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Chorological characterization and distribution of the Balkan endemic vascular flora in Bosnia and Herzegovina

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ABSTRACT: 298 endemic taxa at the species and subspecies rank have been found in the territory of Bosnia and Herzegovina (B&H). Each taxon has been classified into its corresponding chorological group, subgroup and floristic element. The basic chorological structure of endemic Balkan flora in B&H is composed of five main groups: South-European Mountainous (SEM) with 112 taxa, 38% of the total endemic Balkan flora in B&H; Mediterranean - Submediterranean (MED-SUBMED), 77 taxa (26%); Central-European Mountainous (CEM) with 69 taxa (23%); Central-European (CE) with 34 taxa (11%); and Pontic (PONT) with six taxa (2%). Within SEM and CEM groups, the most abundant were Dinaric and Dinaric-Balkan elements, in the MED-SUBMED group it was Adriatic Submediterranean, while in the CE group there were Illyrian and Illyrian-Balkan floristic elements. The distribution of each taxon in B&H was mapped in the network of MGRS squares, with a precision level of 10 km. The richness of Balkan endemic flora in B&H was presented as the number of taxa, at the species and subspecies ranks in each MGRS square 10 x10 km. In the same way, the distribution of endemic taxa of each basic chorological groups was represented. It has been confirmed that high mountains of northern Herzegovina (Prenj, Čvrsnica, Čabulja) are richest in endemics (125 taxa), followed by mountains Bjelašnica, Treskavica, Ivan, together with the canyon of the Rakitnica river (109 taxa), and mountains at the border with Montenegro, Maglić and Volujak with the Sutjeska river canyon (99 taxa). The richest endemic flora was recorded on the following particular mountains: Prenj (99), Čvrsnica (78), Orjen (74), Velež (70), Treskavica (63), Maglić (58), Dinara (52), etc.

Key words: Bosnia and Herzegovina, Balkan endemic flora, chorological structure of flora, distribution of floristic elements.

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INTRODUCTION

The Balkan peninsula is known for its great floristic richness and significant percentage of endemics. According to contemporary assessments, vascular flora of the Balkans comprise almost 8000 taxa, which is c. 1300 taxa more compared with Turrill's data from 1929 (Turrill 1929; Stevanović 2005). The Balkan endemic flora is nowadays estimated to be between 2600 and 2700 taxa, at the species and subspecies ranks, which is about 1000 taxa more compared with Turrill's estimate (Stevanović *et al.* 2007). Preliminary research on the distribution of endemic flora of the Peninsula, obtained by mapping 2250 taxa, showed that the number of taxa increases going from

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northern parts of the Peninsula towards the south, where a significant number of endemics was recorded on almost all high mountains of the western and central part of the Peninsula (Durmitor, Prokletije, Šar-planina, Rila, Pirin), slightly increasing towards the high mountains of Greece (Olymbos, Pindhos), reaching the highest number on mountains of Sterea Ellas (Parnassos and Giona). A high percentage of endemism has also been registered on the high mountains of Peloponnesus, especially on Taygetos, as well as on the mountains LevkaOri and Psiloritis on Crete.

The flora of the western part of the Peninsula, more precisely, Dinaric Alps and Adriatic Mediterranean and Submediterranean, is also characterized by a significant percentage of endemics – with the striking presence of paleo-endemic monotypic genera (*Degenia, Petteria, Pancicia-Pimpinellaserbica*), genera *Heliosperma* and *Edraianthus*, with the highest number of species in the western part of the Peninsula, followed by some sections of the genera *Campanula* (sect. Isophylla), *Asperula* (sect. Typhlisia), *Hieracium* (sect. Pannosa) and aggregates of some other species. Balkan endemics, in the western part of the Peninsula, have primarily been found in high limestone mountains of the Dinaric Alps and its gorges and canyons, as well as on a number of Dalmatian islands and coastal regions. However, the largest part of the flora comprises non-endemic species of wider Central-European Mountain, South-European Mountain, Boreal, Central-European and Mediterranean distributions. This highly-mixed chorological composition of flora is characteristic not only for western, but also for central parts of the Peninsula, in Serbia, Macedonia, northern Albania, northern Greece and western Bulgaria.

The territory of Bosnia and Herzegovina occupies the central position in the western part of the Balkan peninsula. In the north, it is a lowland territory, spreading along alluvial plains of the Sava river and its tributaries. From alluvial plains on the north, the relief changes by gradual rising of the Dinaric Mts range towards the south, which spreads along the northwest – southeast direction. The highest mountains of the central Dinaric Alps are divided into two, almost parallel chains: the inner Dinarides (Plješevica-Grmeč-Klekovača-Cincar-Plazenica-Vlašić-Vranica-Bjelašnica-Treskavica-Zelengora-Maglić) and Mediterranean (coastal) Dinarides (Dinara-Tušnica-Vran-Čvrsnica-Prenj-Velež-Bjelasnica-Viduša-Orjen). These two chains are separated, in the west, by larger karst fields (Grahovsko, Livanjsko, Duvanjsko, Kupreško, Vukovsko), while further to the east they are separated by valleys of the Rama river and upper flow of the Neretva river.

The high-mountain areas of the inner Dinarides are characterized by a modified humid mountain climate of the type Alpine X1 (Walter & Lieth 1964). These are more heterogeneous in geologic composition, but limestone and dolomites are predominant, while the highest silicate mountain, Vranica (2112 m), is situated in the central part of the chain. Northern slopes of the inner Dinarides are rich in water sources, generating large rivers of the Danube basin (Una, Vrbas, Bosna and Drina rivers) that flow mainly in a south-north direction, occasionally forming deep canyons and gorges. The altitude of this chain rises from the northwest towards the southeast, and at the border with Montenegro it reaches the highest point in B&H, on the mountain Maglić (2386 m). The high mountain chain of the inner Dinaric Alps enables Mediterranean warmer air masses to spread deeper into continental parts of the territory.

The coastal line of the Dinarides is characterized by a per-humid mountain climate under the Mediterranean influence of type X2 (Walter & Lieth 1964). The substrates are Triassic and Jurassic limestones and dolomites, and these mountains are mainly waterless. A poor hydrographic network is composed mainly of underground streams that belong to the Cetina river basin in the west and Trebišnjica river basin in the East, while the Neretva river interrupts this mountain chain in its central, highest part (Čvrsnica Mt. 2228 m), building an imposing canyon. The Mediterranean influence is strongly restricted in the valleys of these rivers, but reaches deeper inland, up to the border of the inner Dinarides.

The Pannonian, mainly plain or slightly hilly or/and montane of northern Bosnia is characterized by a moderate-continental climate, with a conspicuous gradient of precipitation, decreasing along the line west-east. It is characterized by a transitional central European moderate-humid climate of hills and plains (VI 2b type).

The state territory of B&H has only a small fragment of the Adriatic Sea coast with a length of 24 km.

MATERIAL AND METHODS

An inventory of B&H endemic flora was made based on extensive herbarium and literature data regarding plant taxonomy and floristic botany (Kummer & Sendtner 1849; Pantocsek 1873-1874; Hofmann 1882; Conrath 1887-88; Freyn & Brandis 1888; Vandas 1888-89; Formanek 1888-1890; Fiala 1889-1899; Brandis 1890/91; Murbeck 1891; Boller 1892; Maly 1893-1952; Maly & Zahn 1925-1929; Maly & Bjelčić 1949; Beck 1903-1927; Beck & Maly 1950; Beck *et al.* 1967-1983; Handel-Mazzetti *et al.* 1905-06; Janchen 1906; Janchen & Watzl 1908; Sagorski 1914; Korica 1950-1966; Bajić *et al.* 1952; Ritter-Studnička 1952-1963; Bjelčić 1956-1964/65; Slavnić & Bjelčić 1963; Bjelčić & Milanović 1968; Bjelčić *et al.* 1969; Bjelčić & Šilić 1971; Šilić 1972-1979; Lakušić 1973; Lakušić *et al.* 1979;

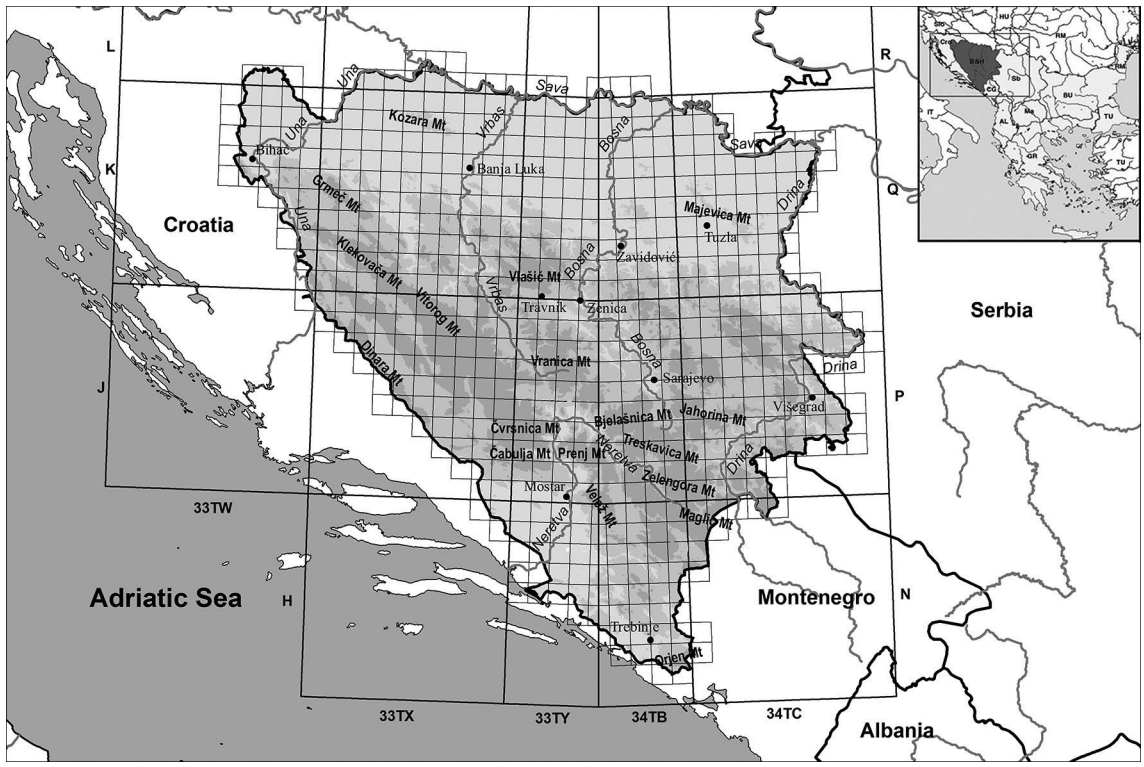

Fig. 1. MGRS network with squares of 10x10 km and numerated squares 100x100 km in B&H. In the upper right corner, the position of BiH (shaded) in the Balkans. Prominent mountains, main rivers and larger settlements are presented.

Šilić & Abadžić 1986-1991; Lakušić & Redžić 1989; Redžić *et al.* 1984-1992/95; Šoljan 2001; Stevanović & Lakušić 2006; Niketić 2007; Bucalo *et al.* 2008; Milanović *et al.* 2009, 2011; Brujić *et al.* 2011; Stupar *et al.* 2009, 2011), phytocoenology, morphology and cytotaxonomy studies (280 references), and comprehensive investigations of flora by the authors in the period 2007-2012 on numerous localities in B&H. In some cases, there was a dilemma regarding the correctness of taxonomical and chorological data from literature sources. Such data were marked as doubtful or erroneous and were not included in the analysis. A total of 298 Balkans endemic taxa were determined at the species and subspecies rank, which is estimated to be a relatively moderate 8% of the total flora in B&H.

The collected data on distribution and ecological characteristics of the Balkan endemics on the territory of B&H were incorporated in a database (6909 records) of MS Excel 2003, containing the following information:

1. Taxonomic-nomenclature data contains the accepted name of the taxon and sub-nomen of the taxon (original title in bibliographic source or herbarium);
2. Chorological data: sub-nomen of the locality (original citation on the location from the bibliographic source or herbarium), region, locality 1 (wider location), locality 2 (more precise location), locality 3 (sub-locality), MGRS mark or marks if the locality encompassed several MGRS squares;
3. Ecological data: habitat (plant community) in which the taxon was found; bedrock, altitude, exposition, terrain gradient, degree of presence in a certain plant community;
4. Bibliographic data: a complete list of authors, publication year and a complete title of the reference with chorological data;
5. Data from herbarium labels: the name of the collector (legator), date of collection, collection and/or inventory number of the sample, the collection in which the material was deposited, name of the author who identified the taxon.

Taxonomic statuses of endemic taxa were given according to contemporary bibliographic sources (Greuter *et al.* 1984-1989; Jalas & Suominen 1972-1994; Jalas *et al.* 1996, 1999; Kurto *et al.* 2004, 2007; Strid & Tan 1997-2002; Tutin *et al.* 1964-1980; Tutin *et al.* 1993), as well as electronic databases (http://ww2.bgbm.org/EuroPlusMed/; http://bgbm3.bgbm.fu-berlin.de/iopi/gpc/default.asp; http://www.ipni.org/).

The distribution of each endemic taxon of the species and subspecies rank on the territory of B&H was mapped onto the MGRS (Military Grid Reference System) network of 10x10 km squares, according to the method

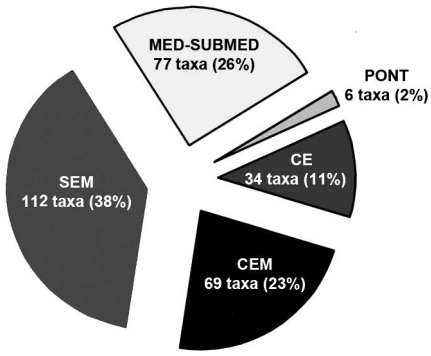

Fig. 2. Spectrum of basic chorologic groups corresponding to floristic regions to which endemic taxa of the Balkans in B&H belong. SEM – South European mountain; CEM – Central European mountain; CE – Central European; MED-SUBMED – Mediterranean-sub Mediterranean; PONT- Pontic.

described in Kurtto *et al.* (2004) (**Figure 1**). Individual distribution maps of each endemic taxa were used for mapping the summary distribution of endemic taxa of basic chorological groups, to which an individual taxon belongs. Maps were made using the software package ESRI ArcGIS 9.3. Arc GIS 9.3.

