

Diversity of Albanian Cladoniaceae

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Abstract. As a result of collections made during the years 2009-2017, the number of Cladoniaceae species is enlarged to 27 species, providing fifteen new records to Albanian *Cladonia*. The distribution of many of the previously mentioned taxa is extended and the chemical variability for many of the species is discussed. *Cladonia borealis*, *C. caespiticia*, *C. cervicornis*, *C. coccifera*, *C. conista*, *C. cryptochlorophaea*, *C. cyathomorpha*, *C. humilis*, *C. merochlorophaea*, *C. parasitica*, *C. peziziformis*, *C. polycarpoides*, *C. ramulosa*, *C. rei* and *C. subulata* are new for Albania.

Key words. *Cladonia*; Albania; phytogeography.

[es] Diversidad de las Cladoniaceae de Albania

Resumen. Como consecuencia de las recolecciones efectuadas en varios periodos durante los años 2009-2017, se amplía a 27 especies el número de Cladoniaceae, además se aportan 15 nuevas especies de *Cladonia* para Albania. Se amplía la distribución de muchos de los taxones citados con anterioridad y se discute la variabilidad química en la mayoría de las especies encontradas. *Cladonia borealis*, *C. caespiticia*, *C. cervicornis*, *C. coccifera*, *C. conista*, *C. cryptochlorophaea*, *C. cyathomorpha*, *C. humilis*, *C. merochlorophaea*, *C. parasitica*, *C. peziziformis*, *C. polycarpoides*, *C. ramulosa*, *C. rei* y *C. subulata* son nuevas para Albania.

Palabras clave. *Cladonia*; Albania; fitogeografía.

Introduction

Albania is a Mediterranean country located in SE Europe and surrounded by the Adriatic Sea and Montenegro in the NW, by the Ionian Sea and Greece in the SW and North Macedonia in the East. Despite its small extension, 28,748 km², it is topographically very diverse. Although Albania lies within the temperate zone the topographic heterogeneity and the combination of Mediterranean and continental influences confer a great climatic and vegetation diversity (Reed *et al.* 2004).

The main mountain ranges in the country, the Dinaric Alps, run parallel to the coast and they present the highest peak at 2753 m (Mt. Korab). The coastal region has a Mediterra-

nean climate, and further east the mountains act as a barrier to the penetration of temperate air masses. The climate of the mountainous regions is alpine, with strong changes in precipitation and temperature depending on height and exposure. The temperature differences between the coast and the interior regions are more marked in winter, while the precipitations are more intense in summer (Tatli & Türkeş 2014).

The karstic soils (limestones) are predominant, although there are locations with serpentine substrates containing a certain amount of silicates, yielding slightly acid soils (Bego *et al.* 2018).

Most of the Albanian territory is included in the Illyrian province of the Circumboreal

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Region with predominant deciduous forest of *Quercus* ssp. (*Q. pubescens*, *Q. frainetto* and *Q. cerris*) and with an important presence of *Carpinus orientalis* (Polunin & Walters 1989). In the higher altitudinal zones the grasslands and beech forests are dominant. The Mediterranean vegetation belongs to the Adriatic province and is usually well developed. It occupies a small coastal strip and has sub-Mediterranean and Mediterranean species of evergreen and maquis shrubs (Sadori et al. 2015).

The lichenological studies in Albania are quite scarce as confirmed by Hafellner & Kashata (2003) and Hafellner (2007). Later Svoboda et al. (2012) increased the number of species found up to 333 taxa of lichenized fungi and 11 of them represent *Cladonia*. The aim of this contribution is to summarize results from new collections in the framework of a project on the family Cladoniaceae in the Mediterranean area of Eurasia.

Materials and Methods

After several recollections in the Albanian territory at different periods during 2009-2017, we studied and analysed 335 *Cladonia* specimens, which are listed in Annex 1. The new collections were deposited in Madrid (MACB), Helsinki (H) or Budapest (BP). Most of the specimens were analysed by means of thin-layer chromatography (TLC, HPTLC) to identify the major lichen substances according to standardized methods (Orange et al. 2001, 2010; Arup et al. 1993). The main secondary metabolites of Albanian *Cladonia* are listed in Table 1. Comments on world distribution of species are from Ahti & Stenroos (2013). The distribution maps are presented according to the administrative divisions in counties of Albania (Figure 1). The ITS rDNA region was sequenced in some specimens to confirm the identifications and the GeneBank numbers are provided (Annex 1). The primers and protocols used are described in Pino-Bodas et al. (2015).

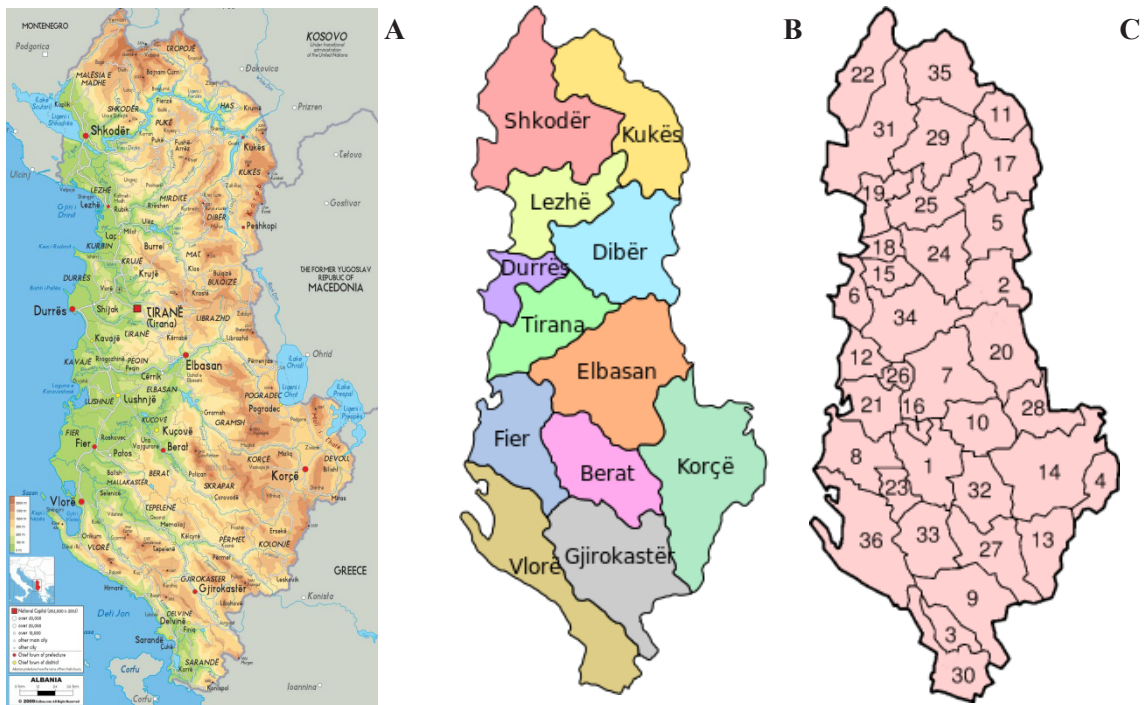


Figure 1. **A-** Map of Albania (<http://www.lahistoriaconmapas.com/atlas/albania-map/tirana-albania-map.htm>). **B-** Albanian counties (<https://www.revolv.com/page/Counties-of-Albania> Albania_Countries_Gray.svg: Joshbaumgartner). **C-** Districts of Albania: 1 Berat, 2 Bulqizë, 3 Delvinë, 4 Devoll, 5 Dibër, 6 Durrës, 7 Elbasan, 8 Fier, 9 Gjirokastrë, 10 Gramsh, 11 Has, 12 Kavajë, 13 Kolonjë, 14 Korçë, 15 Krujë, 16 Kuçovë, 17 Kukës, 18 Kurbin, 19 Lezhë, 20 Librazhd, 21 Lushnjë, 22 Malësi e Madhe, 23 Mallakastër, 24 Mat, 25 Mirditë, 26 Peqin, 27 Përmet, 28 Pogradec, 29 Pukë, 30 Sarandë, 31 Shkodër, 32 Skrapar, 33 Tepelenë, 34 Tirana, 35 Tropojë and 36 Vlorë (https://en.wikipedia.org/wiki/Districts_of_Albania).

Results and discussion

Cladonia is the only genus of Cladoniaceae represented in Albania. Of the 27 analysed species the following 15 are newly reported to the former lichen checklist of Albania (*): *Cladonia borealis*, *C. caespiticia*, *C. cervicornis*, *C. coccifera*, *C.*

conista, *C. cryptochlorophaea*, *C. cyathomorpha*, *C. humilis*, *C. merochlorophaea*, *C. parasitica*, *C. peziziformis*, *C. polycarpoides*, *C. ramulosa*, *C. rei* and *C. subulata*. The species studied occur between the sea level and 1800 m of altitude based on our records and the information published by other authors (Figure 2).

