72 (21.4 %)
<i>Euroasian</i>	31 (7.1 %)	28 (8.3 %)	26 (7.7 %)
<i>Cosmopolitan</i>	53 (12.1 %)	43 (12.8 %)	46 (13.6 %)
<i>Endemic</i>	33 (7.6 %)	27 (8.0 %)	19 (5.6 %)
<i>Invasive alien</i>	8 (1.8 %)	4 (1.2 %)	5 (1.5 %)

The calculation of the Sørensen index showed a fairly high similarity between the floras of all the fields studied (Tab. 2). Nevertheless, each field has its own peculiarities. Due to its lower altitude (604 m a.s.l.) and openness to Bjelopavlička Ravnica, the flora of Kopilje polje contains some thermophilous and Mediterranean elements that do not occur at higher altitudes. These include *Asparagus acutifolius*, *Bombacillaena erecta*, *Crepis sancta*, *Rhagadiolus stellatus*, *Astragalus monspesulanus* subsp. *wulfenii*, *Colutea arborescens*, *Hip-*

pocrepis emerus subsp. *emeroides*, *Trifolium subterraneum*, and *Micromeria juliana*. The flora of Radovče polje contains some montane or alpine elements: *Cirsium eriophorum*, *Dianthus petraeus*, *Gentiana utriculosa*, *G. cruciata*, *Danthonia alpina*. The flora of Gostilje Martiničko includes both alpine species, such as *Gentiana utriculosa* and *G. cruciata*, as well as thermophilous and Mediterranean elements like *Nigella damascena*, *Ranunculus neapolitanus*, *Rubus ulmifolius*, and *Serapias bergonii*.

Table 2. Values of Sørensen index of similarity for floras of the studied karst fields

	Total number of species and subspecies	Number of common species and subspecies	Sørensen index
Kopilje-Radovče	774	299	0.77
Kopilje-Gostilje	774	326	0.84
Gostilje-Radovče	674	292	0.87

All three fields are settled and traditionally used primarily as pasture or mown meadows. Nine grassland communities have been documented in the surveyed karst fields (Table 3). Seven of these

are classified under NATURA 2000 habitat 62A0, one under habitat 6510, while the annual grasslands with *Dasypyrum villosum* represent anthropogenic habitats (Tab. 3, Fig. 2).

Table 3. Plant communities and NATURA 2000 habitat types documented in the studied karst fields: Kopilje, Radovče and Gostilje Martiničko

	Habitat type	Kopilje	Radovče	Gostilje Martiničko
<i>Armerio canescenti-Festucetum illyricae typicum</i>	62A0		+	+
<i>Armerio canescenti-Festucetum illyricae chrysopogonetosum gryllii</i>	62A0	+		
<i>Gladiolo palustri-Agrostietum castellanae</i>	62A0		+	
<i>Ornithogalo comosi-Koelerietum pyramidatae typicum</i>	62A0	+		+
<i>Ornithogalo comosi-Koelerietum pyramidatae artemisietosum albae</i>	62A0	+	+	+
<i>Saturejo subspicatae-Edraianthetum tenuifolii</i>	62A0	+	+	
<i>Stipo eriocauli-Caricetum humilis</i>	62A0	+	+	+
<i>Ranunculo bulbosi-Arrhenatheretum elatioris</i>	6510			+
Ruderalized annual grasslands with <i>Dasypyrum villosum</i>	Anthropogenic	+		