Depending on the geography of ranges and phylogenetic relations, for each Balkan endemic taxon, belonging to the certain floristic element, chorological subgroup, and finally, chorological group was determined. In that way, endemic taxa were not only defined based on geography of the ranges (floristic elements), but their wider belonging to the appropriate basic phychoria [phytochoria?], i.e. chorological groups (CEM, SEM, CE, MED-SUBMED and PONT). Names of chorological subgroups and groups mainly corresponded to phytochoria at the floristic region, sub-region and province ranks as given for the Balkan peninsula by Glavač (in Horvat *et al.* 1974). A list of species assigned to the appropriate chorological group, subgroup and floristic element, was given in the Annex of this paper (see the annexes on line http://botanicaserbica.bio.bg.ac.rs/)

RESULTS

The chorological spectrum of Balkan endemic flora in B&H, encompassed 298 endemic taxa at the species and subspecies ranks. The most dominant was the South-European Mountain chorological group (SEM) with 112 taxa or 37.7% of the total Balkan endemic flora. Mediterranean-Submediterranean group (MED-SMED) and Central-European Mountain group (CEM) were represented with significantly smaller numbers of taxa – 77 taxa or 25, 7% and 69 taxa or 23, 2%, respectively. The Central European chorological group (CE) included 34 taxa, or 11.4%, while the Pontic group (PONT) was represented by only six taxa, or 2% of the total chorological spectrum (**Figure 2**).

South-European Mountainous group (SEM) – 112 taxa, 38% of the total endemic Balkan flora in B&H.

This includes endemic orophytes whose closest relatives are distributed on mountains of South Europe. Their ranges enclose the limestone coastal and partly central Dinarides, mountains of the Scardo-Pindhic system, from Šar-planina to south Pindhos, rarely to Peloponnese, and mountains of south-west Bulgaria. This group of orophytesis was divided into two subgroups: Dinaric and Dinaric-Balkan Mountain, with 67 taxa (60%), and 45 taxa (40%) participating, respectively (**Figure 3**). Among the Dinaric endemic taxa, the most abundant were those of central-eastern Dinaric distribution, having ranges spreading from the mountains of C. B&H to E. & S.E. Dinaric Alps of Montenegro, N. Albania and W. & S.W. Serbia (19 taxa, 28%), such as e.g. *Veronica saturejoides*, *Edraianthus serpyllifolius*, *Campanula hercegovina*, *Hieracium stirovacense* subsp. *miricifissimum*, *H. plumulosum*, *Scilla lakusicii*, *Thesium auriculatum* etc., followed by east Dinaric elements with 17 taxa, 21% (*Edraianthus montenegrinus*, *Senecio thapsoides* subsp. *visianianus*, *Avenula blavii*, *Centaurea incompta*, *Hieracium calophyllum*, etc.) and western to eastern Dinaric endemics distributed from Velebit to Prokletije with 14 taxa, 14% (*Cerastium grandiflorum*, *Arenaria gracilis*, *Lonicera glutinosa*, *Leucanthemum chloroticum*, *Aubrieta columnae* subsp. *croatica*, *Edraianthus caricinus*, *Fritillaria gracilis* subsp. *gracilis* etc.). Central Dinaric elements (11 taxa, 16%) encompassed species distributed on mountains of C. Bosnia (Vlašić, Vranica, Treskavica, Bjelašnica) and Herzegovina (Čvrsnica, Čabulja, Prenj, Velež), and West Dinaric and western-central Dinaric elements were represented with only 3 species (5%) each (*Campanula waldsteiniana*, *Heliosperma pussila* subsp. *malyi*, *Sesleria albicans* subsp. *angustifolia*, for the former, and *Sibiraea croatica*, *Edraianthus croaticus* and *Viola chelmea* subsp. *vratnikensis* for the latter). A certain number of strict endemics should be added to this group. These were limited to particular mountains such as *Dianthus freynii* on Prenj, *Edraianthus niveus* on Vranica, *E. sutjeskae* on Maglić, *Iris orjenii* on Orjen, etc.

The Dinaric-Balkan subgroup included endemic taxa whose ranges enclose, besides Dinarides and Scardo-Pindhic mountains (22 taxa or 49%), Scardo-Pindhic and Moesian mountains (21 taxa or 47%), while disjunctive Dinaric-Moesian elements were very rare and represented with only two taxa (4%). More detailed division of each of these groups within the Dinaric-Balkan orophytes is given

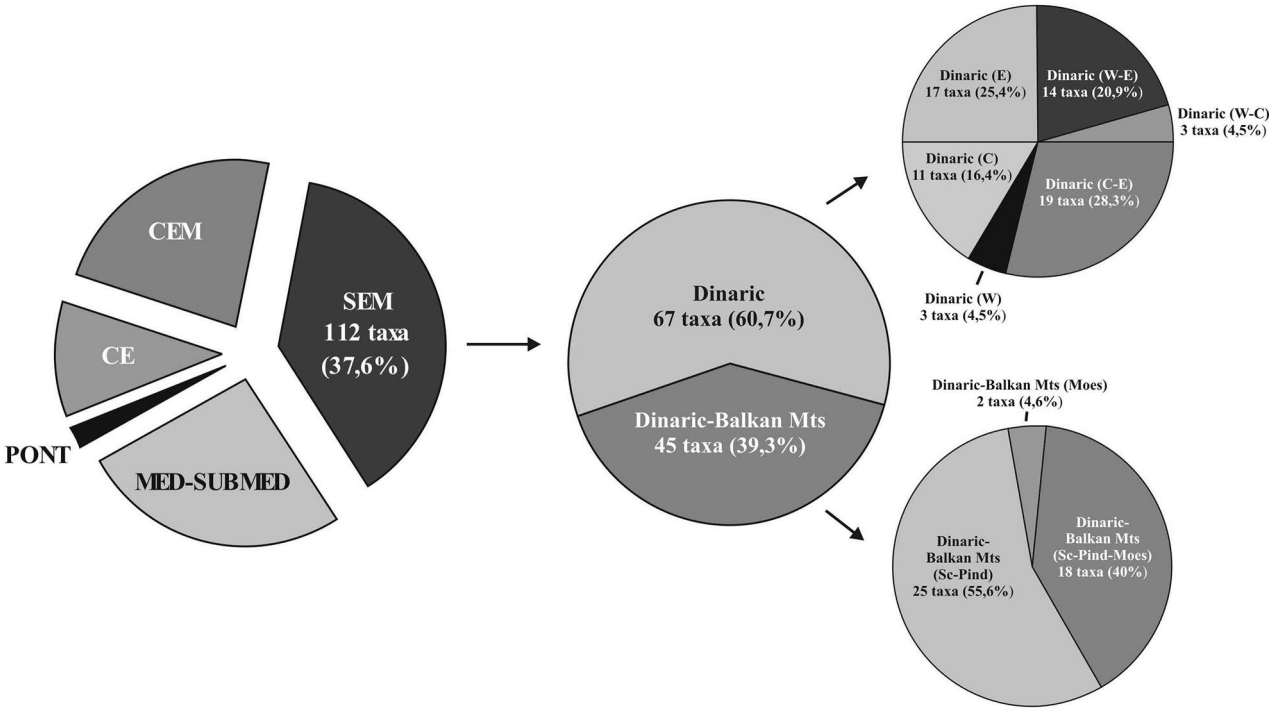

Fig. 3. Percentage of endemic Balkan taxa of the SEM chorological group and corresponding subgroups and floristic elements in BiH. Abbreviations: Dinar - Dinaric; Balk - Balkan mountain; Scard-Pind - Scardo-Pindhic mountains; Moes - Moesian mountains: N - North; S - South; W - West; C - Central; E - East;

based on the width of the areal and is shown in the Annex of the paper. Those are endemics with the largest ranges among Balkan orophytes. Many of these species belong to the group of paleoendemic such as *Minuartia clandestina, Amphoricarpos autariatus, Pimpinella serbica, Asyneuma pichleri, Achillea ageratifolia* subsp. *serbica, Aurinia corymbosa, Cephalaria pastricensis, Euphorbia capitulata, Anthyllis aurea, Potentilla speciosa* subsp. *illyrica*, etc.

On a summary map of distribution and number of endemic taxa of the SEM group, the following mountains were distinguished by their floristic richness, in the descending order Prenj (43), Čvrsnica (38), Orjen (38), Velež (35), Treskavica and Bjelašnica (30), Maglić and Zelengora (26), Čabulja (21) (**Figure 4**). These are mostly high mountains of the coastal Dinarides which are under strong Mediterranean influences. Endemic taxa from this group also occurred less on the mountains of west and central Bosnia. Thus, on the mountains Dinara Mt. (13 taxa), Vlašić (12), Vranica (10), Klekovača and Šator (8), Osječenica (7), Vitorog (4) etc. have been recorded. Thanks to the relatively low limestone and serpentine mountains of east Bosnia, the number of endemic taxa of this chorological group was comparatively high, as was also the case with the Višegrad area, where 22 taxa have been found.

Central European Mountainous chorological group (CEM) comprised endemic taxa whose closest relatives have been found distributed on mountains of central Europe, primarily in the Alps, and to a lesser degree on the Carpathians. This areal group, in comparison with the previous group (SEM), was represented by around only half the numbers of endemic flora of B&H, enclosing 69 taxa (23%) of the total endemic flora. It has been divided into two subgroups: Dinaric, with 32 taxa (46%) and Dinaric-Balkan, with 37 taxa (54% of the total endemic flora of the CEM group) (**Figure 5**). The most abundant within the Dinaric subgroup were central-eastern Dinaric orophytes with 11 taxa, 34% of this subgroup (*Aquilegia dinarica*, *Asperula wettsteinii, Astragalus fialae, Pedicularis heterodonta, Saxifraga prenja* and others), followed by the central Dinaric with eight taxa, 25% (*Knautia travnicensis, Rhinanthus dinaricus, Centaurea murbeckii, Alchemilla vranicensis* and others) and west to east Dinaric endemic orophytes with seven taxa, 22 % (*Arabis scopoliana, Cerastium dinaricum, Tephroseris crassifolia* and others). These were followed by east Dinaric orophytes with five taxa, 16% (*Aquilegia grata* subsp. *grata, Picea omorika, Knautia pancicii* and others), while west to central Dinaric orophytes were represented with only one species, 3% (*Primula kitaibeliana*) (Figure 5).

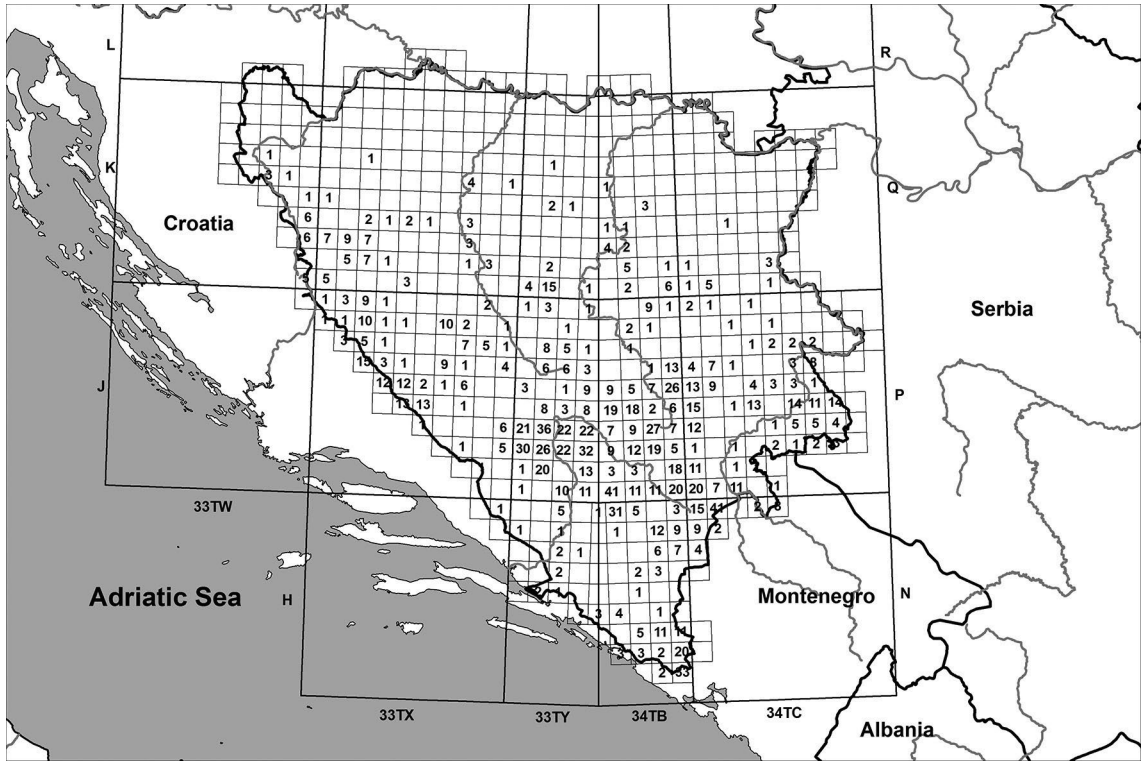

Fig. 4. Distribution and number of endemic taxa per square 10x10 km from the South European mountainous group (SEM) in B&H.