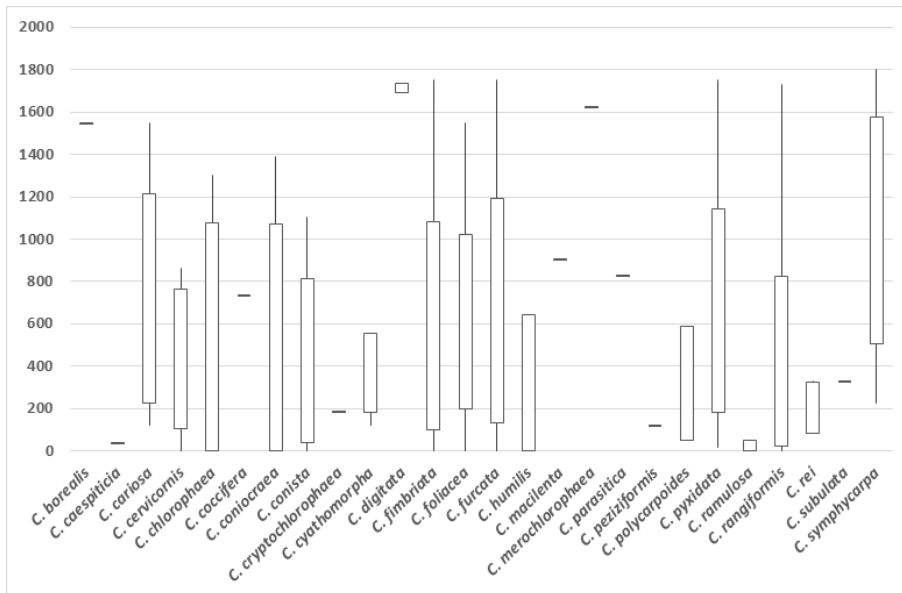


Figure 2. Species altitudinal rank in Albania (except for *C. carneola* in the lack of data).

The commonest species are: *C. cariosa*, *C. fimbriata*, *C. foliacea*, *C. furcata*, *C. pyxidata* and *C. rangiformis*, while *C. caespiticia*, *C. coccifera*, *C. digitata*, *C. macilenta*, *C. peziziformis*, *C. polycarpoides* and *C. ramulosa* are restricted

to northern Albania, and *C. borealis*, *C. cryptochlorophaea*, *C. humilis*, *C. merochlorophaea* and *C. parasitica* have a southern or a south-eastern distribution (Figure 3).

*Cladonia borealis**Cladonia caespiticia**Cladonia cariosa**Cladonia cervicornis**Cladonia chlorophaea**Cladonia coccifera**Cladonia coniocraea**Cladonia conista**Cladonia cryptochlorophaea**Cladonia cyathomorpha*



Cladonia digitata



Cladonia fimbriata



Cladonia foliacea



Cladonia furcata



Cladonia humilis



Cladonia macilenta



Cladonia merochlorophaea



Cladonia parasitica



Cladonia peziziformis



Cladonia polycarpoides

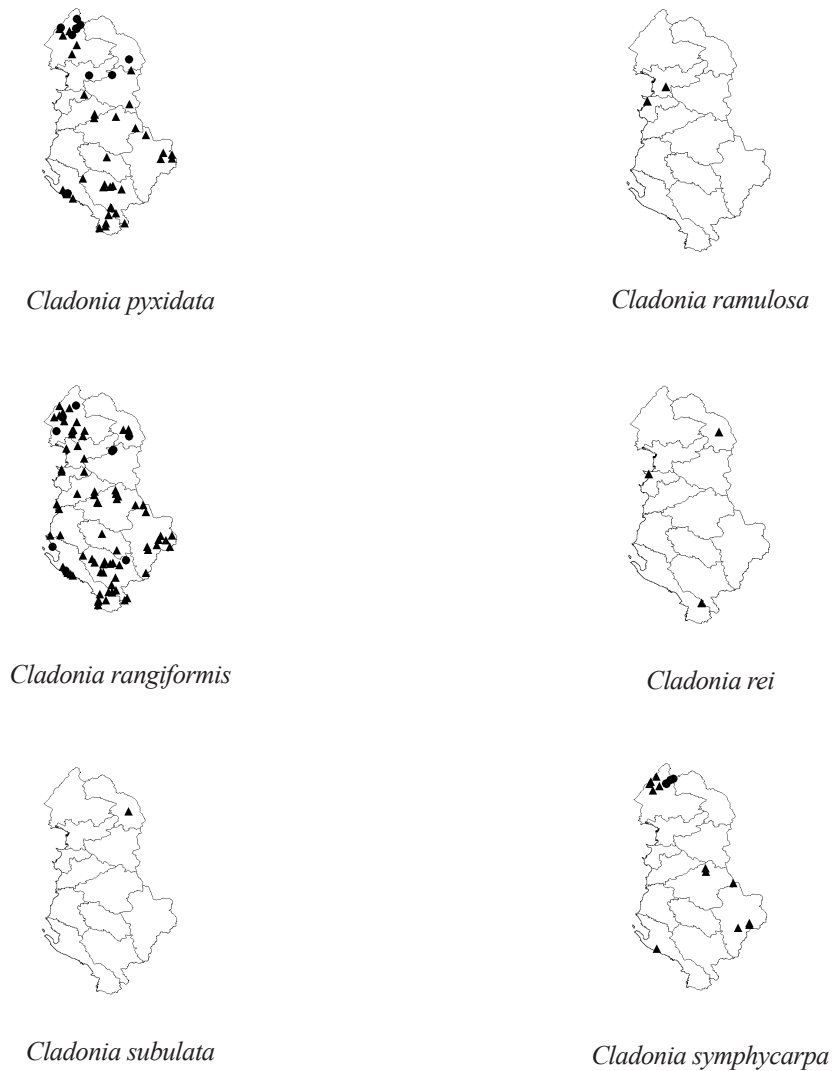


Figure 3. Distribution of *Cladonia* species in Albania (except of *C. carneola* in the lack of exact locality data). Bibliographic reports: ●, new records: ▲.

Nine species are chemically variable (Table 1) *C. cariosa*, *C. foliacea*, *C. furcata*, *C. polycarpoides*, *C. pyxidata*, *C. rangiformis*, *C. rei* and *C. symphycarpa*. *Cladonia cariosa* specimens contain three chemotypes: atranorin; atranorin and norstictic acid; atranorin and rangiformic acid, and additional zeorin. Most of the specimens of *C. foliacea* contain fumarprotocetraric and usnic acids, additionally physodalic acid; but a few contain fumarprotocetraric, psoromic and usnic acids. In *C. furcata* most of the specimens contain fumarprotocetraric acid, occasionally with physodalic acid; specimens with atranorin and fumarprotocetraric acid or atranorin and bourgeanic acid were also found. Two chemotypes were detected in the specimens of

C. polycarpoides atranorin and norstictic acid, and one specimen containing only norstictic acid. *Cladonia pyxidata* contains fumarprotocetraric acid and additionally physodalic acid, and also some specimens have fumarprotocetraric and psoromic acids. The commonest chemotype in *C. rangiformis* contains atranorin, fumarprotocetraric and rangiformic acids sometimes with additional physodalic acid, the other chemotype with atranorin and rangiformic acid is very rare in the Albanian specimens. The specimens of *C. rei* contain fumarprotocetraric and homosekikaic acids and other with only homosekikaic acid. Specimens of *C. symphycarpa* have atranorin and norstictic acid; and other also atranorin, norstictic and fumarprotocetraric acids.

Table 1. Main secondary metabolites of the *Cladonia* species chemically analysed from Albania. ATR: atranorin, BAR: barbatic acid, BOU: bourgeanic acid, CRY: cryptochlorophaeic acid, FUM: fumarprotocetraric acid, HSEK: homosekikaic acid, MER: merochlorophaeic acid, NST: norstictic acid, PHY: physodalic acid, PSO: psoromic acid, RAN: rangiformic acid, THAM: thamnolic acid, USN: usnic acid, ZEO: zeorin.