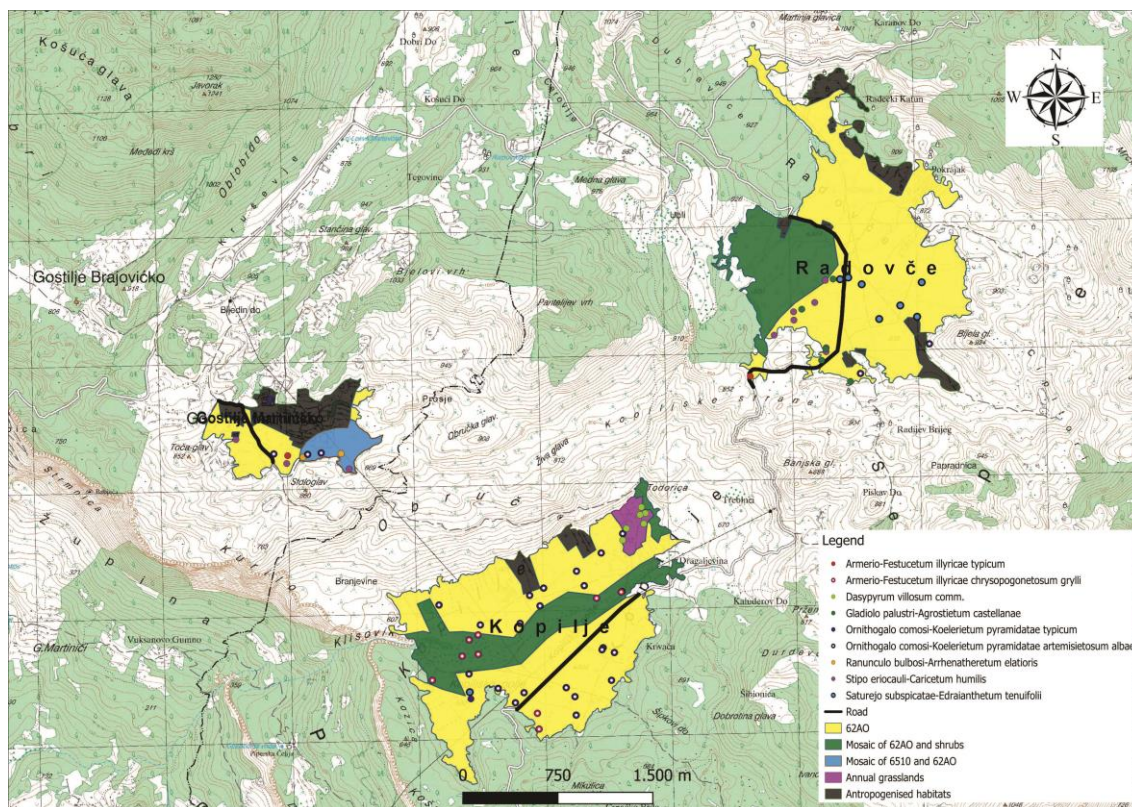


Figure 2. Habitat map of the investigated karst fields: Kopilje, Radovče, and Gostilje Martiničko in Montenegro.

The landscape of the arid karst fields in Piperi is predominantly characterized by the perennial grassland type 62A0 East Sub-Mediterranean dry grasslands (*Scorzonera villosa*) (Fig. 2, Tab. 4). In areas where the soil is skeletal and shallow, and the vegetation is sparse, associations of *Satureja subspicatae* develop in the following sequence (from the most open and skeletal): *Satureja subspicatae*-*Edraianthetum tenuifolii*, *Stipa eriocauli*-*Caricetum humilis*, and *Ornithogalo comosi*-*Koelerietum pyramidatae*. The latter is considered a transition to *Scorzonera villosa* grasslands, which develop on less skeletal and deeper soils, such as *Armerio canescens*-*Festucetum illyricae* and *Gladiolo palustri*-

Agrostietum castellanae. Including mosaic area with wood vegetation and lowland hay meadows, 62A0 covers an area of 4.46 km². *Ranunculo bulbosi*-*Arrhenatheretum elatioris*, classified as habitat type 6510 Lowland hay meadows, grows on abandoned cultivated land. This habitat type occupies a relatively small area of 0.09 km² and is limited to Gostilje Martiničko. Annual grasslands were recorded only on Kopilje, covering a small area of 0.085 km². However, due to the significant presence of ruderal elements, they are not considered a part of NATURA 2000 habitat type 6220 Pseudo-steppe with grasses and annuals of *Thero-Brachypodietea*.

Table 4. Cover area of habitat of investigated karst fields: Kopilje, Radovče, Gostilje Martiničko in Montenegro

Habitat	Kopilje	Radovče	Gostilje Martiničko
62A0 (km ²)	1.79	1.79	0.24
Share of 62A0 in the mosaic with 6510 (km ²)			0.05
Mosaic of 62A0 and 6510 (km ²)			0.13
Mosaic of 62A0 and woody vegetation (km ²)	0.61	0.52	
Share of 62A0 in the mosaic with woody vegetation (km ²)	0.27	0.31	
6510 (km ²)			0.09
Annual grasslands (km ²)	0.08		
Antropogenised habitats (km ²)	0.08	0.25	0.27

Here, we present the plant syntaxa recorded in the karst fields, some of which are described provisionally.