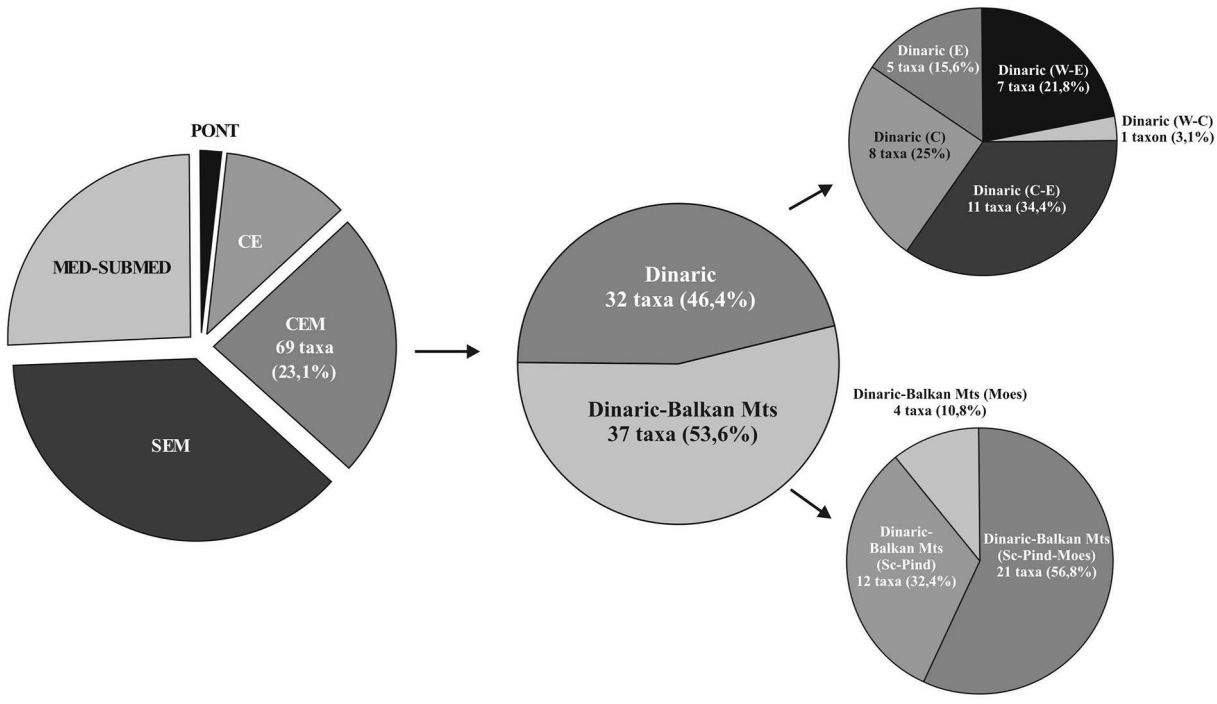

Fig. 5. Percentage of endemic Balkans taxa from the CEM chorological group and appropriate subgroups and floristic elements in BiH. Abbreviations as in Fig. 3.

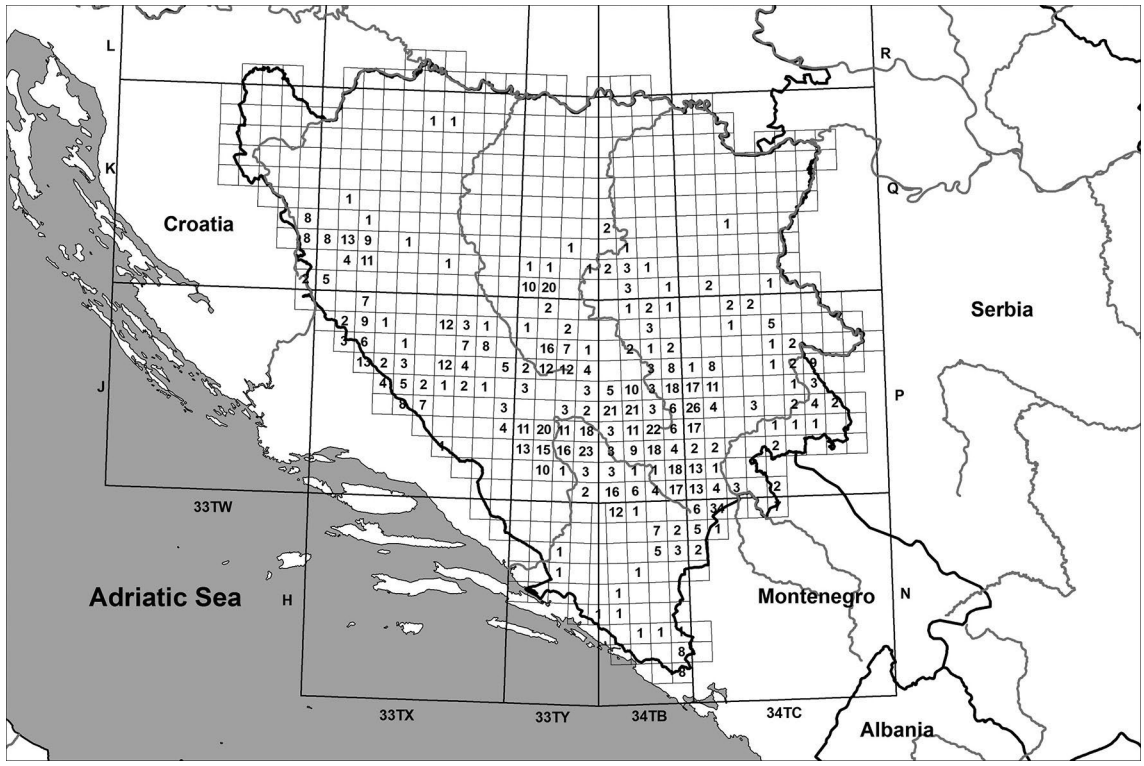

Fig. 6. Distribution and number of endemic taxa per square 10x10 km from the Central European mountainous group (CEM) in B&H.

The Dinaric-Balkan subgroup of endemic orophytes of the Central-European Mountainous group includes taxa that are widely distributed on mountains of the Peninsula, from the Dinaric Alps through the Scardo-Pindhic mountains of Macedonia, Albania and Greece, and Moesian mountains of Bulgaria, E. Serbia and E. Macedonia. The most abundant were Dinaric-Scardo-Pindhic-Moesian mountain floristic elements with 21 taxa, 57% of this chorological subgroup (*Alyssum scardicum, Pedicularis grisebachii, P. hoermanniana, Potentilla montengrina* and others), followed by Dinaric-Scardo-Pindhic endemic orophytes with 12 taxa, 32% (*Oxytropis prenja, O. dinarica* subsp. *dinarica, Vicia montenegrina, Plantago reniformis,* and others), while the disjunct Dinaric-Moesian orophytes had four taxa, 11% (e.g. *Geum bulgaricum*).

The greatest species number of taxa of the CEM group was mainly found on the mountain massive of Prenj (29) and the central Dinaric Alps: Bjelašnica (28), Jahorina (27), Maglić (26), Vranica (25), Treskavica (25), Zelengora (21), Vlašić (20), etc. (**Figure 6**). Significantly fewer taxa have been recorded on the coastal Dinarides of Herzegovina, such as Velež (15), Orjen (14), Čabulja (9), etc.

Within the **Mediterranean - Submediterranean chorological group (MED-SMED)** three subgroups have been defined, depending on whether and to what extent their ranges exceeded the borders of the MED-SMED region, that is, how much they spread within the Balkans

1. Mediterannean-Submediterranean-Subcontinental subgroup (Med-submed-subcont) that enclosed endemic taxa that are spreading, apart from the Mediterranean basin, also around continental parts of the Peninsula;
2. Submediteranean (Balk-submed) that included taxa limited to Submediterranean parts of the Peninsula, i.e. its immediate Mediterranean hinterland;
3. Subcontinental (subcont) subgroup that included ancient Mediterranean species that are distributed in continental parts of the Peninsula on thermophilous limestone or serpentine habitats.

The largest number of taxa, 42 (55% of MED-SUBMED group) belonged to the Balkan Submediterranean endemic taxa (Balk-submed). This subgroup comprised almost exclusively endemic Adriatic Submediterranean elements (40 taxa, 95% of this subgroup) characterized by varying size of ranges spreading along the Adriatic Submediterranean floristic subregion (*Acinos orontius*, *Alyssum moellendorfianum*, *Heliosperma retzdorfiana, H. tommasinii, Knautia clementii*, *Arum petteri*, *Crepis pantocsekii*, *Dianthus ciliatus* subsp. *dalmaticus*, *Hyacinthella dalmatica*, *Edraianthus tenuifolius*, *Dianthus*

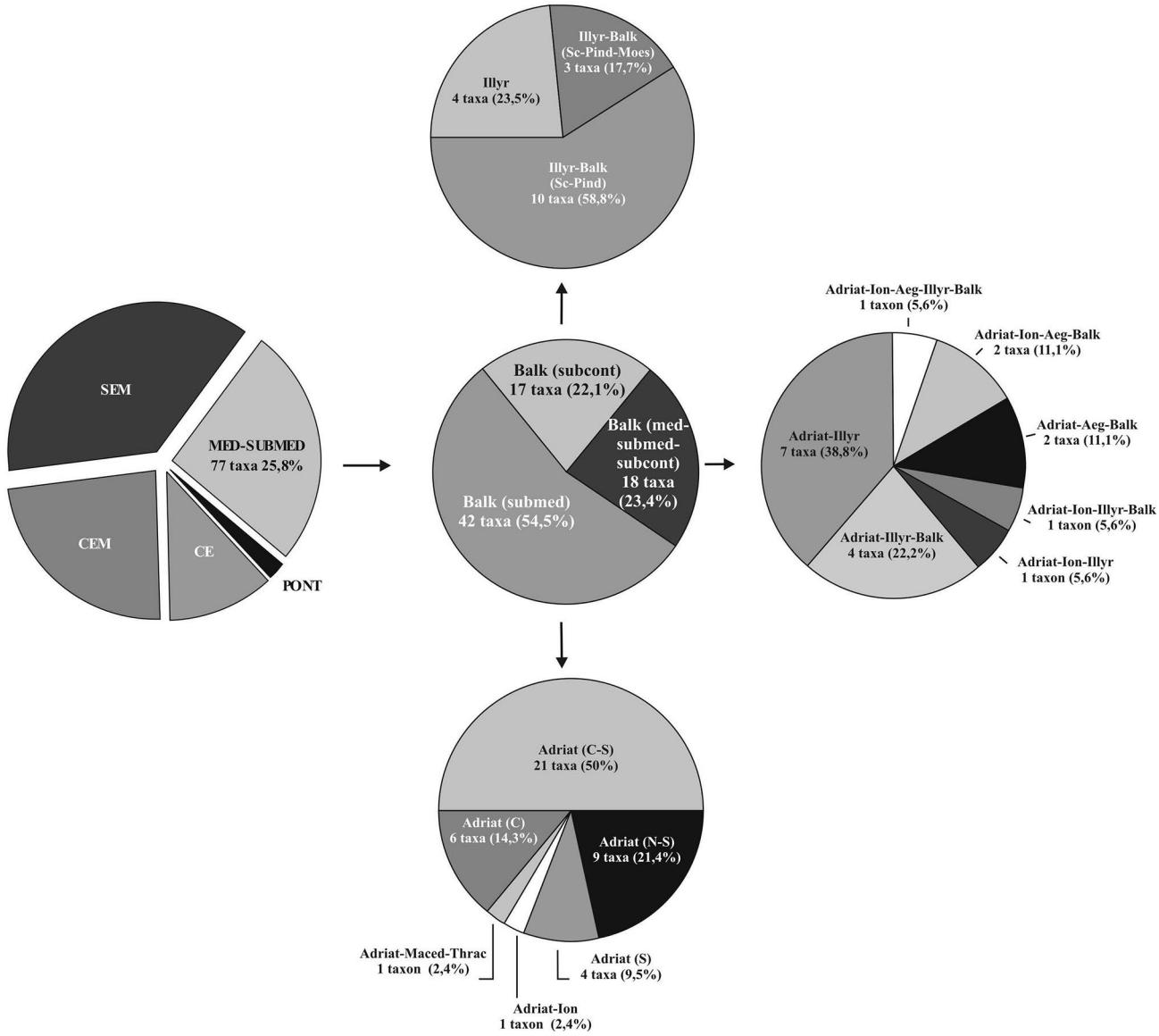

Fig. 7. Percentage of endemic Balkan taxa of subgroups of Mediteranean-submediteranean chrological group in BiH. Abbrevations: Adriat - Adriatic; Ion - Ionian; Aeg - Aegean; Mac-Thrac - Macedonian-Thracian; Balk - Balkan; Sc-Pind - Scardo-Pindhic; Moes - Moesian, Illyr - Illyrian; N - North; S - South; W - West; C - Central; E - East

knappii, *Seseli tomentosum*, *S. globiferum, Succisella petteri, Silene reichenbachii, Salvia brachyodon, Thymus bracteosus, Vicia ochroleuca* subsp. *dinara,* etc.), while Adriatic-Ionian (*Petteri aramentacea*) and Adriatic-Macedonian-Thracian elements (*Rhamnus orbiculata*) were represented with only one taxon.

The mediterranean-submediterranean-subcontinental subgroup (Med-submed-subcont) took second place. It was represented with 20 taxa (26%) of endemic species of widest distribution. Their ranges enclosed the MED-SUBMED region of the Balkans, but were more-less widely distributed within the Peninsula as well: *Trifolium dalmaticum*, *T. pignantii*, *Chaerophyllum coloratum*, *Bupleurum karglii*, *Allium guttatum* subsp. *dalmaticum* and others.

There follows the subcontinental subgroup (subcont) with 15 taxa (19%), including ancient Mediterranean species that inhabit thermophilous serpentine and limestone habitats. Such species were either phylogenetically isolated, or their relatives were widespread on the Mediterranean basin and hinterland. Such species on serpentine habitats were *Halacsya sendtneri, Gypsophila spergulifolia, Fumana bonapartei, Haplophyllum boisserianum, Potentilla visianii, Viola beckiana, Scrophularia tristis, Euphorbia glabriflora* and others, and on limestone *Onosma stellulata*, *Symphyandra hofmannii, Salvia sonklari, Eryngium palmatum* and others.