Species	ATR	BAR	BOU	CRY	FUM	HSEK	MER	NST	PHY	PSO	RAN	THAM	USN	ZEO
<i>C. borealis</i>		+												
<i>C. caespiticia</i>					+									
<i>C. cariosa 1</i>	+													
<i>C. cariosa 2</i>	+							+						
<i>C. cariosa 3</i>	+										+			
<i>C. cariosa 4</i>	+										+			+
<i>C. cervicornis</i>					+									
<i>C. chlorophaea</i>					+				+					
<i>C. coccifera</i>													+	+
<i>C. coniocraea</i>					+									
<i>C. conista</i>			+		+									
<i>C. cryptochlorophaea</i>				+										
<i>C. cyathomorpha</i>					+									
<i>C. fimbriata</i>					+									
<i>C. foliacea 1</i>					+								+	
<i>C. foliacea 2</i>					+				+				+	
<i>C. foliacea 3</i>					+					+			+	
<i>C. furcata 1</i>					+									
<i>C. furcata 2</i>					+				+					
<i>C. furcata 3</i>	+				+									
<i>C. furcata 4</i>	+				+				+					
<i>C. furcata 5</i>	+		+		+									
<i>C. humilis</i>	+				+									
<i>C. macilenta</i>		+										+		
<i>C. merochlorophaea</i>					+		+							
<i>C. parasitica</i>		+										+		
<i>C. peziziformis</i>					+									
<i>C. polycarpoides 1</i>								+						
<i>C. polycarpoides 2</i>	+							+						
<i>C. pyxidata 1</i>					+									
<i>C. pyxidata 2</i>					+				+					
<i>C. pyxidata 3</i>					+					+				
<i>C. ramulosa</i>					+									
<i>C. rangiformis 1</i>	+										+			
<i>C. rangiformis 2</i>	+				+						+			
<i>C. rangiformis 3</i>	+				+				+		+			
<i>C. rei 1</i>						+								
<i>C. rei 2</i>					+	+								
<i>C. subulata</i>					+									
<i>C. symphycarpa 1</i>	+							+						
<i>C. symphycarpa 2</i>	+				+			+						
<i>C. symphycarpa 2</i>	+				+			+						

List of species

*1. *Cladonia borealis* S. Stenroos, Ann. Bot. Fenn. 26: 160 (1989)

This terricolous species was only found in Korçë County growing on sandstone in slopes of beech forest at 1550 m altitude. It is distributed in arctic/antarctic-temperate and circum-boreal regions (Ahti & Stenroos 2013).

*2. *Cladonia caespiticia* (Pers.) Flörke, Clad. Comm.: 8 (1828)

It is a very rare species only found in Lezhë County on limestone in slopes of *Carpinus orientalis* formations at 40 m altitude. This is mainly a temperate species with oceanic tendencies, not continuously circumpolar (Ahti & Stenroos 2013).

3. *Cladonia cariosa* (Ach.) Spreng., Syst. Veg., Edn 16, 4(1): 272 (1827)

A very common species found in Elbasan, Korçë, Kukës, Shkodër and Tiranë counties. It was reported by Svoboda *et al.* (2012) from Dibër County on calcareous soil. This is a terricolous species growing on bare soils of limestone, sandstone, serpentine and slate substrates in a wide variability of formations at 120-1550 m altitude. It is a Holarctic species with an outlier in southern South America (Ahti & Stenroos 2013). It is very common and frequent with several chemotypes.

4. *Cladonia carneola* (Fr.) Fr., Lichenogr. Eur. Reform.: 233 (1831)

This species has only been reported from Shkodër County by Zahlbruckner (1889: 7) (Hafellner 2007). Species with bipolar distribution (Ahti & Stenroos 2013).

*5. *Cladonia cervicornis* (Ach.) Flot., Jahresber., Schles. Ges. Vaterl. Cult. 27: 105 (1849)

This species is not frequent, only encountered in Durrës, Shkodër and Vlorë counties. It grows from sea level to 865 m altitude on limestone and sandy and acid soils. It has a Holarctic distribution with uncertain records in South America (Ahti & Stenroos 2013).

6. *Cladonia chlorophaea* (Flörke ex Sommerf.) Spreng., Syst. Veg., Edn 16, 4(1): 273 (1827)

A rare species collected in Gjirokastër and Vlorë counties. But it was early reported from Kukës and Shkodër districts (Hafellner & Kas-

tha 2003); from Dibër and Tiranë districts by Markgraf (1931, 1932) (Hafellner 2007). It is a cosmopolitan species (Ahti & Stenroos 2013).

*7. *Cladonia coccifera* (L.) Willd., Fl. Berol. Prodr.: 361 (1787)

This is a very rare species only collected in Shkodër County at 735 m altitude on serpentine substrate. It has a cosmopolitan distribution (Ahti & Stenroos 2013).

8. *Cladonia coniocraea* (Flörke) Spreng., Syst. Veg., Edn 16, 4(1): 272 (1827)

syn. *C. ochrochlora* Flörke

It was collected from Durrës, Lezhë and Vlorë counties from sea level until 828 m altitude, on limestone and sandy substrates or stumps of *Castanea sativa*. It was reported of Dibër and Shkodër districts by Svoboda *et al.* (2012) and Hafellner & Kashta (2003). All of the Albanian specimens belong to *C. coniocraea* s.str. the more oceanic morphotype often recognized as *C. ochrochlora*, which is not distinguishable in DNA analyses (Pino-Bodas *et al.* 2011) is not present here.

*9. *Cladonia conista* (Nyl.) Robbins, in Allen, Rhodora 32: 92 (1930)

A common species collected in Durrës, Elbasan, Fier, Gjirokaster, Korçë, Lezhë, Shkodër, Tirana and Vlorë counties. It grows on slopes and bare soils of *Carpinus orientalis* formations and also *Quercus coccifera*, on sandstone and limestones substrates, from 40-1000 m altitude. Traditionally considered a chemotype of *C. humilis* with fumarprotocetraric and bourgeanic acids nevertheless, should be considered a different species in base of the results of Pino-Bodas *et al.* (2012).

*10. *Cladonia cryptochlorophaea* Asahina, J. Jap. Bot. 16: 711 (1940)

This is a very rare species only collected in Vlorë County at 186 m altitude growing on limestones with *Erica arborea* and deciduous *Quercus*. Is a terricolous species with arctic/antarctic to northern temperate distribution (Ahti & Stenroos 2013).

*11. *Cladonia cyathomorpha* Stirt. ex Walt. Watson, J. Bot. 73: 156 (1935)

It was collected from Elbasan, Kukës, Shkodër and Tiranë counties growing at 120-540 m altitude on limestone and serpentine substrates with *Carpinus orientalis*, deciduous *Quercus*

and *Arbutus unedo*. It has a western European distribution with some outpost in southern South America (Ahti & Stenroos 2013).

12. *Cladonia digitata* (L.) Hoffm., Deutschl. Fl., Zweiter Theil (Erlangen): 124 (1796)

This species was only reported by Svoboda *et al.* (2012) from Dibër district growing on rotten wood at 1700-1730 m altitude. It is mainly a Holarctic species with some outposts in East Africa (Ahti & Stenroos 2013).

13. *Cladonia fimbriata* (L.) Fr., Lich. Eur. Reform. (Lund): 222 (1831)

syn. *C. major* (K. G. Hagen) Sandst., *C. minor* (K. G. Hagen) Szat.

A very common species encountered in Dibër, Durrës, Elbasan, Gjirokastrë, Korçë, Kukës, Lezhe, Shkodër, Tiranë and Vlorë counties. It grows from sea level to 1750 m altitude on rotten wood, tree bases and humose soil over limestone, sandstone and sandy soil. The species was reported by Hafellner & Kashta (2003) and Svoboda *et al.* (2012) from Dibër, Has, Kukës and Shkodër districts. It is a cosmopolitan species (Ahti & Stenroos 2013).

14. *Cladonia foliacea* (Huds.) Willd., Fl. Berol. Prodr.: 363 (1787)

incl. *C. convoluta* (Lam.) Anders

This is a very common species found in Berat, Dibër, Durrës, Elbasan, Gjirokastrë, Korçë, Kukës, Lezhe, Shkodër, Tiranë and Vlorë counties from 78 to 1550 m altitude. It is a terricolous species growing on grasslands and open soil, preferably calcareous. It is a Western Eurasian, Macaronesian and North African species which extends in Asia as far as Mongolia and it grows in temperate to subtropical areas (Ahti & Stenroos 2013).

The specimens containing fumarprotocetraric and usnic acids, additionally physodalic acid are the commonest, but samples with fumarprotocetraric, usnic and psoromic acids were found in Korçë, Gjirokastrë and Vlorë counties on sandstone at 211-953 m altitude.

Most of the early reports (Markgraf 1927, 1931, 1932; Hafellner & Kashta 2003; Svoboda *et al.* 2012) were published as *C. convoluta* but we include it in the concept of *C. foliacea* because there are no molecular differences between these taxa (Pino-Bodas *et al.* 2010a, 2018), although specimens called *C. convoluta* are of larger size due to its adaptation to calcareous soil and dry situations.

15. *Cladonia furcata* (Huds.) Schrad., Spicil. Fl. Germ. 1: 107 (1794)

incl. *C. subrangiformis* Sandst.

This common species was collected in Durrës, Elbasan, Gjirokastrë, Korçë and Vlorë counties from sea level to 1700 m altitude. Most of the samples contain fumarprotocetraric acid and occasionally physodalic acid. The morphotype with atranorin and fumarprotocetraric acid or atranorin and bourgeanic acid, traditionally identified as *C. subrangiformis*, was collected from Korçë, Shkodër and Vlorë counties. This taxon is considered to fall into the chemical variability of *C. furcata* supported by the DNA studies of Pino-Bodas *et al.* (2015).

C. furcata was reported from Dibër, Përmet, Shkodër and Tiranë districts by Markgraf (1931, 1932), Hafellner & Kashta (2003) and Svoboda *et al.* (2012) without chemical indications. It grows on humose, shaded or open soil over limestone, serpentine, and conglomerate substrates in a wide variety of forests. It has a subcosmopolitan distribution in boreal to tropical areas (Ahti & Stenroos 2013).