***Saturejo subspicatae-Edraianthetum tenuifolii* Horvat in Horvat et al. 1974** (Fig. 3) is found in Kopilje and Radovče (Fig. 2). This open pasture community develops on fluvioglacial sediments as well as moraine deposits. The soil is shallow and highly skeletal, typically of the rendzina type. The terrain is flat to slightly inclined, predominantly exposed to the E and SE. The total vegetation cover ranges from 40 % to 70 (85) %, which is lower compared to other communities. Although considered a species-poor grassland, it is rich in Balkan endemic species (e.g., *Edraianthus tenuifolius*, *Satureja subspicata*, *Hyacinthella dalmatica*, *Seseli montanum* subsp. *tommasinii*, *Vincetoxicum huteri*). Most species are characteristic of *Saturejion subspicatae* (*Edraianthus tenuifolius*, *Satureja subspicata*, *Bunium alpinum* subsp. *montanum*, *Genista sericea*), *Scorzoneretalia villosae* (*Carex caryophylla*, *Teucrium montanum*, *Plantago holostium*, *Anthyllis vulneraria* subsp. *polyphylla*, *Koeleria splendens*, *Bromus pannonicus*),

and *Festuco-Brometea* (*Leontodon crispus*, *Sanguisorba minor*, *Bupleurum veronense*, *Helianthemum nummularium* subsp. *obscurum*, *Ornithogalum comosum*) [35].

***Stipo eriocauli-Caricetum humilis* Trinajstić 1987** (Fig. 4) was documented in Gostilje Martiničko and Radovče, in the altitudinal zone 812 to 856 m above sea level (Fig. 2). It is a species-poor, open pasture community that has developed on moraine deposits and shallow and very skeletal rendzina. The terrain is mostly inclined between 5° and 17° and has different exposures. The total vegetation cover ranges from 50 to 90(95) %. The majority of species are characteristic of *Saturejion subspicatae* (*Carex humilis*, *Satureja subspicata*, *Bunium alpinum* subsp. *montanum*, *Edraianthus tenuifolius*), *Scorzoneretalia villosae* (*Carex caryophylla*, *Anthyllis vulneraria* subsp. *polyphylla*, *Eryngium amethystinum*, *Plantago holostium*, *Koeleria splendens*, *Asperula aristata* subsp. *scabra*), *Festuco-Brometea* (*Leontodon crispus*, *Muscari comosum*, *Helianthemum nummularium* subsp. *obscurum*, *Centaurea alba* subsp. *deusta*) [35].



Figure 3. *Saturejo subspicatae-Edraianthetum tenuifolii* (Radovče)



Figure 4. *Stipa eriocaule*-*Caricetum humilis* (Gostilje Martiničko)

Armerio canescenti-Festucetum illyrica Trinajstić et Šugar 1972 (Fig. 5, 6). In the Piperi area, the *Armerio canescenti-Festucetum illyrica* grasslands are the best quality hay meadows beside the *Ranunculo bulbosi-Arrhenatheretum elatioris* meadows. The stands are mowed regularly, once or twice a year. The geological substrates are glacial sediments and moraine sediments, while the soil is a deep rendzina, rich in nutrients and not skeletal. The vegetation cover ranges from 95 to 100 %. The association is characterized by the dominance of *Festuco-Brometea* species: *Bromus erectus*, *Chrysopogon gryllus*, *Festuca rupicola*, *Filipendula vulgaris*, with a significant participation of *Scorzoneretalia villosae* species (*Eryngium amethystinum*, *Seseli montanum* subsp. *tommasinii*, *Medicago prostrata*, *Hippocrepis comosa*, *Anthyllis vulneraria* subsp. *polyphylla*, *Asperula aristata* subsp. *scabra*, *Thymus longicaulis*) and the *Scorzonerion villosae* species (*Filipendula vulgaris*, *Veronica spicatum*, *Koeleria pyramidata*, *Plantago holostium*, *Ononis spinosa*) [35]. Within *Armerio canescenti-Festucetum illyrica*, two sub-associ-

ations are distinguished: *typicum* nom. prov. Stanišić-Vujačić 2023 and *chrysopogonetosum grylli* nom. prov. Stanišić-Vujačić 2023. The first is distributed in Radovče and Gostilje Martiničko, while the second is documented only in Kopilje (Fig. 2). In the floristic composition of the typical subassociation, elements of the *Molinio-Arrhenatheretea* are common (*Lotus corniculatus*, *Trifolium incarnatum*, *Tragopogon orientalis*, *Achillea millefolium*, *Ranunculus bulbosus*), which is due to mowing. Nevertheless, these grasslands are also used as pastures and contain ruderal elements of the classes *Artemisietea vulgaris*, *Chenopodietea* and *Papaveretea rhoeadis*. The subassociation *chrysopogonetosum grylli* occurs near forest fringes and is characterized by the dominance of *Chrysopogon gryllus*. The endemic species *Chaerophyllum coloratum* also differentiates it from the typical subassociation. The presence of the species *Trifolio-Geranietea* and *Quercetea pubescentis* species indicates an overgrowing process, as these meadows are not mowed.