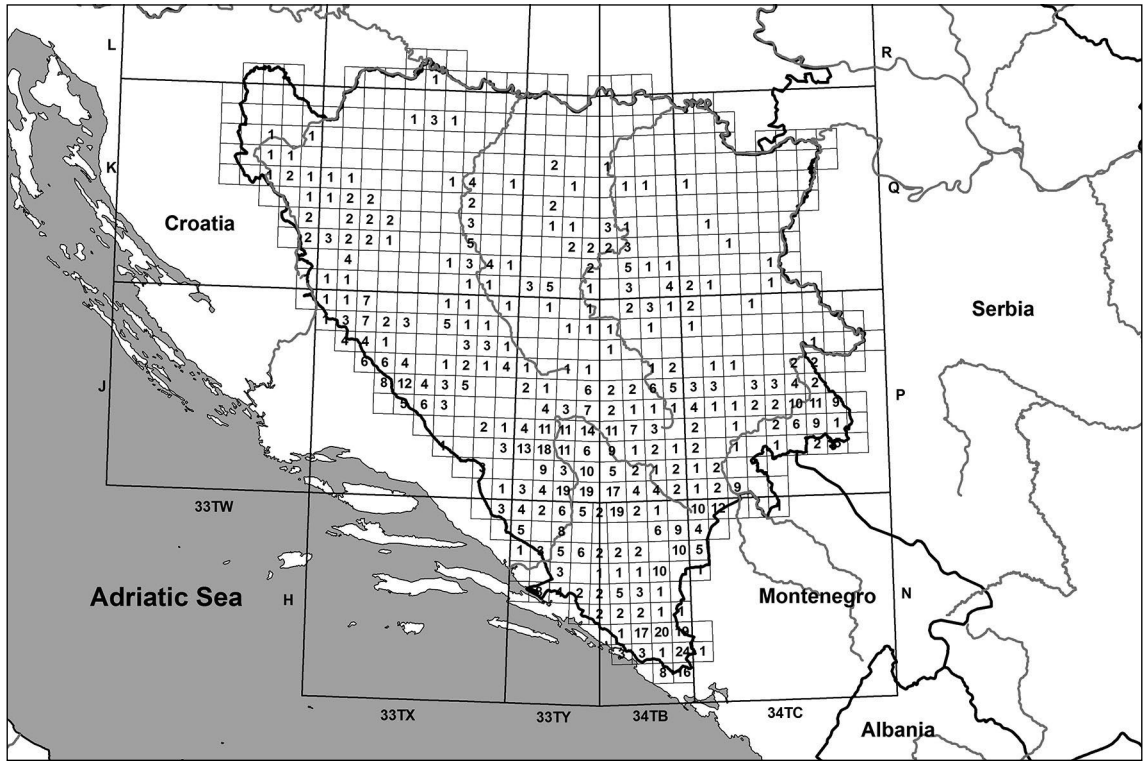

Fig. 8. Distribution and number of endemic taxa per square 10x10 km from the Mediteranean-submediteranean group (MED-SUBMED) in B&H.

A summary map of the distribution and number of endemic taxa of the Mediterranean-Submediterranean chorological group (**Figure 8**) shows that the largest number of taxa of this group were situated in hilly regions and canyons of limestone mountains of Herzegovina, such as Dinara (24), Orjen (21), Prenj (15), Velež (14), Čvrsnica (13), Čabulja (11), etc., as well as the surrounding karst fields under Mediterranean influences. Note that endemics from the Mediterranean-Submediterranean group have also often been found on serpentine terrains in E. Bosnia, e.g. in the vicinity of Višegrad (17) and Rudo (10), and to a lesser degree on serpentines of C. Bosnia, around Zavidovići (6).

The **Central-European chorological group (CE)** encloses endemic taxa that have been limited to woody and meadow habitats to the mountain zone in the inner Peninsula, whose closest relatives have a central European distribution. The group is divided into two subgroups: Illyrian with 25 taxa, 74% of this chorological group, and Illyrian-Balkan with 9, 26% (**Figure 9**). Of Illyrian endemic taxa, most represented were those whose ranges cover complete central parts of the Illyrian subregion (9 or 36%), followed by central-eastern Illyrian (11 or 44%), and eastern Illyrian (4 or 16%), while western to eastern Illyrian endemics were represented with a single taxon (4%). Illyrian-Balkan elements of the CE group were represented by widely distributed taxa whose ranges enclosed central to southeast Illyrian, Scardo-Pindhic and Moesian subregions and corresponding provinces with 6 taxa, 67% of the Illyrian-Balkan subgroup. Central-southeast Illyrian – Balkan (Scardo-Pindhic) elements of the Balkans endemic flora in B&H have been found in a somewhat smaller number (3 taxa, 33%) (Figure 9).

On the distribution map of endemic taxa of the CE group (**Figure 10**), the largest number of species was recorded on mountains in the vicinity of Sarajevo (Trebević, Jahorina, Romanija, including the canyon of the Miljacka river – 16 taxa), Prenj (10) and Bjelašnica (7). Also, ten endemic CE taxa occurred in E. Bosnia, in the vicinity of Višegrad and Prača. Of the total of 34 endemic taxa of the CE group, 16 taxa belong to the hybrid species of the genus *Hieracium* from aggregates of *H. murorum* and *H. bifidum,* while 14 endemic subspecies of these species have been recorded only on Trebević Mt and around Sarajevo. A moderate number of taxa from this group was found on almost all mountains of the inner Dinarides in Bosnia and Herzegovina, while a significantly smallest number of CE endemics was present in parts of the territory that are under strong Mediterranean influences.

The **Pontic chorological group (PONT)** was represented by only six endemic taxa that are phylogenetically and taxonomically related to their Pontic or Pontic-Mediteranean relatives. Their distribution was found to be limited on the one hand by thermophilous

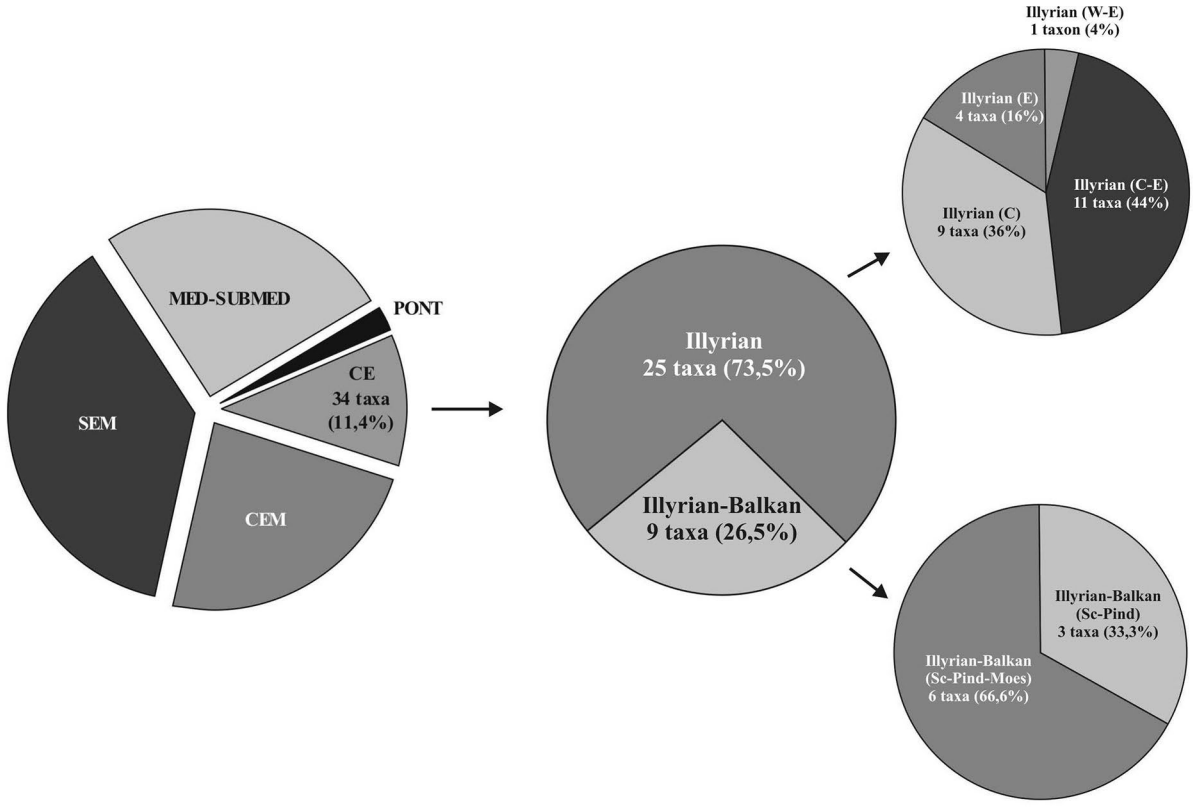

Fig. 9. Percentage of endemic Balkan taxa from the Central European (CE) subgroup of chorological group in BiH. Abbrevations as in Fig. 3.

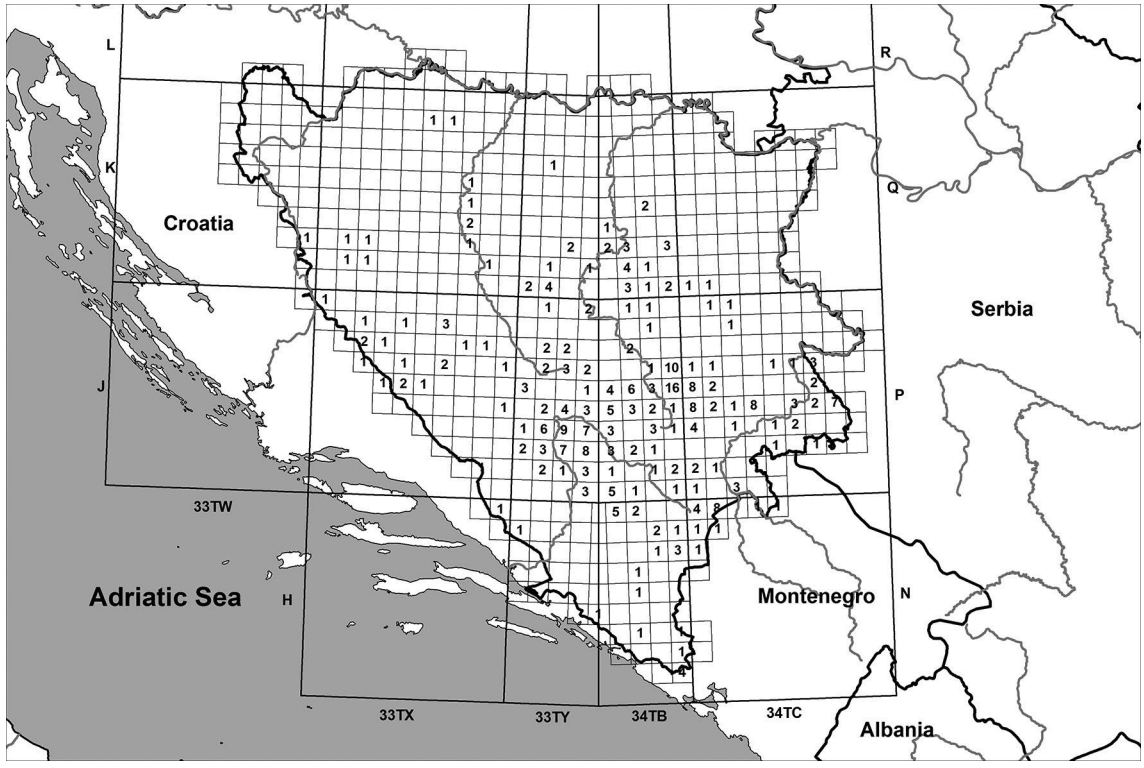

Fig. 10. Distribution and number of endemic taxa per square 10x10 km from the Central European group (CE) in B&H.

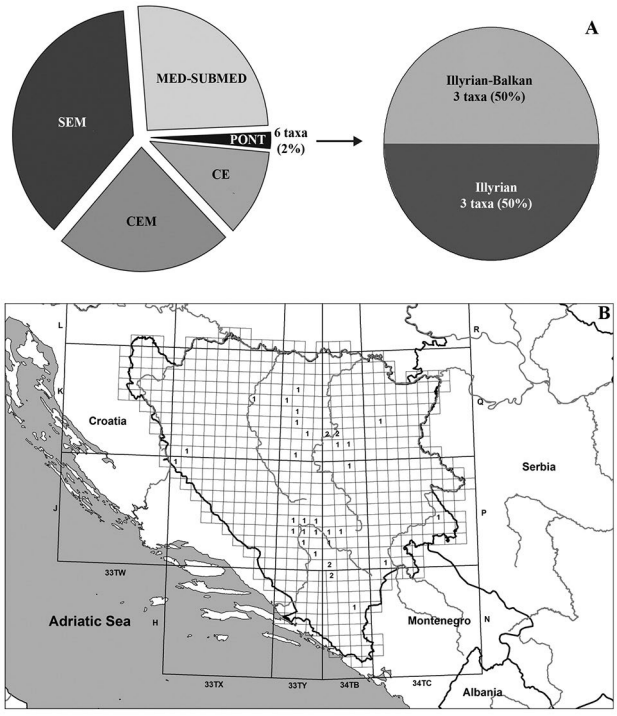

Fig. 11. Percentage of endemic Balkan taxa from the subgroup of Pontic chorological group (PONT) in BiH (left) and distribution and number of endemic taxa per square 10x10 km from this group in B&H (right).

rocky serpentine habitats of N. & E. Bosnia (*Chamaecytisus maezeius*, *Polygonum albanicum*) and/or open limestone steppe-like rocky habitats of Herzegovina (*Onosma pseudoarenaria* subsp. *fallax*, *Pulsatilla velezensis*, *Ranunculus psilostachys, Peucedanum neumayeri*) (**Figure 11**). An equal number of three taxa was characterized by an Illyrian and Illyrian-Balkan endemic distribution.