*16. *Cladonia humilis* (With.) J.R. Laundon, Lichenologist 16: 220 (1984)

A rare species only collected in Elbasan and Vlorë counties from 50 to 540 m altitude. It grows on limestone substrate with *Carpinus orientalis*, *Quercus* spp. and *Buxus sempervirens*. The samples analysed contain atranorin and fumarprotocetraric acid. It has a Holarctic distribution, with several outposts in the Southern Hemisphere, occurring from boreal to arctic areas (Ahti & Stenroos 2013), although its distribution is not well known.

17. *Cladonia macilentata* Hoffm., Deutschl. Fl., Zweiter Theil (Erlangen): 126 (1796)

This is a rare species only collected in Lezhë County growing on bark of *Pinus nigra*. It was reported from Vlorë district (Hafellner & Kashta 2003). This species has a subcosmopolitan distribution (Ahti & Stenroos 2013).

*18. *Cladonia merochlorophaea* Asahina, J. Jap. Bot. 6: 713 (1940)

A very rare species only collected in Korçë County, on calcareous soil, at 1625 m altitude. This is a subcosmopolitan species but its taxonomic status is not fully clear (Ahti & Stenroos 2013).

*19. *Cladonia parasitica* (Hoffm.) Hoffm., Deutschl. Fl. 2: 127 (1796)

This is a very rare species only collected in Vlorë County at 828 m altitude growing on *Castanea sativa* stumps. This is a Holarctic species with continental tendencies (Ahti & Stenroos 2013).

*20. *Cladonia peziziformis* (With.) J.R. Laundon, Lichenologist 16: 223 (1984)

A very rare species only collected in Shkodër County, on serpentine soil at 120 m altitude. This is a subcosmopolitan species easily overlooked due to its small size (Ahti & Stenroos 2013).

*21. *Cladonia polycarpoides* Nyl. in Zwackh, Lich. Exs. Nos. 626, 626bis (1892) syn. *C. subcariosa* auct.

It is a rare species collected in Kukës and Shkodër counties growing on serpentine soil from sea level to 600 m altitude. It is a subcosmopolitan species especially abundant under suboceanic to oceanic conditions (Ahti & Stenroos 2013).

22. *Cladonia pyxidata* (L.) Hoffm., Deutschl. Fl., Zweiter Theil (Erlangen): 121 (1796) incl. *C. pocillum* (Ach.) Grognot; *C. monomorpha* Aptroot, Sipman & van Herk

A common species collected in Dibër, Durrës, Elbasan, Fier, Gjirokastrë, Korçë, Shkodër, Tiranë and Vlorë counties growing on bare soils, grasslands and rarely on wood. Most of the samples analysed contain fumarprotocetraric acid and often additional physodalic acid. A chemotype with fumarprotocetraric and psoromic acids was collected at 540 m altitude from Elbasan County. *Cladonia pyxidata* was early reported from Kukës, Lezhë, Shkodër and Vlorë districts (Zahlbruckner 1889, Markgraf 1931, Szatala & Timkó 1926, Murati 1979, Hafellner & Kashta 2003, Svoboda et al. 2012). Some of these reports refer to *C. pocillum* but we do not distinguish it as a different entity because molecular studies do not support it (Kotelko & Piercey-Normore 2010). It has a cosmopolitan distribution (Ahti & Stenroos 2013).

*23. *Cladonia ramulosa* (With.) J.R. Laundon, Lichenologist 16: 225 (1984)

It was collected in Durrës and Lezhë counties on sandy soil and limestone from sea level to 40 m altitude. This is a subcosmopolitan species (Ahti & Stenroos 2013).

24. *Cladonia rangiformis* Hoffm., Deutschl. Fl., Zweiter Theil (Erlangen): 114 (1796)

A very common species collected in Berat, Dibër, Durrës, Elbasan, Fier, Gjirokastrë, Korçë, Kukës, Lezhë, Shkodër, Tiranë and Vlorë counties. It grows on grasslands and open soil of sandy substrate, serpentines, limestones and slates from sea level to 1770 m altitude. Its distribution is mainly restricted to western Eurasia and North Africa with one outpost in eastern Canada (Ahti & Stenroos 2013). The commonest chemotype contains atranorin, fumarprotocetraric and rangiformic acids sometimes with additional physodalic acid, but the chemotype with atranorin and rangiformic acid (common elsewhere) is very rare. One specimen of a sorediate morph ('var. *sorediophora*') was found in Shkodër.

It was reported from Dibër, Gjirokastrë, Kukës, Shkodër, Tiranë and Vlorë counties by Szatala & Timkó (1926), Markgraf (1927, 1932) and Svoboda et al. (2012), but without indication of their chemistry.

*25. *Cladonia rei* Schaer. Lich. Helv. Spicil. 1(1): 34 (1823)

It is an uncommon species collected in Durrës, Kukës and Vlorë counties. It grows on limestone and sandstone substrates at 90-330 m altitude on limestone and sandstones substrates. It has a Holarctic distribution with continental preferences (Ahti & Stenroos 2013). One sample analysed contains homosekikaic acid only, but other specimens contain homosekikaic and fumarprotocetraric acids. Some time ago *C. rei* was considered a homosekikaic chemotype of *C. subulata* (Spier & Aptroot 2007) but molecular studies maintained them as different species (Pino-Bodas et al. 2010b).

*26. *Cladonia subulata* (L.) F.H. Wigg., Prim. Fl. Holsat.: 90 (1780)

This is a rare species only collected in Kukës and Lezhë counties on limestone substrate at 40-330 m altitude. It is a subcosmopolitan species (Ahti & Stenroos 2013).

27. *Cladonia symphycarpa* (Flörke) Fr., Sched. Crit. Lich. Suec. 8-9. 20 (1826) incl. *C. dahliana* Kristinsson

A very common species collected in Elbasan, Korçë and Shkodër counties growing on limestone substrate at 400 to 1800 m altitude. It has been reported only from Shkodër County by Svoboda et al. (2012). The most frequent chemotype

has atranorin and norstictic acid, additionally fatty acid; the other chemotype with atranorin, norstictic and fumarprotocetraric acids is very rare. It has a Holarctic distribution with some outliers in South America (Ahti & Stenroos 2013).

Cladonia sp.

Some specimens collected in Shkodër and Vlorë were difficult to identify when the podetia are not well developed and do not bear split proliferations in the margin of the scyphi. These specimens belong to the *Cladonia humilis* group (Pino-Bodas et al. 2013) but molecular

studies are necessary to clarify the identity of these specimens.

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Annex 1. Selected specimens examined

Cladonia borealis S. Stenroos

Barbatic acid: KORÇË: District of Korçë, Dardhë, SH90 Boboshticë-Dardhë, 40°31'26"N 20°48'06"E, *Fagus sylvatica*, *Juniperus communis*, *Abies* sp., sandstone, 1550 m, 23-IV-2017, A.R. Burgaz (MACB 111457).

Cladonia caespiticia (Pers.) Flörke

Fumarprotocetraric acid: LEZHË: District of Kurbin, Milot, left side Mat river, SH25 Milot-Zogu Bridge, 41°41'54"N 19°45'10"E, *Carpinus orientalis*, *Erica arborea*, limestone, 40 m, 21-IV-2017, A.R. Burgaz (MACB 111430, GenBank accession n°: MK543953).

Cladonia cariosa (Ach.) Spreng.

Atranorin chemotype: KUKËS: District of Kukës, Kukës, Rruga Tirana, 42°04'46"N 20°24'45"E, *Quercus cerris*, deciduous *Quercus*, limestone, 330 m, 21-IV-2017, A.R. Burgaz (MACB 111436). SHKODËR: Vau i Dejës, SH25 Vau i Dejës-Koman, 42°00'55"N 19°39'37"E, *Pinus pinaster*, *Carpinus orientalis*, serpentine soil, 120 m, 20-IV-2017, A.R. Burgaz (MACB 111420). Vau i Dejës, Karmë, SH25 Vau i Dejës-Koman, 42°04'02"N 19°40'59"E, *Quercus macrolepis*, *Q. pubescens*, *Juniperus oxycedrus*, *Erica arborea*, slates, 130 m, 20-IV-2017, A.R. Burgaz (MACB 111429). District of Malësi e Madhe, Bogë, SH21 Koplik-Bogë, 42°21'46"N 19°37'56"E, *Pinus nigra*, *Juniperus oxycedrus*, limestone, 865 m, 20-IV-2017, A.R. Burgaz (MACB 111298). **Atranorin and norstictic acid chemotype:** ELBASAN: Prrenjas, Urakë, SH9 Qafë Thanë, 41°04'24"N 20°36'18"E, *Quercus macrolepis*, deciduous *Quercus*, *Juniperus oxycedrus*, limestone, 1000 m, 22-IV-2017, A.R. Burgaz (MACB 111446). District of Elbasan, Bradashesh, SH3 Bradashesh-Graze, 41°06'33"N 19°59'49"E, *Carpinus betulus*, *Juniperus oxycedrus*, limestone karst, 530 m, 15-IV-2017, A.R. Burgaz (MACB 111402). KORÇË: District of Korçë, Dardhë, SH90 Boboshticë-Dardhë, 40°31'18"N 20°49'22"E, *Fagus sylvatica*, *Pinus nigra*, *Juniperus communis*, *Betula pendula*, *Abies* sp., limestone, 1390 m, 23-IV-2017, A.R. Burgaz (MACB 111459). District of Korçë, Dardhë, SH90 Boboshticë-Dardhë, 40°31'26"N 20°48'06"E, *Fagus sylvatica*, *Juniperus communis*, *Abies* sp., sandstone, 1550 m, 23-IV-2017, A.R. Burgaz (MACB 111455). District of Korçë, Boboshticë, SH90 Boboshticë-Dardhë, 40°32'37"N 20°47'11"E, *Juniperus*