Figure 5. *Armerio canescenti-Festucetum illyricae typicum* (Radovče)



Figure 6. *Armerio canescentis-Festucetum illyricae chrysopogonetosum gryllii* (Kopilje)

Gladiolo palustri-Agrostietum castellanae
nom. prov. (Stanišić-Vujačić 2023). According to current knowledge, this pasture community is only reported in Radovče (Fig. 2). The geological substrate is fluvioglacial sediments and moraine deposits. The soil is deep rendzina with a small proportion of skeletal components. The vegetation cover ranges from (70)90 to 100 % (Fig. 7). The vegetation optimum is dominated by the grass species *Agrostis castellana* together with *Bromus pannonicus* and *Festuca rupicola*. The community is characterized by the

Scorzonerion villosae species (*Plantago holosteum*, *Scorzonera villosa*, *Ononis spinosa*, *Plantago media*), the *Scorzoneretalia villosae* species (*Asperula aristata* subsp. *scabra*, *Dorycnium pentaphyllum* subsp. *germanicum*, *Seseli montanum* subsp. *tomasinii*, *Hippocrepis comosa*, *Thymus longicaulis*), and the *Festuco-Brometea* species (*Pilosella bauhini*, *Muscari comosum*, *Sanguisorba minor*, *Hypericum perforatum*, *Centaurea jacea* subsp. *angustifolia*, *Euphorbia cyparissias*) [35].



Figure 7. *Gladiolo palustri*-*Agrostietum castellanae* (Radovče)

***Ornithogalo comosi*-*Koelerietum pyramidatae* nom. prov.** (Stanišić-Vujačić 2023) is considered a transitional variant between the *Armerio canescenti-Festucetum illyricae* and the more open and skeletal grasslands of *Saturejo subspicatae*-*Edraianthetum tenuifolii* and *Stipo eriocauli-Caracetum humilis*. The floristic composition is dominated by species of *Festuco-Brometea*: *Anthyllis vulneraria* subsp. *polyphylla*, *Artemisia alba*, *Bromus pannonicus*, *Festuca rupicola*, *Sanguisorba minor* and *Koeleria pyramidata*. The characteristic species of *Saturejion subspicatae* that occur in grasslands include: *Bunium alpinum* subsp. *montanum*, *Satureja subspicata*, *Edraianthus tenuifolius*, *Muscari botryoides* and *Inula ensifolia*, and from the *Scorzonerion villosae*: *Filipendula vulgaris*, *Lathyrus latifolius*, *Scorzonera villosa*, *Ononis spinosa*. Elements of the *Molinio-Arrhenatheretea* also form this grasslands: *Tragopogon tommasinii*, *Lotus corniculatus*, *Trifolium incarnatum*, *Rhinanthus rumelicus*. Within the *Ornithogalo comosi*-*Koelerietum pyramidatae*

association, two sub-associations are distinguished: *typicum* (Fig. 8) and *artemisetosum albae* (Fig. 9). The first community is common in Gostilje Martiničko and Kopilje, while the second is found at higher elevations across all three fields (Fig. 2). A typical subassociation is an open pasture community, occasionally mowed. The geological substrates include both glacial and moraine sediments, with the soil being shallow and skeletal rendzina, though less so compared to other communities within the *Saturejion subspicatae*. The total vegetation cover ranges from 75 % to 95(100) %. The subassociation *artemisetosum albae* is a more open pasture community that develops on moraine sediments and shallow, skeletal rendzina. The vegetation cover here ranges from 70 % to 90(95) %. Differential species for this subassociation include *Artemisia alba*, *Chrysopogon gryllus*, *Carex humilis*, and *Stipa eriocaulis*. In areas where grazing has been abandoned, overgrowth processes have been observed.