The summary distribution of all endemic Balkan flora on B&H territory presented through the number of endemic species in each of MGRS squares 10x10 km (**Figure 12**) clearly shows that high limestone mountains in B&H are the most significant centers of endemism in this part of the W. Balkans. Several mountains and spatially close mountain groups i.e. Maglić and Volujak with the canyon of the Sutjeska river (99 taxa), Prenj (99 taxa), Čvrsnica (78), Velež (70), Orjen and Bijela Gora (76), Bjelašnica and Treskavica (109), Vranica (47), Jahorina, Trebević, Romanija (76), Zelengora (50), Dinara (52), Vlašić (38) etc. were distinguished by their floristic richness. This is caused by the mixed chorological structure of flora, with numerous endemics from SEM and CEM taxa in high mountain regions, Mediterranean – Submediterranean elements in the surrounding limestone canyons, gorges or open rocky habitats, as well as taxa from the CE group in mountain forest areas of those mountains. In that respect, the mountain of Prenj in Herzegovina is characterised

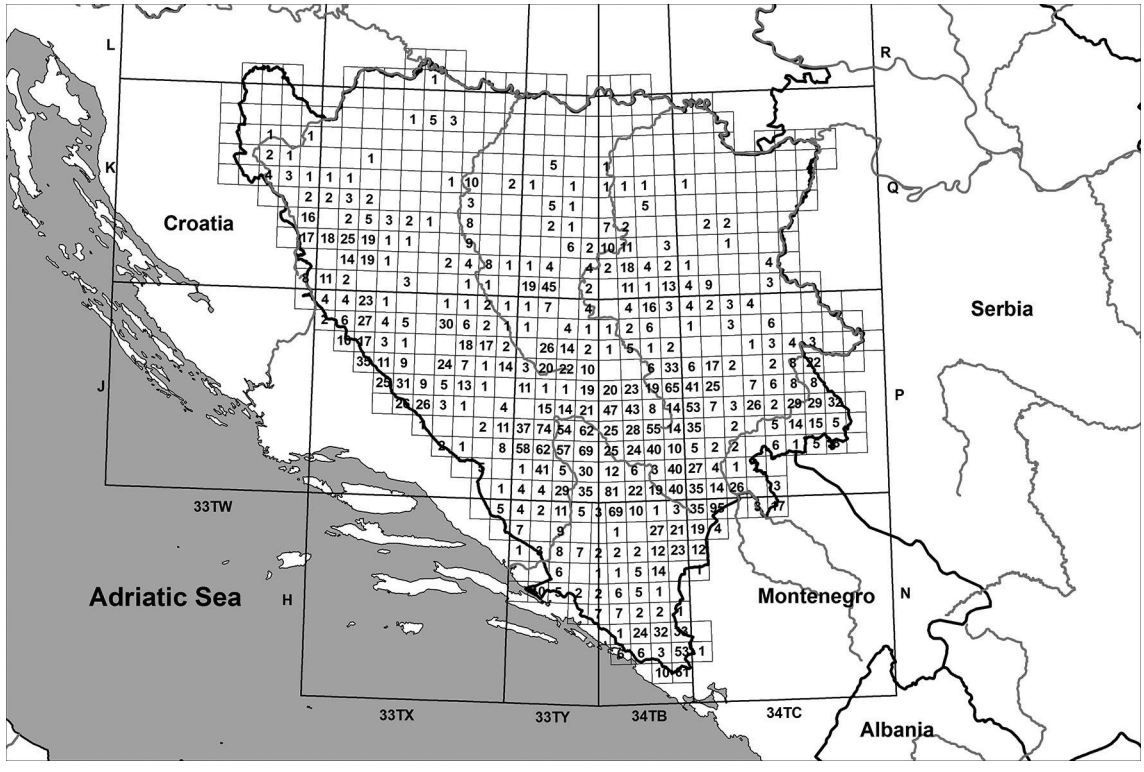

Fig. 12. Number of endemic taxa of all chorological groups in B&H mapped on MGRS squares 10x10 km.

by a mixed chorological composition of flora, with high percentages of endemics of all chorological groups, except Pontic.

Such mixed composition of flora is largely a consequence of the complex genesis of flora during the Neogene.

DISCUSSION AND CONCLUSIONS

Based on data gathered from the vast quantity of taxonomical and phytocoenological literature, field research and reviews of Herbarium collections, 298 Balkan endemic taxa were found to occur at the species and subspecies ranks in B&H.

The largest number of endemics belonged to the South-European Mountainous chorological group (SEM) with 112 taxa, 38% of the endemic Balkan flora in B&H, followed by the Mediterranean–Subediterranean group (MED-SUBMED) with 77 taxa (26%), Central-European Mountainous group (CEM) with 69 taxa (23%), Central-European (CE) with 34 taxa (11%) and Pontic (PONT) with six taxa (2%).

The SEM chorological group was composed of Dinaric and Dinaric-Balkan elements that participated with 22.5% and 15.1%, respectively, of the total chorological spectrum of endemic flora in B&H. These are taxa phylogenetically connected with the closest vicarious relatives on mountains of S. Europe (S. Alps, Apennines, mountains of Greece, Asia Minor, even the Iberian Peninsula). These are often isolated paleo-endemic species that give a particular 'signature' to the flora of the Dinaric Alps. Such species are *Amphoricarpos neumayeri, A. autariatus, Sibiraea croatica, Veronica saturejoides, Moltkia petraea, Arenaria gracilis, Euphorbia capitulata, Daphne malyana, Edraianthus serpyllifolius, Campanula waldsteiniana, Micromeria croatica, Anthyllis aurea, Pimpinella serbica, Cephalaria pastricensis*, etc.

The CEM group also included Dinaric and Dinaric-Balkan elements that participated with almost equal shares of 10.7% and 12.4%, respectively, in the overall chorological spectrum of endemic Balkan flora of B&H. Those taxa are vicarious with relatives on mountains of C. Europe, primarily the Alps and Carpathians. Such species are *Primula kitaibeliana*, *Oxytropis dinarica* subsp. *dinarica*, *O. prenja*, *Astragalus fialae*, *Arabis scopoliana*, *Asperula wettsteinii*, *Cerastium dinaricum*, *Minuartia handelii*, *Lonicera formanekiana* subsp. *hectoderma*, *Lilium albanicum*, *Saxifraga prenja*, *Petasites doerfleri*, *Knautia travnicensis*, etc.

Within the MED-SUBMED group, the largest subgroup was Balkan-Submediteranean (Balk-submed) with 42 taxa, 15% of endemic Balkan flora in B&H. Among the endemic taxa from this group, a significant number is paleoendemics such as *Silene reichenbachii, Heliosperma retzdorfiana, H. tommasinii, Dianthus nikolae, Salvia brachyodon, Micromeria kerneri, Petteria ramentacea, Seseli globiferum*, etc. In second place came endemics of the Mediterranean – Submediterranean – subcontinental subgroup with 20 taxa, 6.7% of the total spectrum. These were the species either with the widest dispersion, which in addition to the Balkan Mediterranean coastal area and hinterland, were distributed also on thermophilous habitats of the inland of the Peninsula (*Trifolium dalmaticum*, *T. pignantii*, *Sideritis purpurea*, *Chaerophyllum coloratum*, *Cephalaria flava* subsp. *flava* etc.) or were distributed in the Adriatic basin, reaching to the inside of the western part of the Peninsula (*Moltkia petraea*, *Teucrium ardunii*, *Stachys serbica*, *Helleborus multifidus* subsp. *multifidus*, *Asperula scutellaris*, etc.). The Subcontinental subgroup comprised 15 taxa, 5% of the overall spectrum. Some species from this group may be considered ancient Mediterranean elements that are exclusively distributed on thermophilous limestone or serpentine habitats in the inner part of the Peninsula. Such species on serpentines were, e.g. *Potentilla visianii, Fumana bonapartei, Gypsophila spergulifolia, Haplophyllum boisserianum, Viola beckiana*, etc., and on limestone *Symphyandra hofmannii*, *Eryngium palmatum*, *Onosma stelullata*, *Asperula scutellaris, Helleborus multifidus* subsp. *multifidus, Teucrium arduinii*, etc.

The Central-European group (CE) was represented by Illyrian and Illyrian-Balkan elements that participated with 25 taxa (8.4%) and nine taxa (3%), respectively, in the overall chorological spectrum of endemic flora in B&H. Those species were characterized by phylogenetical relations with central European flora elements. Most of the endemic taxa from this group are of hybrid origin within the complex *Hieracium murorum* and *H. bifidum*.

The number of endemic taxa from the PONT group was very small, which were mainly related to species that inhabit warm, steppe-like habitats on limestone or serpentine. Such species are *Onosma pseudoarenaria* subsp. *fallax, Pulsatilla velezensis, Peucedanum neumayeri, Chamaecytisus maezius, Ranunculus psilostachys* and *Polygonum albanicum*.

The analysis of geographical distribution, diversity and number of endemic taxa indicate the centers of Balkan endemic flora in B&H. Analyzing geographic distribution of diversity and number of endemic taxa, we determined the centers of endemic flora in BiH.These are, first and foremost, mountain areas of the Prenj sector, Prenj, Čvrsnica, Čabulja (125 taxa), mountains south of Sarajevo between the Neretva and Bosna rivers, such as Bjelašnica, Treskavica, Igman, Ivan, Rakitnica (109 taxa), mountains of the Durmitor sector, Maglić, Sutjeska, Volujak, Vučevo (99 taxa), and the mountains Trebević and Jahorina (76 taxa), Orjenand Bijelagora (76), Velež (70), which could

be considered as the most significant centers of diversity Balkans endemic flora on the territory of B&H. Besides these mountains, Dinara (52 taxa), Zelengora (50), Vranica (47 taxa) and Vlašić (38 taxa) are also mountains with high diversity of endemic flora in B&H. Only around half the number of endemic taxa were recorded on the mountains of W. Bosnia, such as Klekovača (25 taxa), Vitorog (21), Osječenica (17) and Grmeč (7). Particularly interesting areas in B&H were around Višegrad (64) and Rudo (21) in eastern Bosnia and surroundings of Zavidovići in central Bosnia (24), mostly due to rich endemic serpentine flora. We assume that such differences in the number of endemic species between particular mountains and mountain groups were derived from unevenness of their floristic exploration. The significant number of MGRS squares without any recorded endemic taxa undoubtedly supports this. This is more likely an indicator of their insufficient exploration, rather than the absence of any endemic species in these quadrants. The only exception was the northern plains of Bosnia, where endemic taxa were really missing.

Bearing in mind orophytic Balkan endemic flora in B&H as a whole, the ratio of the number of taxa between SEM and CEM groups is particularly important. Taxa from both groups were present on almost all high mountains in B&H, but in different numbers. The domination of SEM in relation to CEM representatives has been determined on many mountains, particularly in Herzegovina and the Maritime Dinarides. Thus, on Čvrsnica Mt. that ratio was 38 (SEM) vs 22 (CEM); Čabulja (21 vs 9), Prenj (43 vs 29) Orjen (36 vs 14), Velež (35 vs 15). Going towards the inner Dinarides, that ratio gradually changed, so on Treskavica it was 30 (SEM) vs 25(CEM), Bjelašnica (30 vs 28), Volujak (13 vs 9) and was equal on Maglić (26 vs 26). This ratio changed in favor of CEM species in the inner chain and western Dinarides in B&H, so on Klekovača the ratio was 14 (CEM) vs 8 (SEM), Vranica (25 vs 10), Vlašić (20 vs 12), Jahorina (27 vs 20), Romanija (15 vs 6), Vitorog (11 vs 4), etc. The relation of SEM and CEM endemic species is an important indicator in the border of phytochoria of the subregion rank in the western part of the Peninsula, more precisely Alpine-High Nordic and south European mountain subregions. This analysis once again showed that the Dinaric mountains are characterized by a mixed composition of orophytic flora and a wide zone where CEM and SEM subregions overlap. Indeed, only an outside line of limestone Dinaric Alps under strong Mediterranean influences would belong to the SEM subregion, while the inner line and western parts of the Dinaric Mts. would be included in the CEM subregion. This kind of demarcation of SEM and CEM subregions in the western part of the Peninsula is in line with previous analyses that included endemic and non-endemic orophytic elements on the whole Balkan peninsula (Stevanović 1996).

Also, demarcation of the Central European region (CE), i.e. Illyric subregion from the Mediterranean – Submediterranean region (MED-SUBMED) (Adriatic province), based on the distribution of endemic Balkan flora is far more precise and in general corresponds to earlier established borders between these two phytochoria, given by Horvat*et al.* (1974).

It is important to point out that a large number of endemic Balkans taxa is represented on the territory of B&H, which make a significant and specific part of the total vascular flora of the Dinaric Alps. The large number of steno-, local- and regional-endemics of different age and origin in all chorological groups, confirm the fact that the Dinaric mountains are an important center of florogenesis in S.E. Europe. A comparatively large number of endemic taxa of wider Adriatic-Ionian-Aegean distribution within the MED-SUBMED group and Dinaric-Balkan ranges from the SEM and CEM groups indicate interconnections between the Adriatic, Illyrian and Dinaric flora with other parts of the Balkan Peninsula. This is, undoubtedly, related to processes of genesis of the flora during the Neogene, particularly with the complex Pleistocene Ice Age, with glacial and interglacial periods, that strongly impacted on the isolation and speciation of populations of ancestral species, as well as on migration processes which spread the species toward the Peninsula from surrounding mountain and Mediterranean or/and often distant territories (Boral and Pontic regions) and vice versa.

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Botanica SERBICA

REZIME

Horološka karakterizacija i distribucija balkanske endemične flore u Bosni i Hercegovini

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Na teritoriji Bosne I Hercegovine utvrđeno je prisustvo 298 endemičnih taksona u rangu vrste I podvrsta. Za svaki takson određena je njegova pripadanost odgovarajućoj horološku grupi, podgrupi i flornom elementu. Osnovnu horološku strukturu balkanske enedmične flore u BiH čine 5 glavnih grupa: Južnoevropska planinska (SEM) sa 112 taksona ili 38% ukupne endemične flore u BiH, Mediteransko-submediteranska (MED-SUBMED) sa 77 taksona (26%), Centralnoevropska planinska sa 69 taksona (23%), Centralnoevropska (CE) sa 34 taksona (11%) i Pontska sa 6 taksona (2%). U okviru SEM I CEM grupe najbrojniji su dinarski i dinarsko-balkanski, u MED-SUBMED grupi jadransko-submediteranski, dok u CE grupi to su ilirski i ilirsko-balkanski florni elementi. Rasprostranjenje svakog endemičnog taksona kartirano je na MGRS mreži 10 x 10 km. Bogatstvo balkanske endemične flore u BiH predstavljeno je brojem taksona ranga vrsta i podvrsta u svakom MGRS kvadratu veličine 10x10 km. Na isti način je prikazano bogatstvo i distribucija taksona koji pripadaju osnovnim horološkim grupama. Utvrđeno je da su visoke planine severne Hercegovine (Prenj, Čvrsnica, Čabulja) najbogatije endemičnim biljkama (125 taksona), zatim slede planine Bjelašnica, Treskavica, Ivan, zajedno sa kanjonom reke Rakitnice (109 taxa) i granične planine sa Crnom Gorom - Maglić i Volujak sa kanjonom reke Sutjeske (99 taxa). Pojedinačne planine sa najbogatijom endemičnom florom su Prenj (99), Čvrsnica (78), Orjen (74), Velež (70), Treskavica (63), Maglić (58), Dinara (52) itd. Horološke analize su pokazale da je najveći broj endemičnih biljaka SEM grupe rasprostranjen na primorskim Dinaridima Hercegovine, dok su endemiti iz CEM grupe najbrojniji na planinskom lancu untrašnjih Dinarida. Takođe je utvrđeno da skoro sve visoke planine u BiH imaju mešoviti karakter endemične orofitske flore u kome učestvuju u različitim odnosima SEM i CEM elementi. Rasprostranjenje MED-SUBMED i CE elemenata poklapa se sa linijom razgraničenja Mediteranskog i Centralnoevropskog regiona. Posebno je razmatrano prisustvo drevnih mediteranskih endemičnih elemenata na serpentinitima centralne istočne Bosne.

Ključne reči: Bosna i Hercegovina, Balkanska endemična flora, horološka struktura flore, florni elementi.

