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Phytogeographical characteristics of the high-mountain flora of Mt Kopaonik (S.W. Serbia, Yugoslavia)

Abstract

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A phytogeographical characterization of the high-mountain flora of Mt Kopaonik (847 vascular plant species and subspecies attributed to 89 floristic elements, 15 area groups and 10 area types) is provided. The analysis shows that specific high-mountain elements (Eurasian mountain, boreal, and arcto-alpine area types) outweigh almost exactly the more widely distributed elements (Eurasian, holarctic, and cosmopolitan area types). Balkan endemics and subendemics are in excess of 20 %. Florogenetic links are strongest with the Carpathians, next strongest with the Alps.

Introduction

Within the chorologically, florogenetically and ecologically complex and rich flora of the Balkan Peninsula, the mountain regions, and the high mountains in particular, are the most significant centres of diversity and endemism (Turrill 1929).

The geographical position of Mt Kopaonik, relatively isolated from other mountains of the central Balkans, as well as its sheer bulk, its varying geological composition and diverse biota, have kept attracting the attention of numerous scientists. Starting from Boué (1840), Grisebach (1843-1846) and Pančić (1856, 1867, 1870), most Serbian and many foreign botanists explored the plants of the Kopaonik massif and published relevant results (see Lakušić & Puzović 1993).

General characteristics of the area

Mt Kopaonik is situated in the central part of the Balkan Peninsula (Fig. 1). The entire massif occupies a surface of 2756 km^2, extending over a distance of 80 km in a N.W. to S.E. direction, with an insular high-mountain area of 110 km^2 lying above the 1.500 m line. Altitudes range over a total spread of 1600 m, from the valley of the Ibar river at 400 m to Pančić's peak (2017 m).

Table 1. Phytogeographical spectrum, with species numbers (No.) and per-cents per basic area type and area group, of the high mountain flora of Mt Kopaonik.

Area type (and subtype)	No.	%	Area group	No.	%
Eurasian mountain (s.l.)	281	34.0			
(Eurasian mountain s.str.)	(9)	(1.09)	Eurasian	7	0.85
			European-Caucasian-Altaic	1	0.12
			S.-European-W.-Asian	1	0.12
(Central-S.-European mountain)	(129)	(15.62)	Central European	1	0.12
			Central-S.-European	99	11.99
			Central-S.-European-Caucasian	10	1.21
			Alpine-Balkanic	5	0.61
			Balkanic-Carpathian	6	0.73
			Balkanic	8	0.97
(S. European mountain)	(143)	(17.31)	S. European	42	5.08
			S.-European-Caucasian	2	0.24
			Apenninic-Balkanic	12	1.45
			Balkanic-Carpathian	28	3.39
			Oriental-Balkanic	2	0.24
			Balkanic	56	6.78
			Balkanic-Crimean	1	0.12
Arcto-Alpine	24	2.91	amphiatlantic	8	0.97
			circumarctic-Eurasian	11	1.33
			circumarctic-European	2	0.24
			European	3	0.36
Boreal			Eurasian-N.-American	18	2.18
			Eurasian	18	2.18
			amphiatlantic	2	0.24
Central European	85	10.29	Central European (s.str.)	51	6.17
			Alpine-Balkanic	2	0.24
			Apenninic-Balkanic	4	0.48
			Pontic-Balkanic	3	0.36
			Balkanic	10	1.21
			Central-S.-European mountain	15	1.82
Mediterranean (s.l.)	43	5.21	Mediterranean-submediterranean	11	1.33
			submediterranean	4	0.48
			Apenninic-Balkanic	3	0.36
			Pontic-Balkanic	3	0.36
			Balkanic-Carpathian	4	0.48
			Balkanic	18	2.18
Pontic (s.l.)	9	1.09	Pontic-Balkanic	8	0.97
			Balkanic-Carpathian	1	0.12
Eurasian	286	34.62	Eurasian (s.str.)	68	8.23
			W. Eurasian	188	22.76
			Mediterranean-W.-Eurasian	30	3.63
Holarctic	39	4.72	(not subdivided)	39	4.72
Cosmopolitan	19	2.30	(not subdivided)	19	2.30
Adventive	1	0.12	(not subdivided)	1	0.12

Geologically, Mt Kopaonik is highly complex. Of foremost significance for the plant cover are massive occurrences of granites and serpentines, whereas limestones and various kinds of acid metamorphic rocks are somewhat less prominent.

Along an altitudinal profile Mt Kopaonik shows a regular succession of climatic belts, ranging from the warm submediterranean climate of the lowermost hills at its foot to the severe subalpine climatic conditions of its highest peaks.

Owing to these diverse climatic and geological conditions the vegetation of Mt Kopaonik is highly differentiated. So far, as many as 118 different plant associations and