oxycedrus, pastureland, sandstone, 1200 m, 23-IV-2017, A.R. Burgaz (MACB 111453). District of Pogradec, Udënisht, SH3 Piskutat-Pogradec, shore Ohrid lake, 40°58'55"N 20°38'21"E, *Pinus halepensis*, *Juniperus oxycedrus*, *Buxus sempervirens*, sandstone, 710 m, 22-IV-2017, A.R. Burgaz (MACB 111452). KUKËS: District of Kukës, Kolsh, SH5 close Drin river, 42°04'18"N 20°20'32"E, deciduous *Quercus*, *Juniperus oxycedrus*, *Buxus sempervirens*, serpentine soil, 510 m, 21-IV-2017, A.R. Burgaz (MACB 111433). District of Kukës, Rruga Tirana, 42°04'46"N 20°24'45"E, *Quercus cerris*, deciduous *Quercus*, limestone, 330 m, 21-IV-2017, A.R. Burgaz (MACB 111435, 111434). **Atranorin and rangiformic acid chemotype:** ELBASAN: Prrenjas, Urakë, SH9 Qafë Thanë, 41°04'24"N 20°36'18"E, *Quercus macrolepis*, deciduous *Quercus*, *Juniperus oxycedrus*, limestone, 1000 m, 22-IV-2017, A.R. Burgaz (MACB 111447). KORÇË: District of Kolonjë (Rrethi i Kolonjës), c. 1.9 km W of village Pepellash, 40°28'56.18"N 20°40'21.27"E, on acid soil in moist road slope, 549 m, 18-X-2011, Z. Barina, L. Lökös, D. Pifkó (BP 96585). District of Korçë, Dardhë, SH90 Boboshticë-Dardhë, 40°31'18"N 20°49'22"E, *Fagus sylvatica*, *Pinus nigra*, *Juniperus communis*, *Betula pendula*, *Abies* sp., limestone, 1390 m, 23-IV-2017, A.R. Burgaz (MACB 111460). District of Korçë, Dardhë, SH90 Boboshticë-Dardhë, 40°31'26"N 20°48'06"E, *Fagus sylvatica*, *Juniperus communis*, *Abies* sp., sandstone, 155 m, 23-IV-2017, A.R. Burgaz (MACB 111456). District of Korçë (Rrethi i Korçës), on the ridge of Mts Mali i Moravës above village Dardhë, near peak Buzeja e Boboshticës (1701 m), 40°32'23.97"N 20°49'14.20"E, on acid soil in beech forest on gravel conglomerate, 1550 m, 10-VIII-2010, L. Lökös (BP 96563). KUKËS: District of Kukës, Kolsh, SH5 close Drin river, 42°04'18"N 20°20'32"E, deciduous *Quercus*, *Juniperus oxycedrus*, *Buxus sempervirens*, serpentine soil, 510 m, 21-IV-2017, A.R. Burgaz (MACB 111462). SHKODËR: Vau i Dejës, SH25 Vau i Dejës-Koman, 42°03'01"N 19°39'45"E, *Pinus pinaster*, *Juniperus oxycedrus*, *Quercus cerris*, *Erica arborea*, *Cotinus coggygria*, serpentine soil, 130 m, 20-IV-2017, A.R. Burgaz (MACB 111426). TIRANË: District of Tiranë, Mushqeta, SH3 Mushqeta-Gracen, 41°12'38"N 19°57'09"E, *Arbutus unedo*, *Erica arborea*, *Platanus orientalis*, boulders, 480 m, 22-IV-2017, A.R. Burgaz (MACB 111440). **Atranorin, rangiformic acid and zeorin**

chemotype: SHKODËR: Vau i Dejës, SH25 Vau i Dejës-Koman, 42°03'01"N 19°39'45"E, *Pinus pinaster*, *Juniperus oxycedrus*, *Quercus cerris*, *Erica arborea*, *Cotinus coggygria*, serpentine soil, 130 m, 20-IV-2017, A.R. Burgaz (MACB 111425). Vau i Dejës, Karmë, SH25 Vau i Dejës-Koman, 42°04'02"N 19°40'59"E, *Quercus macrolepis*, *Q. pubescens*, *Juniperus oxycedrus*, *Erica arborea*, slates, 130 m, 20-IV-2017, A.R. Burgaz (MACB 111428).

***Cladonia cervicornis* (Ach.) Flot.**

Fumarprotocetraric acid: DURRËS: District of Durrës, Fushë-Draçi, San Pietro beach track, 41°31'01"N 19°31'12"E, *Pinus pinea*, sandy soil, 1 m, 19-IV-2017, A.R. Burgaz (MACB 111225). SHKODËR: District of Malësi e Madhe, Poica, SH21 Koplík-Bogë, 42°15'53"N 19°29'47"E, *Juniperus oxycedrus*, *Cupressus sempervirens*, boulders, 320 m, 20-IV-2017, A.R. Burgaz (MACB 111292). District of Malësi e Madhe, Dedaj, SH21 Koplík-Bogë, 42°18'04"N 19°32'32"E, *Carpinus betulus*, *Juniperus oxycedrus*, limestone rocks, 495 m, 20-IV-2017, A.R. Burgaz (MACB 111299). District of Malësi e Madhe, Bogë, SH21 Koplík-Bogë, 42°21'46"N 19°37'56"E, *Pinus nigra*, *Juniperus oxycedrus*, limestone, 865 m, 20-IV-2017, A.R. Burgaz (MACB 111303). Pukë District (Rrethi i Pukës), Mount Rras' e Qerretit above village Qerret, 42°03'36.98"N 19°49'53.45"E, in serpentine rocky area, on acid soil in pine woodland, 735 m, 6-V-2015, L. Lökös (BP 96620). District of Shkodër (Rrethi i Shkodrës), Qafa e Çelës above village Mirdicë, 42°0'11.98"N 19°43'33.16"E, on soil in roadside dry rocky grassland, 470 m, 12-X-2011, L. Lökös (BP 96756). VLORE: Finiq, Muzinë, Muzinë, 39°54'48"N 20°11'20"E, deciduous *Quercus*, *Erica arborea*, limestone, 186 m, 17-IV-2017, A.R. Burgaz (MACB 111199).

***Cladonia chlorophaea* (Flörke ex Sommerf.) Spreng.**

Fumarprotocetraric and physodalic acids: GJIROKASTËR: District of Tepelenë, Këlcyrë, Këlcyrë gorge, left side Vjosa river, 40°17'52"N 20°10'05"E, *Carpinus betulus*, *Pinus halepensis*, sandstone, 180 m, 18-IV-2017, A.R. Burgaz (MACB 111411). LEZHË: District of Mirditë (Rrethi i Mirditës), in the valley of stream Fani i Vogël above village Thirrë, in serpentine rocky area, on bark (*Pinus nigra*), 42°0'20.98"N 20°14'33.25"E, 905 m, 6-V-2015, L. Lökös (BP 96627). VLORE: Finiq, Bisticë, Muzinë,

39°55'08"N 20°08'48"E, *Quercus coccifera*, *Carpinus betulus*, *Pinus halepensis*, *Cercis siliquastrum*, limestone slopes, 125 m, 17-IV-2017, A.R. Burgaz (MACB 111193).

***Cladonia coccifera* (L.) Willd.**

Usnic acid and zeorin: SHKODËR: Pukë District (Rrethi i Pukës), Mount Rras' e Qerretit above village Qerret, 42°03'36.98"N 19°49'53.45"E, in serpentine rocky area, on acid soil in pine woodland, 735 m, 6-V-2015, L. Lökös (BP 96621).