Figura 8. *Ornithogalo comosi-Koelerietum pyramidatae typicum* (Kopilje)



Figura 9. *Ornithogalo comosi-Koelerietum pyramidatae artemisietosum albae* (Kopilje)

***Ranunculo bulbosi-Arrhenatheretum elatioris* Ellmauer in Mucina et al. 1993** (Fig. 10) is a mown meadow community growing on Gostilje Martiničko (Fig. 2), on abandoned cultivated land, on deep eutric cambisol and deep carbonate rendzina. The geological substrates are moraine deposits and fluvioglacial and glacial sediments. These meadows are rich in biomass and are regularly mowed once or twice a year. The total vegetation cover is very high, between 90 and 100 %. The majority of species are

characteristic of *Arrhenatherion elatioris* and *Arrhenatheretalia elatioris*: *Arrhenatherum elatius*, *Tragopogon orientalis*, *Rhinanthus rumelicus*, *Achillea millefolium*, *Anthoxanthum odoratum*, *Trifolium pratense*, *Leucanthemum vulgare*, *Daucus carota*, *Dactylis glomerata*, as well as the *Festuco-Brometea* (*Euphorbia cyparissias*, *Ajuga genevensis*, *Festuca rupicola*, *Galium verum*). Also present are species characteristic of the ruderal vegetation of *Artemisietea vulgaris*, *Papaveretea rhoeadis*, *Chenopodietea*

and *Sisymbrietea* (*Crepis setosa*, *Convolvulus arvensis*, *Sherardia arvensis*, *Dasypyrum villosum*, *Geranium molle*). The presence of ruderal elements is to be expected, as the community develops on abandoned fields and nutrient-rich substrate.

Ruderalized annual grasslands with the dominant *Dasypyrum villosum* (Fig. 11) develop in Kopilje polje (Fig. 2) on abandoned cultivated

land and very deep, nitrophilous rendzina. These areas are regularly mowed and species-poor, with ruderal elements such as *Avena barbata*, *Convolvulus arvensis*, and *Verbascum* sp. predominating. Further studies are needed for the syntaxonomic classification of this community to better understand its syngeneses and its relationship to other grasslands in the Piperi karst fields.



Figure 10. *Ranunculo bulbosi-Arrhenatheretum elatioris* (Gostilje Martiničko)



Figure 11. Ruderalized annual grasslands with the dominant *Dasypyrum villosum* (Kopilje)

Syntaxonomical classification of grasslands communities in Piperi

Festuco-Brometea Br.-Bl. et Tx. ex Soó 1947

Scorzoneretalia villosae Kovačević 1959

Saturejion subspicatae Tomić-Stanković 1970

Saturejo subspicatae-Edraianthetum tenuifolii Horvat in Horvat et al. 1974
Stipo eriocauli-Caricetum humilis Trinajstić 1987

Ornithogalo comosi-Koelerietum pyramidatae nom. prov. Stanišić-Vujačić 2023

-*typicum* nom. prov.

-*artemisiotosum albae* nom. prov.

Scorzonerion villosae Horvatić ex Kovačević 1959

Armerio canescenti-Festucetum illyricae Trinajstić et Šugar 1972

-*typicum*

-*chrysopogonetosum grylli* nom. prov. Stanišić-Vujačić 2023

Gladiolo palustri-Agrostietum castellanae nom. prov. Stanišić-Vujačić 2023

Molinio-Arrhenatheretea Tx. 1937

Arrhenatheretalia elatioris Tx. 1931

Arrhenatherion elatioris Luquet 1926

Ranunculo bulbosi-Arrhenatheretum elatioris Ellmauer in Mucina et al. 1993

Helianthemetea guttati Rivas Goday et Rivas-Mart. 1963

Vulpietalia Pignatti 1953

Vulpio-Lotion Horvatić 19633

Dasypyrum villosum comm.

DISCUSSION

A relatively large number of vascular plant species (480 species and subspecies) were recorded in a relatively small area of the arid karst field in Piperi (approximately 7.4 km²). The flora of the karst fields is not only rich but also diverse, containing various chorological elements, ecological forms, and life forms. In addition to 18 species of conservation value, the fields are home to some rare species that occur only in one or a few localities in Montenegro, such as *Galatella linosyris*, *Crocus weldenii* f. *lutescens*, and *Succisella petteri* [36]. The vegetation of the fields is also unique, and according to current knowledge, the distribution of three plant communities is restricted to the karst fields in Piperi: *Armerio canescenti-Festucetum illyricae chrysopogonetosum*

grylli, *Ornithogalo comosi-Koelerietum pyramidatae artemisiotosum albae*, and *Stipo eriocauli-Caricetum humilis*.