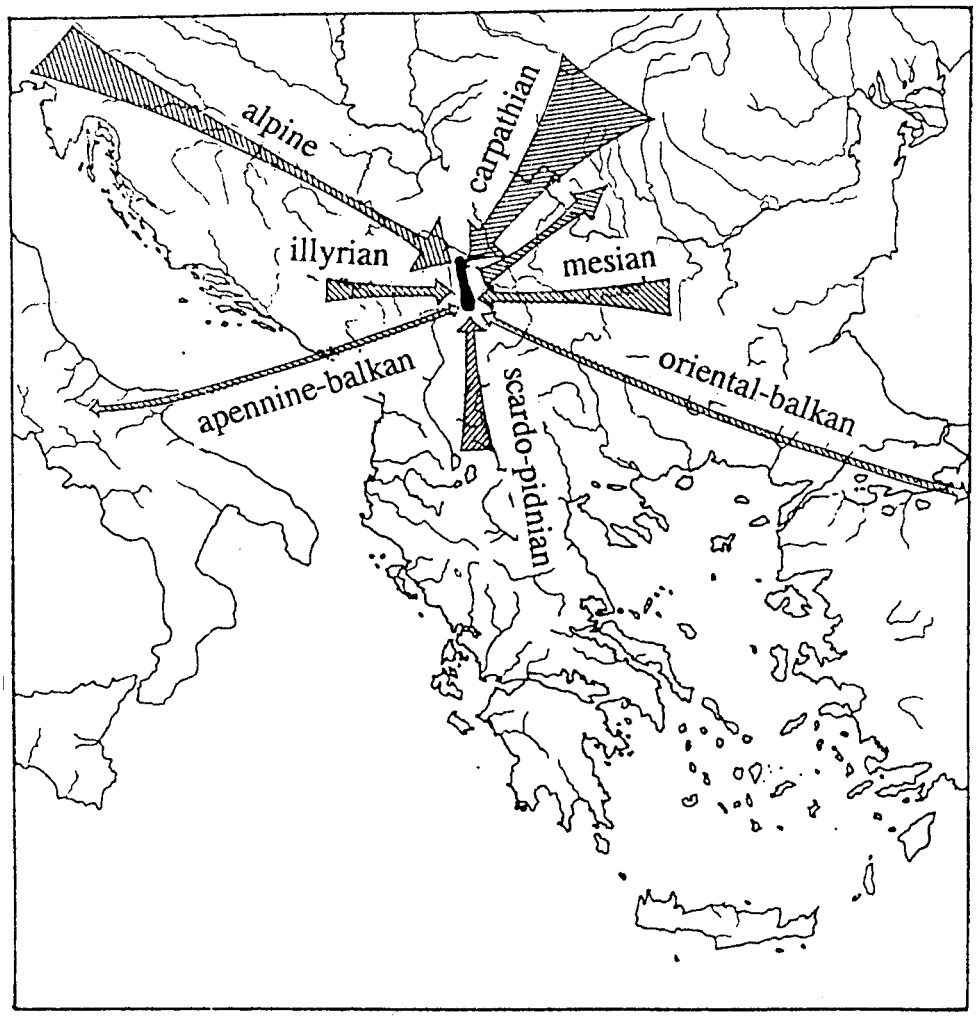

Fig. 1. The main florogenetic influences reflected by the high-mountain flora of Mt Kopaonik (the basal width of each arrow is proportional to the strength of the florogenetic influence).

39 subassociations belonging to 62 alliances, 41 orders and 24 classes have been registered (Lakušić & Randjelović 1996).

Material and methods

As here defined, the high-mountain flora of Mt Kopaonik comprises all species and subspecies of vascular plants found growing at altitudes above (1300-)1500 m, i.e. from the dark coniferous forest belt (*Vaccinio-Piceetea* Braun-Blanquet 1939 emend. Zupančić 1976) through the belt of subalpine scrub vegetation (*Rhodoreto-Vaccinietea* Lakušić & al. 1979) up to the alpine vegetation belts on rocky ground (*Festuco-Seslerietea* Barbero & Bonin 1969 and *Juncetea trifidi* Hadač 1944).

Data on the flora of Mt Kopaonik were assembled by myself during 6 years of field work and by screening all available literature. Moreover, parts of the herbarium collections at the Institute of Botany, Faculty of Biology (BEOU), and at the Natural History Museum in Belgrade (BEO) were revised. The complete floristic inventory has been provided elsewhere (Lakušić 1993).

Each species was assigned to the appropriate floristic element, as defined by Meusel & al. (1965, 1978). The grouping of floristic elements into area groups and area types was performed on the basis of the definitions by Stevanović (1992) which, following modern concepts of European geobotany and floristics, are based primarily on the link between flora and vegetation.

Results and discussion

The high-mountain region of Mt Kopaonik is remarkably rich and diverse both floristically and phytogeographically. On an area of just 110 km^2 no less than 847 species and subspecies of vascular plants have been recorded, belonging to 89 floristic elements, 15 area groups, and 10 area types. This compares favourably with the 1366 species and subspecies so far known from the entire Kopaonik massif, with its 2756 km^2. The summital area of Mt Kopaonik is undoubtedly one of the most significant centres of floristic diversity of the whole Balkan Peninsula.

The results of the phytogeographical analysis of the high-mountain flora of Mt Kopaonik are summarized in Table 1. They show that the specific high-mountain elements of the Eurasian mountain, boreal, and arcto-alpine area types (343 species, 41.53 %) outweigh almost exactly the more widely distributed elements of the Eurasian, holarctic, and cosmopolitan area types (344 species, 41,64 %). One fifth of the high-mountain taxa are either Balkan endemics (92 species, 11.15 %) or subendemics (82 species, 9.93 %), which confirms the phytogeographical distinctiveness of the high-mountain region of Mt Kopaonik.

The phytogeographical analysis indicates that the Kopaonik high-mountain island lies on the borderline between the Central-S.-European and S. European subregions of the Central-S.-European region, i.e. at the meeting point of the three floristic provinces, Mesian, Illyric, and Scardo-Pindic. In numbers, the florogenetic influence of the S.