Appendix 1.

Family	Taxon (species or/and subspecies)	Chorologicalgroup	Chorological subgroup	Floristic element
Asclepiadaceae	*Vincetoxicum huteri* Vis. et Ascherson	SEM	Dinar-Balk	Dinar(W-E)-Balk(sc-pind(N-C))
Campanulaceae	*Edraianthus hercegovinus* K. Malý	SEM	Dinar	Dinar(C)
Campanulaceae	*Edraianthus murbeckii* Wettst.	SEM	Dinar	Dinar(C)
Campanulaceae	*Edraianthus niveus* Beck	SEM	Dinar	Dinar(C)
Campanulaceae	*Edraianthus sutjeskae* Lakušić	SEM	Dinar	Dinar(C)
Campanulaceae	*Campanula hercegovina* Degen & Fiala	SEM	Dinar	Dinar(C-E)
Campanulaceae	*Edraianthus serpyllifolius* (Vis.) A. DC.	SEM	Dinar	Dinar(C-E)
Campanulaceae	*Edraianthus montenegrinus* Horák	SEM	Dinar	Dinar(E)
Campanulaceae	*Campanula waldsteiniana* Schult.	SEM	Dinar	Dinar(W)
Campanulaceae	*Edraianthus croaticus* A. Kern.	SEM	Dinar	Dinar(W-C)
Campanulaceae	*Edraianthus caricinus* Schott	SEM	Dinar	Dinar(W-E)
Campanulaceae	*Edraianthus jugoslavicus* Lakušić	SEM	Dinar-Balk	Dinar(C-E)-Balk(moes(W))
Campanulaceae	Asyneuma pichleri (Vis.) D. Lakušić & F. Conti (*Asyneuma trichocalycinum* - auct. balc.)	SEM	Dinar-Balk	Dinar(W-E)-Balk(sc-pind(N-S)-(krit))
Caprifoliaceae	*Lonicera glutinosa* Vis.	SEM	Dinar	Dinar(W-E)
Caryophyllaceae	*Dianthus freynii* Vandas	SEM	Dinar	Dinar(C)
Caryophyllaceae	*Cerastium malyi* (Georgiev) Niketić subsp. *serpentini* (Novák) Niketić	SEM	Dinar	Dinar(C-E)
Caryophyllaceae	*Dianthus integer* Vis. subsp. *integer*	SEM	Dinar	Dinar(C-E)
Caryophyllaceae	*Dianthus sylvestris* Wulfen subsp. *nodosus* (Tausch) Hayek	SEM	Dinar	Dinar(C-E)
Caryophyllaceae	*Heliosperma monachorum* Vis. & Pančić	SEM	Dinar	Dinar(C-E)
Caryophyllaceae	*Heliosperma pussila* (Waldst. & Kit.) subsp. *malyi* (Neumayer) Greuter & Burdet	SEM	Dinar	Dinar(W)
Caryophyllaceae	*Arenaria gracilis* Waldst. & Kit.	SEM	Dinar	Dinar(W-E)
Caryophyllaceae	*Silene sendtneri* Boiss.	SEM	Dinar-Balk	Dinar(C-E)-Balk(moes(W))
Caryophyllaceae	*Minuartia bosniaca* (Beck) K. Malý	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N)-moes(W))
Caryophyllaceae	*Cerastium malyi* (Georgiev) Niketić subsp. *malyi*	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N)-moes(W-E))
Caryophyllaceae	*Cerastium rectum* Friv. subsp. *rectum*	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N)-moes(W-E))
Caryophyllaceae	*Dianthus cruentus* Griseb. subsp. *cruentus*	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-S)-moes(W-E))
Caryophyllaceae	*Minuartia clandestina* (Port.) Trinajstić	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N))

Family	Taxon (species or/and subspecies)	Chorologicalgroup	Chorological subgroup	Floristic element
Caryophyllaceae	*Cerastium decalvans* Schlosser & Vuk. subsp. *leontopodium* (Stoj. & Stefanov) Niketić	SEM	Dinar-Balk	Dinar(E)-Balk(sc-pind (N-S)-moes(W))
Caryophyllaceae	*Dianthus sylvestris* Wulfen subsp. *bertisceus* Rech. fil.	SEM	Dinar-Balk	Dinar(E)-Balk(sc-pind(N))
Caryophyllaceae	*Cerastium decalvans* Schloss. & Vuk. subsp. *decalvans*	SEM	Dinar-Balk	Dinar(W-E)-Balk(sc-pind(N))
Compositae	*Hieracium chalcidicum* Boiss. & Heldr. subsp. *divaricatum* (Fr.) Greuter	SEM	Dinar	Dinar(C)
Compositae	*Hieracium grossianum* Zahn	SEM	Dinar	Dinar(C)
Compositae	*Hieracium pilosissimus* Friv. subsp. *pilosissimum= Hieracium chalcidicum* Boiss. & Heldr. subsp. *divaricatum* (Fr.) Greuter	SEM	Dinar	Dinar(C)
Compositae	*Leucanthemum chloroticum* Kerner & Murbeck	SEM	Dinar	Dinar(C)
Compositae	*Hieracium albanicum* Freyn	SEM	Dinar	Dinar(C-E)
Compositae	*Hieracium andrasovszkyi* Zahn subsp. *euglabratisimile* O. Behr & Zahn	SEM	Dinar	Dinar(C-E)
Compositae	*Hieracium stirovacense* Degen & Zahn subsp. *mirificissimum* (Rohlena & Zahn) Greuter = *Hieracium mirificissimum* Rohlena & Zahn	SEM	Dinar	Dinar(C-E)
Compositae	*Hieracium plumulosum* A. Kerner	SEM	Dinar	Dinar(C-E)
Compositae	*Hieracium waldsteinii* Tausch subsp. *nipholeucum* Zahn	SEM	Dinar	Dinar(C-E)
Compositae	*Reichardia macrophylla* Vis. & Pančić	SEM	Dinar	Dinar(C-E)
Compositae	*Senecio thapsoides* DC. subsp. *visianianus* (Vis.) Vandas	SEM	Dinar	Dinar(C-E)
Compositae	*Amphoricarpos neumayeri* Vis.	SEM	Dinar	Dinar(E)
Compositae	*Centaurea derventana* Vis. & Pančić	SEM	Dinar	Dinar(E)
Compositae	*Centaurea incompta* Vis.	SEM	Dinar	Dinar(E)
Compositae	*Hieracium calophyllum* R. Uechtr.	SEM	Dinar	Dinar(E)
Compositae	*Hieracium guglerianum* Zahn subsp. *guglerianum*	SEM	Dinar	Dinar(E)
Compositae	*Hieracium pichleri* A. Kern. subsp. *pichleri*	SEM	Dinar	Dinar(E)
Compositae	*Hieracium scheppigianum* Freyn	SEM	Dinar	Dinar(E)
Compositae	*Hieracium suborieni* (Zahn) P. D. Sell & C. West	SEM	Dinar	Dinar(E)
Compositae	*Cerastium grandiflorum* Waldst. & Kit.	SEM	Dinar	Dinar(W-E)
Compositae	*Hieracium brevilanosum* Degen & Zahn	SEM	Dinar	Dinar(W-E)
Compositae	*Leucanthemum visianii* (Gjurašin) Vogt & Greuter	SEM	Dinar	Dinar(W-E)
Compositae	*Hieracium brandisii* Freyn	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N))
Compositae	*Hieracium coloriscapum* Rohlena & Zahn	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N))
Compositae	*Hieracium guentheri-beckii* Zahn	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N))
Compositae	*Hieracium pichleri* A. Kerner subsp. *adamovicii* Sagorski & Zahn	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N))

Compositae	*Hieracium bosniacum* Freyn	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N)-moes(W))
Compositae	*Hieracium thapsiforme* Ascherson & Kanitz	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N)-moes(W))
Compositae	*Achillea abrotanoides* (Vis.) Vis.	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-C))
Compositae	*Amphoricarpos autariatus* Blečič & E. Mayer	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-C))
Compositae	*Gnaphalium roeseri* Boiss. & Heldr. subsp. *pichleri* (Murb.) Hayek	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-C))
Compositae	*Hieracium gymnocephalum* Pant.	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-C))
Compositae	*Hieracium friwaldii* Reichenb. fil.	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-S)-moes(W))
Compositae	*Achillea ageratifolia* (Sm.) Benth. & Hooker fil. subsp. *serbica* (Nyman) Heimerl	SEM	Dinar-Balk	Dinar(E)-Balk(sc-pind(N)-moes(W))
Compositae	*Hieracium heterogynum* (Froelich) Gutermann subsp. *heterogynum*	SEM	Dinar-Balk	Dinar(E)-Balk(sc-pind(N)-moes(W))
Compositae	*Hieracium baldaccianum* Bald.	SEM	Dinar-Balk	Dinar(E)-Balk(sc-pind(N)-moes(W))
Cruciferae	*Aubrieta columnae* Guss. subsp. *croatica* (Schott, Nyman & Kotschy) Mattf.	SEM	Dinar	Dinar(W-E)
Cruciferae	*Aurinia corymbosa* Griseb.	SEM	Dinar-Balk	Dinar(E)-Balk(sc-pind(N-C)-moes(W))
Cruciferae	*Erysimum linarifolium* Tausch	SEM	Dinar-Balk	Dinar(W-E)-Balk(sc-pind(N-C))
Cruciferae	*Cardamine carnosa* Waldst. & Kit.	SEM	Dinar-Balk	Dinar(W-E)-Balk(sc-pind(N-S))
Dipsacaceae	*Cephalaria pastricensis* Dörfl. & Hayek	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N)-moes(W))
Euphorbiaceae	*Euphorbia montenegrina* (Bald.) K. Malý	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N))
Euphorbiaceae	*Euphorbia capitulata* Rchb.	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-C))
Gramineae	*Sesleria insularis* Sommier subsp. *sillinger*i (Deyl) Deyl= S. paparistoi Ujhely	SEM	Dinar	Dinar(C-E)
Gramineae	*Sesleria serbica* (Adamović) Ujhelyi	SEM	Dinar	Dinar(C-E)
Gramineae	*Avenula blavii* (Ascherson & Janka) W. Sauer & Chmelitschek	SEM	Dinar	Dinar(E)
Gramineae	*Sesleria ujhelyii* Strgar	SEM	Dinar	Dinar(E)
Gramineae	*Sesleria albicans* Kit. ex Schultes subsp. *angustifolia* (Hackel & G. Beck) Deyl	SEM	Dinar	Dinar(W)
Gramineae	*Sesleria robusta* Schott subsp. *robusta*	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N))
Gramineae	*Sesleria latifolia* (Adamović) Degen	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-C)-moes(W-E))
Iridaceae	*Iris bosniaca* Beck	SEM	Dinar	Dinar(C-E)
Iridaceae	*Iris orjenii* Bräuchler& Cikovac	SEM	Dinar	Dinar(E)
Labiatae	*Micromeria croatica* (Pres.) Schott.	SEM	Dinar	Dinar(W-E)
Labiatae	*Satureja subspicata* Bartl. ex Vis. subsp. *subspicata*	SEM	Dinar	Dinar(W-E)
Labiatae	*Stachys anisochila* Vis. & Pančić	SEM	Dinar	Dinar(W-E)
Labiatae	*Stachys recta* L. subsp. *baldaccii* (K. Malý) Hayek (incl. *S. chrysophaea* Pančić)	SEM	Dinar	Dinar(W-E)
Labiatae	*Stachys recta* L. subsp. *subcrenata* (Vis.) Briquet	SEM	Dinar	Dinar(W-E)
Labiatae	*Acinos alpinus* (L.) Moench subsp. *dinaricus* Šilić	SEM	Dinar-Balk	Dinar(W-E)-Balk(sc-pind(N))
Labiatae	*Stachys scardica* (Griseb.) Hayek	SEM	Dinar-Balk	Dinar(E)-Balk(sc-pind(N-S)-moes(W))
Liliaceae	*Scilla lakusicii* Šilić	SEM	Dinar	Dinar(C-E)
Liliaceae	*Fritillaria gracilis* (Ebel) Asch. & Graebn. subsp. *gracilis*	SEM	Dinar	Dinar(W-E)
Liliaceae	*Allium phthioticum* Boiss. & Heldr.	SEM	Dinar-Balk	Dinar(E)-Balk(sc-pind(N-S))
Linaceae	*Linum elegans* Spruner ex Boiss.	SEM	Dinar-Balk	Dinar(E)-Balk(sc-pind(N-S)-moes(W)

Family	Taxon (species or/and subspecies)	Chorologicalgroup	Chorological subgroup	Floristic element
Papilionaceae	*Chamaecytisus thomasinii* (Vis.) Rothm.	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-C)-moes(W))
Papilionaceae	*Anthyllis aurea* Host	SEM	Dinar-Balk	Dinar(W-E)-Balk(sc-pind(N-C)-moes(W))
Ranunculaceae	*Aquilegia nikolicii* Niketić & Cikovac	SEM	Dinar	Dinar(E)
Rosaceae	*Sibiraea croatica* Degen	SEM	Dinar	Dinar(W-C)
Rosaceae	*Potentilla speciosa* Willd. subsp. *illyrica* Soják	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N))
Rubiaceae	*Asperula hercegovina* Degen	SEM	Dinar	Dinar(C)
Santalaceae	*Thesium auriculatum* Vandas	SEM	Dinar	Dinar(C-E)
Scrophulariaceae	*Veronica saturejoides* Vis.	SEM	Dinar	Dinar(C-E)
Scrophulariaceae	*Verbascum durmitoreum* Rohlena	SEM	Dinar	Dinar(E)
Scrophulariaceae	*Verbascum nicolai* Rohlena	SEM	Dinar	Dinar(E)
Scrophulariaceae	*Verbascum baldaccii* Degen	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-C))
Thymeleaceae	*Daphne malyana* Blečić	SEM	Dinar	Dinar(E)
Umbelliferae	*Bunium alpinum* Waldst. & Kit. subsp. *alpinum*	SEM	Dinar	Dinar(W-E)
Umbelliferae	*Pimpinella serbica* (Vis.) Drude	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N))
Umbelliferae	*Athamanta turbith* (L.) Broth subsp. *haynaldii* (Borbás & R. Uechtr.) Tutin	SEM	Dinar-Balk	Dinar(W-E)-Balk(sc-pind(N))
Violaceae	*Viola prenja* Beck	SEM	Dinar	Dinar(C)
Violaceae	*Viola polyodonta* W. Becker	SEM	Dinar	Dinar(E)
Violaceae	*Viola chelmea* Boiss. & Heldr. subsp. *vratnikensis* Gáyer & Degen	SEM	Dinar	Dinar(W-C)
Violaceae	*Viola elegantula* Schott	SEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N))
Aceraceae	*Acer hyrcanum* Fischer & C. A. Meyer subsp. *intermedium* (Pančić) Bornm.	CE	Illyr-Balk	Illyr(C-E)-Balk(sc-pind(N-S)-moes(W-E))
Caprifoliaceae	*Viburnum maculatum* Pant.	CE	Illyr	Illyr(C-E)
Compositae	*Centaurea nigrescens* Willd. subsp. *smolinensis* (Hayek) Dostál	CE	Illyr	Illyr(C)
Compositae	*Hieracium austroslavicum* K. Malý & Zahn	CE	Illyr	Illyr(C)
Compositae	*Hieracium bifidum* Hornem. subsp. *polytricholepium* Zahn	CE	Illyr	Illyr(C)
Compositae	*Hieracium melanothyrsum* K. Malý & Zahn	CE	Illyr	Illyr(C)
Compositae	*Hieracium bifidum* Hornem. subsp. *stenolepidotropum* K. Malý & Zahn	CE	Illyr	Illyr(C)
Compositae	*Hieracium macrodon* Nägeli & Peter	CE	Illyr	Illyr(C)
Compositae	*Centaurea stenolepis* A. Kerner subsp. *bosniaca* (Murb.) Dostál	CE	Illyr	Illyr(C-E)