The *Armerio canescenti-Festucetum illyricae* association was originally described in the Croatian Dinara Mountains [37] and has also been documented in Montenegro [31]. The Montenegrin stands are differentiated into two subassociations: *typicum* and *chrysopogonetosum grylli*. Both are characterized by the dominance of *Festuca rupicola*, while the nominal species *Armeria canescens* is completely absent in *chrysopogonetosum grylli*. Besides the Piperi fields, the typical subassociation has been reported from Grahovsko polje, Dragalj, Lukovo, Seoca, Radovče, and Gostilje Martiničko at altitudes ranging from 614 to 945 m a.s.l., while the second subassociation is restricted to Kopilje polje at an altitude of 614 m a.s.l. [31]. The Montenegrin stands of the typical subassociation differ from the Croatian ones by a lower presence of *Armeria canescens*. Both subassociations are classified as NATURA 2000 habitat type 62A0.

Another association from *Scorzonerion villosae* present in the karst fields of Piperi is *Gladiolo palustri-Agrostietum castellanae*. In Montenegro, it has also been reported from Dragaljsko polje, where it alternates with *Saturejo subspicatae-Edraianthetum tenuifolii* [31]. Compared to other *Scorzonerion villosae* communities, it is poorer in species and more similar to *Saturejion subspicatae* in species composition, as indicated by the presence of *Globularia meridionalis*, *Carex humilis*, and *Genista sericea*. It is also classified as NATURA 2000 habitat type 62A0.

The majority of plant communities in the studied fields belong to *Saturejion subspicatae*, which comprises rocky pastures in the Mediterranean montane zone and represents an extreme degradation stage of the climatozonal forest community *Seslerio-Ostryetum* [38, 39]. In the sub-Mediterranean part of Montenegro and in Piperi, it is represented by *Saturejo subspicatae-Edraianthetum tenuifolii*, *Stipo eriocauli-Caricetum humilis*, and *Ornithogalo comosi-Koelerietum pyramidatae (typicum and artemisiotosum albae)*. The first two communities have also been reported from Croatia [35, 39], while the last two are restricted to Montenegro. *Saturejo subspicatae-Edraianthetum tenuifolii* is one of the most representative rocky grassland communities [40], distributed in the Mediterranean montane zone of the Adriatic Sea, with stands that are physiognomically very similar but geographically distinct [40, 38]. In Montenegro, it is also reported from Grahovsko and Dragalj polje [31]. All Montenegrin stands are more or less homogeneous and contain endemic Balkan species

that are absent in the Croatian stands (e.g., *Hya-cinthella dalmatica*, *Festuca hercegovinica*, *Vince-toxicum huteri*), while the Croatian stands contain more Balkan-Apennine elements, such as *Centaurea rupestris*, *Crepis chondrilloides*, and *Sesleria juncifolia*. Physiognomically, the stands in Montenegro and Croatia are very similar, and due to the strong winds to which they are exposed, the dwarf form dominates. The association is classified as NATURA 2000 habitat type 62A0.

Stipo eriocauli-Caricetum humilis is another typical rocky pasture exposed to strong winds, but is physiognomically characterized by the tall grass *Stipa eriocaulis*. For Montenegro, the stands are so far only known from Piperi [31]. The most obvious difference from the Croatian stands is the absence of chasmophytes and/or endemic elements such as *Moltkia petraea*, *Asperula scutellaris*, *Anthyllis montana* subsp. *jacquinii*, *Sesleria juncifolia*, as well as the presence of *Salvia officinalis* and the phanerophytes *Ostrya carpinifolia*, *Pyrus amygdaliformis*, and *Rhamnus intermedia* [40].