***Cladonia coniocraea* (Flörke) Spreng.**

Fumarprotocetraric acid: DURRËS: District of Durrës, Fushë-Draçi, San Pietro beach track, 41°31'01"N 19°31'12"E, *Pinus pinea*, sandy soil, 1 m, 19-IV-2017, A.R. Burgaz (MACB 111224). LEZHË: District of Kurbin, Milot, left side Mat river, SH25 Milot-Zogu Bridge, 41°41'54"N 19°45'10"E, *Carpinus orientalis*, *Erica arborea*, limestone, 40 m, 21-IV-2017, A.R. Burgaz (MACB 111305). VLORE: District of Delvinë (Rrethi i Delvinës), Mali i Gjerë, on the southern slope of 1331 m high mount above Delvinë, 39°57'42.12"N 20°07'59.66"E, in chestnut woodland, on bark (*Castanea sativa*), 828 m, 1-V-2009, Z. Barina & D. Pifkó (BP 96542).

***Cladonia conista* (Nyl.) Robbins**

Fumarprotocetraric and bourgeanic acids: DURRËS: District of Durrës, Fushë-Draçi, road cape of Rodon, 41°32'50"N 19°31'08"E, *Carpinus betulus*, *Arbutus unedo*, *Pistacia lentiscus*, *Cistus salviifolius*, sandstone, 90 m, 19-IV-2017, A.R. Burgaz (MACB 111412). District of Durrës (Rrethi i Durrësit), west of village Shënpjetër, at the southern foot of hill M. e Multit (159.9 m), near the coast of the Adriatic Sea, 41°32'41.0"N 19°29'16.0"E, on soil in grasslands, 0 m, 26-IV-2009, L. Lökös (BP 96551). ELBASAN: Prrenjas, Urakë, SH9 Qafë Thanë, 41°04'24"N 20°36'18"E, *Quercus macrolepis*, deciduous *Quercus*, *Juniperus oxycedrus*, limestone, 1000 m, 22-IV-2017, A.R. Burgaz (MACB 111449). District of Librazhd (Rrethi i Librazhdit), Polis Mts, above village Polis, on the ridge between the valley of brook "Sut Kukit" and river Shkumbin, 41°09'16.50"N 20°15'08.79"E, in bushland, on conglomeratic flysh sediments, 555 m, 12-X-2010, L. Lökös (BP 96571). Elbasan county, in open boxwood scrubland above village Kutërman, 41°13'40.99"N 20°14'41.04"E, on acid soil in

rocky serpentine area, 510 m, 16-V-2016, L. Lökös (BP 96660). FIER: Fier County, Pylli i Levanit, above village Levan, 40°40'48.99"N 19°30'11.70"E, on calcareous soil in oak woodland, 95 m, 5-V-2017, L. Lökös (BP 96678). GJIROKASTËR: Gjirokastrë District (Rrethi i Gjirokastrës), Mali i Nikollaqit above village Sofratikë, 39°59'41.22"N 20°12'40.05"E, on calcareous soil in rocky grasslands, 260 m, 8-V-2015, L. Lökös (BP 96631). District of Gjirokastrë (Rrethi i Gjirokastrës), Kurvelesh i Sipërm uplands above village Picar, 40°11'0.39"N 20°02'31.51"E, on calcareous soil in rocky grasslands, 750 m, 29-III-2015, L. Lökös (BP 96600). District of Përmet (Rrethi i Përmetit); left part of river Vjosë, between town Këlcyrë and village Mbrezhdan, 40°19'11.24"N 20°05'43.54"E, in scrubland, on flysh soil, 205 m, 9-V-2015, L. Lökös (BP 96633). District of Tepelenë (Rrethi i Tepelenës), c. 500 m N of village Mirnë, 40°21'53.91"N 19°58'15.44"E, in dry grassland, on flysh soil, 160 m, 14-X-2012, L. Lökös (BP 96595). KORÇË: Kolonjë District (Rrethi i Kolonjës), between town Leskovik and village Vrëpckë, 40°10'30.62"N 20°38'22.95"E, on acid soil in rocky serpentine grasslands, 1030 m, 10-V-2015, Z. Barina, L. Lökös & D. Pifkó (BP 96637). District of Korçë (Rrethi i Korçës), above the water reservoir c.2.5 km WSW of village Ujëbardhë, 40°31'17.31"N 20°39'50.62"E, on acid soil in dry rocky grassland, 1105 m, 18-X-2011, L. Lökös (BP 96586). LEZHË: Kurbin, Milot, left side Mat river, SH25 Milot-Zogu Bridge, 41°41'54"N 19°45'10"E, *Carpinus orientalis*, *Erica arborea*, limestone, 40 m, 21-IV-2017, A.R. Burgaz (MACB 111431). SHKODËR: Pukë District (Rrethi i Pukës), Mount Rras' e Qerretit above village Qerret, 42°03'36.98"N 19°49'53.45"E, in serpentine rocky area, on bark (*Juniperus*), 735 m, 6-V-2015, L. Lökös (BP 96622). TIRANË: District of Kavajë (Rrethi i Kavajës), by the coast of the Adriatic Sea between villages Spille and Rreth (Rreth-Greth), 41°05'07.6"N 19°27'31.5"E, on sandy soil in sand dune area, 10 m, 27-IV-2009, L. Lökös (BP 96552). VLORE: Finiq, Bisticë, Muzinë, 39°55'08"N 20°08'48"E, *Quercus coccifera*, *Carpinus betulus*, *Pinus halepensis*, *Cercis siliquastrum*, limestone slopes, 125 m, 17-IV-2017, A.R. Burgaz (MACB 111409). District of Delvinë (Rrethi i Delvinës), Mali i Gjerë, on the southern slope of 1331 m high mount above Delvinë, 39°57'42.12"N 20°07'59.66"E, in chestnut woodland, on bark (*Castanea sativa*), 828 m, 1-V-2009, Z. Barina,

D. Pifkó (BP 96543). District of Vlorë (Rrethi i Vlorës), between village Ilias and manastir Shën Theodor, 40°08'07.8"N 19°40'26.4"E, on soil in olive plantation, 211 m, 29-IV-2009, L. Lökös (BP 96557).

***Cladonia cryptochlorophaea* Asahina**

Fumarprotocetraric acid: VLORE: Finiq, Muzinë, Muzinë, 39°54'48"N 20°11'20"E, deciduous *Quercus*, *Erica arborea*, limestone, 186 m, 17-IV-2017, A.R. Burgaz (MACB 111410).

***Cladonia cyathomorpha* Stirt. ex Walt. Watson**

Fumarprotocetraric acid: ELBASAN: Prrenjas, Prrenjas, SH3 Qukës-Prrenjas, 41°04'24"N 20°30'15"E, *Carpinus orientalis*, *Quercus macrolepis*, deciduous *Quercus*, *Buxus sempervirens*, limestone slopes, 540 m, 22-IV-2017, A.R. Burgaz (MACB 111443). KUKËS: District of Kukës, Kukës, Rruga Tirana, 42°04'46"N 20°24'45"E, *Quercus cerris*, deciduous *Quercus*, limestone, 330 m, 21-IV-2017, A.R. Burgaz (MACB 111438). SHKODËR: Vau i Dejës, SH25 Vau i Dejës-Koman, 42°00'55"N 19°39'37"E, *Pinus pinaster*, *Carpinus orientalis*, serpentine soil, 120 m, 20-IV-2017, A.R. Burgaz (MACB 111421). TIRANË: District of Tiranë, Mushqeta, SH3 Mushqeta-Gracen, 41°12'38"N 19°57'09"E, *Arbutus unedo*, *Erica arborea*, *Platanus orientalis*, boulders, 480 m, 22-IV-2017, A.R. Burgaz (MACB 111442).

***Cladonia fimbriata* (L.) Fr.**

Fumarprotocetraric acid: DIBËR: District of Mat (Rrethi i Matit), Mali i Skënderbeut, on the northern forehills of Mt. "maja e Mëllezit", near village Shkopet, 41°41'38.1"N 19°49'16.4"E, on soil in *Ostrya carpinifolia* scrubland, 75 m, 24-IV-2009, L. Lökös (BP 96549). DURRËS: District of Durrës, Fushë-Draçi, San Pietro beach track, 41°31'01"N 19°31'12"E, *Pinus pinea*, sandy soil, 1 m, 19-IV-2017, A.R. Burgaz (MACB 111413). District of Krujë, Krujë, SH38 to Qafë-Shtamë N. P., 41°31'03"N 19°49'27"E, *Carpinus betulus*, pasturelands, limestone, 720 m, 19-IV-2017, A.R. Burgaz (MACB 111414). ELBASAN: Prrenjas, SH3 Qukës-Prrenjas, 41°04'24"N 20°30'15"E, *Carpinus orientalis*, *Quercus macrolepis*, deciduous *Quercus*, *Buxus sempervirens*, limestone slopes, 540 m, 22-IV-2017, A.R. Burgaz (MACB 111445). Prrenjas, Urakë, SH9 Qafë Thanë, 41°04'24"N