Compositae	*Hieracium bifidum* Hornem. subsp. *caesiotropum* K. Malý & Zahn	CE	Illyr	Illyr(C-E)
Compositae	*Hieracium bjeluschae* K. Malý & Zahn subsp. *barathron* K. Malý & Zahn	CE	Illyr	Illyr(C-E)
Compositae	*Hieracium macrodontoides* (Zahn) Zahn subsp. *macrodontoides*	CE	Illyr	Illyr(C-E)
Compositae	*Hieracium praecurrens* Vuk. subsp. *megaladenophyes* K. Malý & Zahn	CE	Illyr	Illyr(C-E)
Compositae	*Hieracium bjeluschae* K. Malý & Zahn subsp. *bjeluschae*	CE	Illyr	Illyr(E)
Compositae	*Hieracium bjeluschae* K. Malý & Zahn subsp. *melacense* K. Malý & Zahn	CE	Illyr	Illyr(E)
Compositae	*Hieracium macutense* K. Malý & Zahn	CE	Illyr	Illyr(E)
Compositae	*Hieracium pseudotommasinii* Rohlena & Zahn	CE	Illyr	Illyr(W-E)
Compositae	*Hieracium tommasinii* Reichenb. fil. subsp. *tommasinii*	CE	Illyr-Balk	Illyr(C-E)-Balk(sc-pind(N))
Compositae	*Hieracium tommasinii* Reichenb. subsp. *steosissimum* NP	CE	Illyr-Balk	Illyr(C-E)-Balk(sc-pind(N))
Compositae	*Hieracium pseudobifidum* Schur subsp. *stenolepioides* (Zahn) Zahn	CE	Illyr-Balk	Illyr(C-E)-Balk(sc-pind(N)-moes(W)
Compositae	*Lactuca visianii* Bornm.	CE	Illyr-Balk	Illyr(C-E)-Balk(sc-pind(N-C)-moes(W-E))
Cruciferae	*Barbarea bosniaca* Murb.	CE	Illyr	Illyr(C)
Dipsacaceae	*Knautia dinarica* (Murb.) Borbás subsp. *dinarica*	CE	Illyr	Illyr(C-E)
Euphorbiaceae	*Euphorbia gregersenii* K. Malý	CE	Illyr	Illyr(C)
Euphorbiaceae	*Euphorbia subhastata* Vis. & Pančić	CE	Illyr	Illyr(C-E)
Euphorbiaceae	*Euphorbia pancicii* Beck	CE	Illyr	Illyr(E)
Fumariaceae	*Corydalis blanda* Schott subsp. *blanda*	CE	Illyr	Illyr(C-E)
Fumariaceae	*Corydalis solida* (L.) Clairv. subsp. *incisa* Lidén	CE	Illyr-Balk	Illyr(E)-Balk(sc-pind(N-S)-moes(W-C))
Gramineae	*Bromus moellendorffianus* (Ascherson & Graebner) Hayek	CE	Illyr	Illyr(C)
Papilionaceae	*Lathyrus binatus* Pančić	CE	Illyr	Illyr(C-E)
Papilionaceae	*Trifolium medium* L. subsp. *balcanicum* Velen.	CE	Illyr-Balk	Illyr(C-E)-Balk(sc-pind(N-C)-moes(W-E))
Scrophulariaceae	*Melampyrum hoermannianum* K. Malý	CE	Illyr	Illyr(C-E)
Scrophulariaceae	*Scrophularia bosniaca* Beck	CE	Illyr-Balk	Illyr(C-E)-Balk(sc-pind(N))
Umbelliferae	*Peucedanum aegopodioides* (Boiss.) Vandas	CE	Illyr-Balk	Illyr(C-E)-Balk(sc-pind(N-C)-moes(W-C)
Aceraceae	*Acer heldreichii* Orph. ex Boiss.	CEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-S)-moes(W))
Boraginaceae	*Myosotis suaveolens* Waldst. & Kit. ex Willd.	CEM	Dinar-Balk	Dinar(W-E)-Balk(sc-pind(N-C)-moes(W-E))
Campanulaceae	*Campanula moesiaca* Velen.	CEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N)-moes(W-E)))
Campanulaceae	*Phyteuma pseudorbiculare* Pant.	CEM	Dinar-Balk	Dinar(E)-Balk(sc-pind(N-C)-moes(W))
Caprifoliaceae	*Lonicera formanekiana* Halácsy subsp. *hectoderma* Blečić & E. Mayer	CEM	Dinar	Dinar(E)
Caprifoliaceae	*Lonicera borbasiana* (Kuntze) Degen	CEM	Dinar	Dinar(W-E)
Caryophyllaceae	*Minuartia handelii* Mattf.	CEM	Dinar	Dinar(C)
Caryophyllaceae	*Cerastium dinaricum* Beck & Szysz.	CEM	Dinar	Dinar(W-E)
Compositae	*Centaurea murbeckii* Hayek	CEM	Dinar	Dinar(C)
Compositae	*Hieracium incisiceps* Rohlena & Zahn	CEM	Dinar	Dinar(C)
Compositae	*Petasites doerfleri* Hayek	CEM	Dinar	Dinar(C-E)

Family	Taxon (species or/and subspecies)	Chorologicalgroup	Chorological subgroup	Floristic element
Compositae	*Senecio hercynicus* Herborg subsp. *durmitorensis* Herborg	CEM	Dinar	Dinar(E)
Compositae	*Tephroseris crassifolia* (Schult.) Griseb. & Schenk	CEM	Dinar	Dinar(W-E)
Compositae	*Lactuca pancicii* (Vis.) N. Kilian & Greuter	CEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-C))
Compositae	*Hieracium naegelianum* Pančić subsp. *naegelianum*	CEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-C)-moes(W))
Compositae	*Hieracium sparsum* Friv. subsp. *subsparsiflorum* (Degen & Zahn) Zahn	CEM	Dinar-Balk	Dinar(E)-Balk(moes(W))
Compositae	*Tephroseris papposa* (Reichenb.) Schur. subsp. *wagneri* (Degen) B. Nord.	CEM	Dinar-Balk	Dinar(E)-Balk(sc-pind(N)-moes(W-C))
Compositae	*Hypochaeris maculata* L. subsp. *pelivanovicii* (Velen.) Hayek	CEM	Dinar-Balk	Dinar(E)-Balk(sc-pind(N-S)-moes(W-E))
Compositae	*Senecio hercynicus* Herborg subsp. *dalmaticus* (Griseb.) Greuter	CEM	Dinar-Balk	Dinar(W-E)-Balk(sc-pind(N)-moes(W-C)
Cruciferae	*Arabis scopoliana* Boiss.	CEM	Dinar	Dinar(W-E)
Cruciferae	*Alyssum scardicum* Wettst.	CEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-C)-moes (W))
Cruciferae	*Barbarea balcana* Pančić	CEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N)-moes(W))
Cruciferae	*Hesperis dinarica* Beck	CEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-C)-moes(W-E))
Dipsacaceae	*Knautia travnicensis* (Beck) Szabó	CEM	Dinar	Dinar(C)
Dipsacaceae	*Knautia sarajevensis* (Beck) Szabó	CEM	Dinar	Dinar(C-E)
Dipsacaceae	*Knautia pancicii* Szabó	CEM	Dinar	Dinar(E)
Dipsacaceae	*Knautia midzorensis* Formánek	CEM	Dinar-Balk	Dinar(E)-Balk(sk pind(N-S)-moes(W-C))
Gentianaceae	*Gentiana verna* L. subsp. *tergestina* (Beck) Hayek	CEM	Dinar-Balk	Dinar(W-E)-Balk(sc-pind(N))-moes(W))
Gramineae	*Festuca malyi* Widder	CEM	Dinar	Dinar(C)
Gramineae	*Festuca bosniaca* Kumm. & Sendtn. subsp. *chloranta* (Beck) Markgr.-Dann.	CEM	Dinar	Dinar(C-E)
Gramineae	*Festuca macranthera* (Beck) Markgr.-Dannenb.	CEM	Dinar	Dinar(W-E)
Gramineae	*Festuca amethystina* L. subsp. *kummeri* (Beck) Markgr.-Dann.	CEM	Dinar-Balk	Dinar(E)-Balk(moes(W))
Gramineae	*Festuca korabensis* (Ják. ex Markgr.-Dann.) Markgr.-Dann.	CEM	Dinar-Balk	Dinar(E)-Balk(sc-pind(N-C))
Labiatae	*Stachys alpina* L. subsp. *dinarica* Murb.	CEM	Dinar-Balk	Dinar(C-E)-Balk(moes(W))
Lentibulariaceae	*Pinguicula balcanica* Casper subsp. *balcanica*	CEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-S)-moes(W-E))
Liliaceae	*Lilium albanicum* Griseb. (incl. *L. bosniacum* Beck)	CEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-C))
Linaceae	*Linum capitatum* Kit. ex Schultes subsp. *capitatum*	CEM	Dinar-Balk	Dinar(W-E)-Balk(sc-pind(N-C)-moes(W-E))
Orchidaceae	*Dactylorhiza cordigera* (Fries) Soó subsp. *bosniaca* (Beck) Soó	CEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N)-moes(W))
Papilionaceae	*Astragalus fialae* Degen	CEM	Dinar	Dinar(C-E)
Papilionaceae	*Oxytropis prenja* (Beck) Beck	CEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind (N-C)

Papilionaceae	*Oxytropis dinarica* (Murb.) Wettst. subsp. *dinarica*	CEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N))
Papilionaceae	*Vicia montenegrina* Rohlena	CEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N))
Papilionaceae	*Onobrychis montana* DC. subsp. *scardica* (Griseb.) P. W. Ball	CEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-S)-moes(W))
Pinaceae	*Picea omorika* (Pančić) Purkynê	CEM	Dinar	Dinar(E)
Plantaginaceae	*Plantago reniformis* Beck	CEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-C))
Polygalaceae	*Polygala alpestris* Reichenb. subsp. *croatica* (Chodat) Hayek	CEM	Dinar-Balk	Dinar(W-E)-Balk(sc-pind(N))
Primulaceae	*Primula kitaibeliana* Schott.	CEM	Dinar	Dinar(W-C)
Ranunculaceae	*Aquilegia dinarica* Beck	CEM	Dinar	Dinar(C-E)
Ranunculaceae	*Aquilegia grata* F. Maly ex Zimmeter subsp. *grata*	CEM	Dinar	Dinar(E)
Ranunculaceae	*Ranunculus concinnatus* Schott (incl. *R. croaticus* Schott)	CEM	Dinar	Dinar(W-E)
Rosaceae	*Alchemilla vranicensis* Pawl.	CEM	Dinar	Dinar(C)
Rosaceae	*Alchemilla amphiargyrea* Buser	CEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-S)
Rosaceae	*Geum bulgaricum* Pančić	CEM	Dinar-Balk	Dinar(C-E)-Balk(moes(SW))
Rosaceae	*Potentilla montenegrina* Pant.	CEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N)-moes(SW))
Rosaceae	*Alchemilla lanuginosa* Rothm.	CEM	Dinar-Balk	Dinar(E)-Balk(sc-pind(N-C)-moes(W))
Rubiaceae	*Asperula wettsteinii* Adamović	CEM	Dinar	Dinar(C-E)
Saxifragaceae	*Saxifraga prenja* Beck	CEM	Dinar	Dinar(C-E)
Saxifragaceae	*Saxifraga blavii* (Engler) Beck	CEM	Dinar-Balk	Dinar(W-E)-Balk(sc-pind(N))
Scrophulariaceae	*Rhinanthus dinaricus* Murb.	CEM	Dinar	Dinar(C)
Scrophulariaceae	*Rhinanthus illyricus* (Beck & Sterneck) Soó	CEM	Dinar	Dinar(C)
Scrophulariaceae	*Euphrasia dinarica* (Beck) Murb.	CEM	Dinar	Dinar(C-E)
Scrophulariaceae	*Pedicularis heterodonta* Pančić	CEM	Dinar	Dinar(C-E)
Scrophulariaceae	*Pedicularis malyi* Janka	CEM	Dinar	Dinar(C-E)
Scrophulariaceae	*Rhinanthus asperulus* (Murb.) Soó	CEM	Dinar	Dinar(C-E)
Scrophulariaceae	*Pedicularis brachyodonta* Schlosser & Vuk. subsp. brachyodonta	CEM	Dinar	Dinar(W-E)
Scrophulariaceae	*Pedicularis grisebachii* Wettst.	CEM	Dinar-Balk	Dinar(E)-Balk(sc-pind(N)-moes(W))
Scrophulariaceae	*Pedicularis hoermanniana* K. Malý	CEM	Dinar-Balk	Dinar(W-E)-Balk(sc-pind(N-C)-moes(W-E))
Scrophulariaceae	*Melampyrum trichocalycinum* Vandas	CEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N)
Valerianaceae	*Valeriana bertiscea* Pančić	CEM	Dinar-Balk	Dinar(C-E)-Balk(sc-pind(N-S))
Aceraceae	*Acer obtusatum* Willd. subsp. *opuloideum* K. Malý	MED-SUBMED	Balk(med-submed-subcont)	Adriat(N)-Illyr(W-C)
Araceae	*Arum petteri* Schott	MED-SUBMED	Balk(submed)	Adriat(C-S)
Asclepiadaceae	*Vincetoxicum hirundinaria* Medicus subsp. *adriaticum* (Beck) Markgraf	MED-SUBMED	Balk(submed)	Adriat(N-S)