The analysis of the plant communities of *Saturejion subspicatae* on the Balkan Peninsula, conducted by (Stanišić-Vujačić) [31], showed that *Ornithogalo comosi-Koelerietum pyramidatae* clearly separates from the others and occupies an intermediate position between *Armerio canescenti-Festucetum illyricae* and *Saturejo subspicatae-Edraianthetum tenuifolii* and *Stipo eriocauli-Caricetum humilis*. It develops on deeper and less skeletal soils and has higher vegetation cover values. *Carex humilis*, which frequently occurs in other *Saturejion subspicatae* associations, is almost completely absent, while species of *Scorzonerion villosae* play a significant role. Thus, *Ornithogalo comosi-Koelerietum pyramidatae* has a transitional character to *Scorzonerion villosae*. This recently reported association [31] is differentiated into two subassociations: *typicum* and *artemisietosum albae*. The first is characterized by higher vegetation cover values and the dominance of *Teucrium capitatum*; it is used as pasture and occasionally mowed, while the second is more open, differentiated by *Artemisia alba* and used exclusively as pasture. Both subassociations are considered the vegetation equivalent of NATURA 2000 habitat 62A0.

A *Molinio-Arrhenatheretea* community has been reported in the arid environment of Piperi—specifically, the most xerophilous variant of *Ranunculo bulbosi-Arrhenatheretum elatioris*. This community shows a transitional character to *Scorzonerion villosae* grasslands. A comparative analysis of grassland communities of *Arrhenatherion* [31] showed the greatest similarity with *Arrhenatheretum elatioris* subass. *litorale* from Ceti-

nje and Njeguši. It has been documented on Gostilje Martiničko and, together with *Armerio canescenti-Festucetum illyricae*, represents the best-quality hay meadows. *Ranunculo bulbosi-Arrhenatheretum elatioris* is included in NATURA 2000 habitat 6510.

Grazing abandonment and overgrowth are among the greatest threats to grassland habitats on the arid karst fields in Piperi. According to a recent EPA report [41], these processes are recognized as a general threat to biodiversity in Montenegro. Possible solutions at the national level could include programs to promote livestock farming or subsidies for mowing. In recent years, the inhabitants of Kopilje have attempted to prevent further overgrowth of grasslands with *Juniperus oxycedrus* by deliberately setting fires.

The trend of urbanization and house construction is becoming noticeable in Radovče, and if this trend continues, habitat fragmentation will be inevitable.

Invasive alien species are also identified as a general threat to biodiversity [42], though their impact on the flora of the arid fields in Piperi remains relatively low. They are primarily found in anthropogenic habitats (e.g., trampled areas, roadsides, and agricultural fields) and rarely in seminatural grasslands. However, as anthropogenic pressure, habitat degradation, and disturbance intensify, their impact is likely to grow.

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ФЛОРА, ВЕГЕТАЦИЈА И ЗНАЧАЈНИ ВИДОВИ ЖИВЕАЛИШТА НА СУШНОТО КАРСТНО ПОЛЕ ВО ПИПЕРИ (ЦРНА ГОРА)

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Локалитетите Копиље, Радовче и Гостиље Мартиниќко се сушни карстни полиња сместени во регионот на Пипери (централен дел на Црна Гора) на надморска височина од 600 до 950 m н.в., во зоните на термофилни габерови и дабови шуми, како и мезофилни букови шуми. На прилично малата површина покриена со три полиња (околу 7,4 km²) регистрирани се 480 видови и подвидови васкуларни растенија, класифицирани во 284 родови и 63 фамилии. Најбогати меѓу фамилиите се *Asteraceae*, *Fabaceae* и *Poaceae*, додека меѓу родовите *Trifolium*, *Medicago*, *Veronica* и *Geranium*. Од животните форми преовладуваат хемикриптофитите, со значително учество на терофити и геофити, додека во хоролошкиот спектар преовладуваат евримедитеранските видови. Осумнаесет видови имаат конзервациска вредност, додека три се наведуваат само за еден или за неколку локалитети во Црна Гора: *Galatella linoisyris*, *Crocus weldenii* f. *lutescens* и *Succisella petteri*. Полуприродната тревеста вегетација која се развива на карстните полиња е уникатна и е претставена со 9 растителни заедници, меѓу кои 3 растителни заедници се ограничени само на карстните полиња во Пипери: *Armerio canescenti-Festucetum illyricae* subass. *chrysopogonetosum grylli*, *Ornithogalo comosi-Koelerietum pyramidatae* subass. *artemisetosum albae* и *Stipo eriocauli-Caricetum humilis*. Со исклучок на рудерализираните едногодишни пасишта, другите пасишни заедници се вегетациски еквиваленти на два типа на живеалишта NATURA 2000: 62A0 и 6510.

Клучни зборови: суви брдски пасишта, *Festuco-Brometea*, *Scorzoneretalia villosae*, *Saturejion subspicatae*, *Scorzonerion villosae*, *Arrhenatheretum*