20°36'18"E, *Quercus macrolepis*, deciduous *Quercus*, *Juniperus oxycedrus*, limestone, 1000 m, 22-IV-2017, A.R. Burgaz (MACB 111448). GJIROKASTËR: Gjirrokastër County, Bredhi i Sotirës above village Sotirë, 39°48'53.21"N 20°21'41.98"E, in dry scrubland area, on bark (*Platanus orientalis*), 550 m, 6-V-2017, L. Lökös (BP 96680). District of Tepelenë, Këlcyrë, Këlcyrë gorge, left side Vjosa river, 40°17'52"N 20°10'05"E, *Carpinus betulus*, *Pinus halepensis*, sandstone, 180 m, 18-IV-2017, A.R. Burgaz (MACB 111350). KORÇË: District of Korçë, Dardhë, SH90 Boboshticë-Dardhë, 40°31'18"N 20°49'22"E, *Fagus sylvatica*, *Pinus nigra*, *Juniperus communis*, *Betula pendula*, *Abies* sp., limestone, 1390 m, 23-IV-2017, A.R. Burgaz (MACB 111458). District of Korçë, Dardhë, SH90 Boboshticë-Dardhë, 40°31'26"N 20°48'06"E, *Fagus sylvatica*, *Juniperus communis*, *Abies* sp., sandstone, 1550 m, 23-IV-2017, A.R. Burgaz (MACB 111454). District of Korçë (Rrethi i Korçës), Mali i Strugarit above village Belorta, 40°39'56.56"N 20°50'9.79"E, open grasslands on conglomerate rocks, 1010 m, 11-V-2015, Z. Barina, L. Lökös, D. Pifkó (BP 96642). District of Pogradec, Udënisht, SH3 Piskutat-Pogradec, shore Ohrid lake, 40°58'55"N 20°38'21"E, *Pinus halepensis*, *Juniperus oxycedrus*, *Buxus sempervirens*, sandstone, 710 m, 22-IV-2017, A.R. Burgaz (MACB 111451). KUKËS: District of Kukës, Kukës, Rruga Tirana, 42°04'46"N 20°24'45"E, *Quercus cerris*, deciduous *Quercus*, limestone, 330 m, 21-IV-2017, A.R. Burgaz (MACB 111437). LEZHË: District of Lezhë (Rrethi i Lezhës), on the slope of Mt Guri i Kuq above village Fregën, 41°51'41.58"N 19°44'11.22"E, on acid soil in open serpentine grasslands, 575 m, 30-III-2015, L. Lökös (BP 96606). SHKODËR: Vau i Dejës, SH25 Vau i Dejës-Koman, 42°03'01"N 19°39'45"E, *Pinus pinaster*, *Juniperus oxycedrus*, *Quercus cerris*, *Erica arborea*, *Cotinus coggygria*, serpentine soil, 130 m, 20-IV-2017, A.R. Burgaz (MACB 111424). District of Malësi e Madhe, Bogë, SH21 Koplík-Bogë, 42°21'46"N 19°37'56"E, *Pinus nigra*, *Juniperus oxycedrus*, limestone, 865 m, 20-IV-2017, A.R. Burgaz (MACB 111417). TIRANË: Rrogozhinë, Grethi i Mesem, 41°05'00"N 19°27'35"E, *Pinus pinaster*, *Juniperus oxycedrus*, sandy soil, 0 m, 15-IV-2017, A.R. Burgaz (MACB 111346). District of Tiranë, Mushqeta, SH3 Mushqeta-Gracen, 41°12'38"N 19°57'09"E, *Arbutus unedo*, *Erica arborea*, *Platanus orientalis*,

boulders, 480 m, 22-IV-2017, A.R. Burgaz (MACB 111441). VLORË: District of Sarandë, Pasqirave, Butrint N. P., SH81, Shengjergj monastery, 39°48'42"N 20°00'43"E, *Quercus coccifera*, limestone slopes, 50 m, 17-IV-2017, A.R. Burgaz (MACB 111347). Finiq, Bistricë, Muzinë, 39°55'08"N 20°08'48"E, *Quercus coccifera*, *Carpinus betulus*, *Pinus halepensis*, *Cercis siliquastrum*, limestone slopes, 125 m, 17-IV-2017, A.R. Burgaz (MACB 111348). Finiq, Muzinë, 39°54'48"N 20°11'20"E, deciduous *Quercus*, *Erica arborea*, limestone, 186 m, 17-IV-2017, A.R. Burgaz (MACB 111349). District of Delvinë (Rrethi i Delvinës), Mali i Gjerë, on the southern slope of 1331 m high mount above Delvinë, 39°57'42.12"N 20°07'59.66"E, in chestnut woodland, on bark (*Castanea sativa*), 828 m, 1-V-2009, Z. Barina & D. Pifkó (BP 96544).

Cladonia foliacea (Huds.) Willd.

Fumarprotocetraric and usnic acids chemotype: BERAT: District of Berat (Rrethi i Beratit), Tomor Mountains (Mali i Tomorrit), c. 700 m north of village Karkanjoz, 40°41'55.61"N 20°03'28.69"E, in Mediterranean scrubland, on calcareous soil in rocky grassland, 490 m, 25-V-2004, Z. Barina & Cs. Németh (BP 96540). District of Skrapar (Rrethi i Skraparit), above the gorge of river Osum next to village Dhorës, 40°28'27.79"N 20°15'16.11"E, in open bushland, on calcareous soil, 420 m, 13-X-2010, L. Lökös (BP 96575). DIBËR: Dibër county, on the mount between villages Fushë Studë and Zabzun, 41°19'54.43"N 20°24'38.25"E, on calcareous soil in rocky grasslands, 1295 m, 18-V-2016, L. Lökös (BP 96668). DURRËS: District of Durrës, Fushë-Draçi, San Pietro beach track, 41°31'01"N 19°31'12"E, *Pinus pinea*, sandy soil, 1 m, 19-IV-2017, A.R. Burgaz (MACB 111288). Prenjas, Urakë, SH9 Qafë Thanë, 41°04'24"N 20°36'18"E, *Quercus macrolepis*, deciduous *Quercus*, *Juniperus oxycedrus*, limestone, 1000 m, 22-IV-2017, A.R. Burgaz (MACB 111313). ELBASAN: District of Elbasan, Bradashesh, SH3 Bradashesh-Graze, 41°06'05"N 20°00'26"E, *Olea europea*, limestone karst, 390 m, 15-IV-2017, A.R. Burgaz (MACB 111278). District of Elbasan, Bradashesh, SH3 Bradashesh-Graze, 41°06'33"N 19°59'49"E, *Carpinus betulus*, *Juniperus oxycedrus*, limestone karst, 530 m, 15-IV-2017, A.R. Burgaz (MACB 111279). Elbasan County (Qarku i Elbasanit), on the mount above bridge Ura e Murrashit, between Mirakë and Librazhd,

41°11'1.64"N 20°16'33.36"E, on acid soil in serpentine scrublands, 290 m, 3-IV-2016, L. Lökös (BP 96657). Elbasan county, in village Floq, 41°16'1.19"N 20°14'19.17"E, on soil by the roadside, 650 m, 17-V-2016, L. Lökös (BP 96664). GJIROKASTËR: Dropull, Grapsh, SH78, 39°56'50"N 20°14'31"E, deciduous *Quercus*, limestone slope rocks, 440 m, 17-IV-2017, A.R. Burgaz (MACB 111285). Dropull, Goranxi, to Kishae Ravenes, 40°00'56"N 20°11'15"E, limestone rocks, 268 m, 17-IV-2017, A.R. Burgaz (MACB 111286). District of Gjirrokastër (Rrethi i Gjirrokastër), Kurvelesh i Sipërm uplands above village Picar, 40°10'21.66"N 20°02'40.64"E, on calcareous soil in rocky grasslands, 390 m, 29-III-2015, L. Lökös (BP 96602). District of Përmet (Rrethi i Përmetit), c. 1.3 km SE of village Kosinë, along river Vjosë, 40°15'40.11"N 20°19'08.84"E, on calcareous conglomerate rocks, 215 m, 17-X-2011, Z. Barina, L. Lökös & D. Pifkó (BP 96580). District of Përmet (Rrethi i Përmetit), right part of river Vjosë between villages Golemas and Kutal, 40°15'22.93"N 20°19'27.80"E, on conglomerate rocks, 220 m, 10-V-2015, Z. Barina, L. Lökös & D. Pifkó (BP 96641). District of Tepelenë, Dukaj, SH76 Tepelenë-Sinanaj, 40°18'45"N 19°57'46"E, *Quercus coccifera*, limestone, 280 m, 18-IV-2017, A.R. Burgaz (MACB 111287). District of Tepelenë (Rrethi i Tepelenës), c. 1.4 km S of village Vasjar, 40°21'27.84"N 19°55'57.13"E, on calcareous soil in exposed rocky grasslands, 155 m, 14-X-2012, L. Lökös (BP 96596). KORÇË: Kolonjë District (Rrethi i Kolonjës), between town Leskovik and village Vrëpckë, 40°10'30.62"N 20°38'22.95"E, on acid soil in rocky serpentine grasslands, 1030 m, 10-V-2015, Z. Barina, L. Lökös, D. Pifkó (BP 96638). District of Korçë (Rrethi i Korçës), above the water reservoir c 2.5 km WSW of village Ujëbardhë, 40°31'17.31"N 20°39'50.62"E, on acid soil in dry rocky grassland, 1105 m, 18-X-2011, L. Lökös (BP 96587). District of Devoll (Rrethi i Devollit), on the hills above village Ponçarë, 40°31'17.63"N 20°57'54.23"E, in dry grasslands, on flysh soil, 1035 m, 11-V-2015, Z. Barina, L. Lökös & D. Pifkó (BP 96646). District of Korçë, Dardhë, SH90 Boboshticë-Dardhë, 40°31'26"N 20°48'06"E, *Fagus sylvatica*, *Juniperus communis*, *Abies* sp., sandstone, 550 m, 23-IV-2017, A.R. Burgaz (MACB 111319). District of Korçë (Rrethi i Korçës), on the ridge of Mts Mali i Moravës above village Dardhë, near peak Buzeja e Boboshticës (1701 m), 40°32'23.97"N