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Boraginaceae	*Moltkia petraea* (Tratt.) Gris.	MED-SUBMED	Balk(med-submed-subcont)	Adriat(C-S)-Illyr(C-SE)-Balk(sc-pind)
Boraginaceae	*Halacsya sendtneri* (Boiss.) Dörfl.	MED-SUBMED	Balk(subcont)	Illyr(C-E)-Balk(sc-pind(N-C))
Boraginaceae	*Onosma stellulata* Waldst. & Kit.	MED-SUBMED	Balk(subcont)	Illyr(W-E)-Balk(sc-pind(N))
Campanulaceae	*Edraianthus dalmaticus* (A.DC.) A. DC.	MED-SUBMED	Balk(med-submed-subcont)	Adriat(N-C)-Illyr(C-E)
Campanulaceae	*Symphyandra hofmannii* Pant.	MED-SUBMED	Balk(subcont)	Illyr(C)
Campanulaceae	*Campanula portenschlagiana* Schult.	MED-SUBMED	Balk(submed)	Adriat(C)
Campanulaceae	*Edraianthus tenuifolius* (Waldst. & Kit.) A. DC.	MED-SUBMED	Balk(submed)	Adriat(N-S)
Caryophyllaceae	*Gypsophila spergulifolia* Griseb.	MED-SUBMED	Balk(subcont)	Illyr(C-E)-Balk(sc-pind(N-C))
Caryophyllaceae	*Heliosperma retzdorfiana* K. Malý	MED-SUBMED	Balk(submed)	Adriat(C)
Caryophyllaceae	*Cerastium ligusticum* Viv. subsp. *trichogynum* Möschl) P. D. Sell & Whitehead	MED-SUBMED	Balk(submed)	Adriat(C-S)
Caryophyllaceae	*Dianthus ciliatus* Guss. subsp. *dalmaticus* (Čelak.) Hayek	MED-SUBMED	Balk(submed)	Adriat(C-S)
Caryophyllaceae	*Silene reichenbachii* Vis.	MED-SUBMED	Balk(submed)	Adriat(N-S)
Caryophyllaceae	*Dianthus knappii* (Pant.) Borbás	MED-SUBMED	Balk(submed)	Adriat(S)
Caryophyllaceae	*Heliosperma tommasinii* (Vis.) Reichenb.	MED-SUBMED	Balk(submed)	Adriat(S)
Cistaceae	*Fumana bonapartei* Maire & Petitm.	MED-SUBMED	Balk(subcont)	Illyr(C-E)-Balk(sc-pind(N-C))
Compositae	*Cyanus tuberosus* (Vis.) Soják	MED-SUBMED	Balk(med-submed-subcont)	Adriat(S)-Illyr(C)-Balk(moes(SW))
Compositae	*Centaurea glaberrima* Tausch	MED-SUBMED	Balk(submed)	Adriat(C-S)

Compositae	*Crepis pantocsekii* (Vis.) Latzel	MED-SUBMED	Balk(submed)	Adriat(C-S)
Compositae	*Klasea radiata* (Waldst. & Kit.) Á. Löve & D. Löve subsp. *cetinjensis* (Rohlena) Greuter & Wagenitz	MED-SUBMED	Balk(submed)	Adriat(C-S)
Compositae	*Tanacetum cinerarifolium* (Trev.) Schultz.-Bip.	MED-SUBMED	Balk(submed)	Adriat(N-S)
Compositae	*Centaurea nicolae* Bald.	MED-SUBMED	Balk(submed)	Adriat(S)
Cruciferae	*Alyssum moellendorfianum* Ascherson ex Beck	MED-SUBMED	Balk(submed)	Adriat(C)
Cruciferae	*Cardamine fialae* Fritsch	MED-SUBMED	Balk(submed)	Adriat(C)
Dipsacaceae	*Cephalaria flava* (Sibth. & Sm.) Szabó subsp. *flava*	MED-SUBMED	Balk(med-submed-subcont)	Adriat(C)-Aeg(N)-Maced-Thrac(NW)-Balk(moes(SW-C)
Dipsacaceae	*Scabiosa fumarioides* Vis. & Pančić	MED-SUBMED	Balk(subcont)	Illyr(C-E)-Balk(sc-pind(N)-moes(W))
Dipsacaceae	*Knautia clementii* (Beck) Ehrenb.	MED-SUBMED	Balk(submed)	Adriat(C)
Dipsacaceae	*Knautia albanica* Briq.	MED-SUBMED	Balk(submed)	Adriat(C-S)
Dipsacaceae	*Knautia visianii* Szabó	MED-SUBMED	Balk(submed)	Adriat(C-S)
Dipsacaceae	*Succisella petteri* (J. Kerner & Murb.) Beck	MED-SUBMED	Balk(submed)	Adriat(C-S)
Euphorbiaceae	*Euphorbia glabriflora* Vis.	MED-SUBMED	Balk(subcont)	Illyr(E)-Balk(sc-pind(N-C))
Fumariaceae	*Pseudofumaria alba* (Mill.) Lidén subsp. *leiosperma* (P. Conrath) Lidén	MED-SUBMED	Balk(subcont)	IllyrW-E)-Balk(sc-pind(N))
Fumariaceae	*Pseudofumaria alba* (Mill.) Lidén subsp. *acaulis* (Wulfen) Lidén	MED-SUBMED	Balk(submed)	Adriat(C-S)
Gramineae	*Festuca hercegovinica* Markgr. - Dannenb.	MED-SUBMED	Balk(med-submed-subcont)	Adriat(C)-Illyr(C-SE)-Balk(sc-pind(N-C))
Iridaceae	*Crocus dalmaticus* Vis.	MED-SUBMED	Balk(submed)	Adriat(C-S)
Iridaceae	*Iris pseudopallida* Trinajstić	MED-SUBMED	Balk(submed)	Adriat(C-S)
Labiatae	*Stachys serbica* Pančić	MED-SUBMED	Balk(med-submed-subcont)	Adriat(C)-Maced-thrac(W)-Balk(moes(W)-Ion(N)-Aeg(N)
Labiatae	*Teucrium arduinii* L.	MED-SUBMED	Balk(med-submed-subcont)	Adriat(N-S)-Illyr(C-E)

Family	Taxon (species or/and subspecies)	Chorologicalgroup	Chorological subgroup	Floristic element
Labiatae	*Sideritis purpurea* Talbot ex Benth.	MED-SUBMED	Balk(med-submed-subcont)	Adriat(N-S)-Ion(N-S)-Aeg(W-S)-Balk(sc-pind(N-S)))
Labiatae	*Salvia sonklari* Pant.	MED-SUBMED	Balk(subcont)	Illyr(C)
Labiatae	*Thymus jankae* Čelak.	MED-SUBMED	Balk(subcont)	Illyr(W-E)-Balk(sc-pind(N-C)-moes(W))
Labiatae	*Acinos orontius* (K. Malý) Šilić	MED-SUBMED	Balk(submed)	Adriat(C)
Labiatae	*Acinos majoranifolius* (Mill.) Šilić	MED-SUBMED	Balk(submed)	Adriat(C-S)
Labiatae	*Micromeria dalmatica* Benthem	MED-SUBMED	Balk(submed)	Adriat(C-S)
Labiatae	*Micromeria parviflora* (Vis.) Reichenb.	MED-SUBMED	Balk(submed)	Adriat(C-S)
Labiatae	*Salvia brachyodon* Vandas	MED-SUBMED	Balk(submed)	Adriat(C-S)
Labiatae	*Micromeria kerneri* Murbeck	MED-SUBMED	Balk(submed)	Adriat(N-S)
Labiatae	*Stachys officinalis* (L.) Trevisan subsp. *velebitica* (A. Kerner) Hayek	MED-SUBMED	Balk(submed)	Adriat(N-S)
Labiatae	*Thymus bracteosus* Vis. ex Bentham	MED-SUBMED	Balk(submed)	Adriat(N-S)
Labiatae	*Satureja horvatii* Šilić	MED-SUBMED	Balk(submed)	Adriat(S)
Liliaceae	*Allium guttatum* Steven subsp. *dalmaticum* (A. Kerner ex Janchen) Stearn	MED-SUBMED	Balk(med-submed-subcont)	Adriat(N-S)-Aeg(C-S)-Balk(moes(W)
Liliaceae	*Scilla litarderei* Breistr.	MED-SUBMED	Balk(med-submed-subcont)	Adriat(N-S)-Illyr(W-C)
Liliaceae	*Hyacinthella dalmatica* Chouard	MED-SUBMED	Balk(submed)	Adriat(C-S)
Papilionaceae	*Trifolium dalmaticum* Vis.	MED-SUBMED	Balk(med-submed-subcont)	Adriat(N-S)-Ion(N-S)-Illyr(W-E)-Balk(sc-pind(N-S)-moes(W-E))

Papilionaceae	*Trifolium pignantii* Fauché & Chaub.	MED-SUBMED	Balk(med-submed-subcont)	Adriat(SE)-Ion-Aeg(N)-Illyr(C-SE)-Balk(sc-pind(N-S)-moes(W))
Papilionaceae	*Genista sylvestris* Scop. subsp. *dalmatica* (Bartl.) H. Lindb.	MED-SUBMED	Balk(med-submed-subcont)	Adriat(W-S)-Illyr(W-E)
Papilionaceae	*Petteria ramentacea* (Sieber) C. Presl	MED-SUBMED	Balk(submed)	Adriat(C-S)-Ion(N)
Papilionaceae	*Vicia ochroleuca* Ten. subsp. *dinara* (Borbas)K. Malý ex Rohlena	MED-SUBMED	Balk(submed)	Adriat(N-S)
Ranunculaceae	*Helleborus multifidus* Vis. subsp. *multifidus*	MED-SUBMED	Balk(med-submed-subcont)	Adriat(C-S)-Illyr(W-E)
Rhamnaceae	*Rhamnus orbiculata* Bornm.	MED-SUBMED	Balk(submed)	Adriat(C-S)-Maced-Thrac(W)
Rhamnaceae	*Rhamnus intermedius* Steud. & Hochst.	MED-SUBMED	Balk(submed)	Adriat(N-S)
Rosaceae	*Potentilla visianii* Pančić	MED-SUBMED	Balk(subcont)	Illyr(E)-Balk(sc-pind(N))
Rubiaceae	*Asperula scutellaris* Vis.	MED-SUBMED	Balk(med-submed-subcont)	Adriat(C-S)-Illyr(C-E)-Maced(SW))
Rubiaceae	*Galium firmum* Tausch	MED-SUBMED	Balk(submed)	Adriat(C-S)
Rutaceae	*Haplophyllum boisserianum* Vis. & Pančić	MED-SUBMED	Balk(subcont)	Illyr(E)-Balk(sc-pind(N))
Scrophulariaceae	*Linaria rubioides* Vis. & Pančić subsp. *rubioides*	MED-SUBMED	Balk(subcont)	Illyr(C-E)
Scrophulariaceae	*Verbascum bosnense* K. Malý	MED-SUBMED	Balk(subcont)	Illyr(C-E)-Balk(sc-pind(N))
Scrophulariaceae	*Scrophularia tristis* (K. Malý) Šilić	MED-SUBMED	Balk(subcont)	Illyr(C-E)-Balk(sc-pind(N))
Scrophulariaceae	*Verbascum niveum* Ten. subsp. *visianianum* (Reichaub.) Murb.	MED-SUBMED	Balk(submed)	Adriat(C-S)
Umbelliferae	*Bupleurum karglii* Vis.	MED-SUBMED	Balk(med-submed-subcont)	Adriat(N-S)-Ion(N)-Illyr(W-E)
Umbelliferae	*Chaerophyllum coloratum* L.	MED-SUBMED	Balk(med-submed-subcont)	Adriat(N-SE)-Illyr(C-E)
Umbelliferae	*Eryngium palmatum* Pančić & Vis.	MED-SUBMED	Balk(subcont)	Illyr(C-E)-Balk(sc-pind(N)-moes(W))
Umbelliferae	*Seseli globiferum* Vis.	MED-SUBMED	Balk(submed)	Adriat(C-S)
Umbelliferae	*Seseli tomentosum* Vis.	MED-SUBMED	Balk(submed)	Adriat(C-S)

Family	Taxon (species or/and subspecies)	Chorologicalgroup	Chorological subgroup	Floristic element
Violaceae	*Viola beckiana* Fiala	MED-SUBMED	Balk(subcont)	Illyr(C)
Boraginaceae	*Onosma pseudoarenaria* Schur subsp. *fallax* (Borbás) Rauschert	PONT	Illyr	Illyr(C-E)
Papilionaceae	*Chamaecytisus maezeius* K. Malý (*Ch. heuffelii* (Griseb. & Schenk) Rothm. var. *maezeius* K. Malý	PONT	Illyr	Illyr(N-E)
Polygonaceae	*Polygonum albanicum* Jáv.	PONT	Illyr-Balk	Illyr(C-E)-Balk(sc-pind(N-C))
Ranunculaceae	*Pulsatilla velezensis* (Beck) Aichele & Schwegler	PONT	Illyr	Illyr(W-C)
Ranunculaceae	*Ranunculus psilostachys* Griseb.	PONT	Illyr-Balk	Illyr(E)-Balk(sc-pind(N-S)-moes(W-C))
Umbelliferae	*Peucedanum neumayeri* (Vis.) Reichenb. fil.	PONT	Illyr-Balk	Illyr(W-E)-Balk(sc-pind(N-C)-moes(W-E))

Abbrevaiations: CE-Central European; CEM-Central European mountainous; MED-SUBMED-Mediterranean-submediterranean; PONT-Pontic; SEM-South European mountainous; Dinar-Dinaric mountains; Balk-Balkan (for SEM and CEM group it reffer to Balkan mountains); Illyr-Illyrian;
Sc-pind-Scardo-Pindhic; moes-Moesian; Maced-Thrac-Macedonian-Thracian; Adriat-Adriatic; Ion-Ionian; Aeg-Aegean, N-north, C-central, E-east; S-south; W-west.