20°49'14.20"E, on acid soil in beech forest on gravel conglomerate, 1550 m, 10-VIII-2010, L. Lökös (BP 96561). Korçë, Boboshticë, SH90 Boboshticë-Dardhë, 40°32'37"N 20°47'11"E, *Juniperus oxycedrus*, pastureland, sandstone, 1200 m, 23-IV-2017, A.R. Burgaz (MACB 111317). District of Korçë (Rrethi i Korçës), Mali i Strugarit above village Belorta, 40° 39' 56.56"N 20°50'9.79"E, open grasslands on conglomerate rocks, 1010 m, 11-V-2015, Z. Barina, L. Lökös, D. Pifkó (BP 96643). District of Devoll (Rrethi i Devollit), on the mount between village Tren and lake Liqeni i Prespës së Vogël, 40°40'10.55"N 20°59'12.62"E, on calcareous soil in rocky grasslands, 910 m, 12-V-2015, Z. Barina, L. Lökös & D. Pifkó (BP 96648). Korçë County, Mali i Lenies at village Gopesh, 40°43'37.56"N 20°23'56.77"E, on calcareous soil in rocky pastures, 1005 m, 3-V-2017, L. Lökös (BP 96676). Korçë County, Mt "Golines" at village Rakickë, 40°43'8.88"N 20°59'0.97"E, on calcareous soil in rocky grasslands, 1105 m, 1-V-2017, L. Lökös (BP 96672). District of Pogradec, Udënisht, SH3 Piskutat-Pogradec, shore Ohrid lake, 40°58'55"N 20°38'21"E, *Pinus halepensis*, *Juniperus oxycedrus*, *Buxus sempervirens*, sandstone, 710 m, 22-IV-2017, A.R. Burgaz (MACB 111316). KUKËS: District of Kukës, Kolsh, SH5 close Drin river, 42°04'18"N 20°20'32"E, deciduous *Quercus*, *Juniperus oxycedrus*, *Buxus sempervirens*, serpentine soil, 510 m, 21-IV-2017, A.R. Burgaz (MACB 111308). LEZHË: District of Lezhë (Rrethi i Lezhës), near the pass between Mt. "Sheshi i Velës" (1049.2 m) and Mt. "Velës" (1170.1 m), above village Kallmet, 41°50'28.1"N 19°42'54.5"E, on soil in rocky forest, 961 m, 23-IV-2009, L. Lökös (BP 96548). SHKODËR: Shkodër District (Rrethi i Shkodrës), c. 1.5 km NE of village Gomsiqë e Epërme, near road SH5, 41°59'31.61"N 19°48'12.99"E, on acid soil in dry serpentine grasslands, 533 m, 6-V-2015, L. Lökös (BP 96618). District of Shkodër (Rrethi i Shkodrës), Qafae Çelës above village Mirdicë, 42°0'11.98"N 19°43'33.16"E, on soil in roadside dry rocky grassland, 470 m, 12-X-2011, L. Lökös (BP 96578). Pukë District (Rrethi i Pukës), Mount Rras' e Qerretit above village Qerret, 42°03'36.98"N 19°49'53.45"E, in serpentine rocky area, on acid soil in pine woodland, 735 m, 6-V-2015, L. Lökös (BP 96623). Shkodër District (Rrethi i Shkodrës), in the valley of stream Përroi i Çibunit E of village Prekal, 42°10'44.69"N 19°43'18.46"E, on calcareous soil in scrubland, 220 m, 5-V-2015, L. Lökös (BP 96617). Shkodër

District (Rrethi i Shkodrës), between villages Linaj-Egç-Lepurosh and Kurtaj, 42°11'10.22"N 19°33'19.74"E, on calcareous soil in dry scrubland, 260 m, 4-V-2015, Z. Barina, L. Lökös & D. Pifkó (BP 96613). District of Shkodër (Rrethi i Shkodrës), in the valley of river Përroi i Thatë at village Lashaj, along the road nr. E 762, 42°14'19.70"N 19°25'24.82"E, on calcareous soil in open dry rocky grasslands, 78 m, 30-III-2015, L. Lökös (BP 96603). District of Malësi e Madhe, Poica, SH21 Koplík-Bogë, 42°15'53"N 19°29'47"E, *Juniperus oxycedrus*, *Cupressus sempervirens*, boulders, 320 m, 20-IV-2017, A.R. Burgaz (MACB 111293). District of Malësi e Madhe, Dedaj, SH21 Koplík-Bogë, 42°18'04"N 19°32'32"E, *Carpinus betulus*, *Juniperus oxycedrus*, limestone rocks, 495 m, 20-IV-2017, A.R. Burgaz (MACB 111294). District of Malësi e Madhe, Bogë, SH21 Koplík-Bogë, 42°21'46"N 19°37'56"E, *Pinus nigra*, *Juniperus oxycedrus*, limestone, 865 m, 20-IV-2017, A.R. Burgaz (MACB 111302). Malësi e Madhe District (Rrethi i Malësisë së Madhe), on Mount Bukovik above village Rrapshë-Starë, 42°23'6.12"N 19°29'25.56"E, on calcareous soil in rocky grasslands, 715 m, 3-V-2015, L. Lökös (BP 96608). TIRANË: District of Kavajë (Rrethi i Kavajës), on hills east of village Stërbeg-Bragash, 41°06'36.2"N 19°32'07.0"E, on soil in poplar woodland, 107 m, 28-IV-2009, L. Lökös (BP 96554). VLORË: Himarë, Ilias, Himarë, 40°08'29"N 19°40'11"E, *Quercus coccifera*, *Cupressus sempervirens*, *Cistaceae* shrubs, limestone, 300 m, 16-IV-2017, A.R. Burgaz (MACB 111283). District of Vlorë (Rrethi i Vlorës), on the E ridge of Mt maja e Thanasit (1352.1 m) above Llogora pass, 40°11'51.54"N 19°35'27.82"E, on calcareous soil in mixed forest, 1075 m, 12-VIII-2010, L. Lökös (BP 96568). District of Vlorë, Dukat i Ri, SH3 Orikum-Dhërmi, Llogora N. P., 40°12'00"N 19°35'26"E, *Pinus nigra*, *Juniperus oxycedrus*, *Buxus sempervirens*, limestone, 1030 m, 16-IV-2017, A.R. Burgaz (MACB 111282). District of Vlorë, Dukat i Ri, SH3 Orikum-Dhërmi, Llogora N. P., 40°15'11"N 19°32'14"E, *Quercus coccifera*, *Pinus halepensis*, limestone, 320 m, 16-IV-2017, A.R. Burgaz (MACB 111280). **Fumarprotocetraric, usnic and physodalic acids chemotype:** KORÇË: District of Korçë, Dardhë, SH90 Boboshticë-Dardhë, 40°31'18"N 20°49'22"E, *Fagus sylvatica*, *Pinus nigra*, *Juniperus communis*, *Betula pendula*, *Abies* sp., limestone, 1390 m, 23-IV-2017, A.R. Burgaz (MACB 111320). KUKËS: District of Kukës,

Kukës, Rruga Tirana, 42°04'46"N 20°24'45"E, *Quercus cerris*, deciduous *Quercus*, limestone, 330 m, 21-IV-2017, A.R. Burgaz (MACB 111310). TIRANË: District of Tiranë, Mushqeta, SH3 Mushqeta-Gracen, 41°12'38"N 19°57'09"E, *Arbutus unedo*, *Erica arborea*, *Platanus orientalis*, boulders, 480 m, 22-IV-2017, A.R. Burgaz (MACB 111311). **Fumarprotocetraric, usnic and psoromic acids chemotype:** KORÇË: District of Kolonjë (Rrethi i Kolonjës), Mt. Melesin (1410.8 m), 40°08'50.1"N 20°35'37.0"E, on limestone rocks, 953 m, 3-V-2009, L. Lökös (BP 96559). VLORË: District of Vlorë (Rrethi i Vlorës), between village Ilias and monastir Shën Theodor, 40°08'07.8"N 19°40'26.4"E, on soil in olive plantation, 211 m, 29-IV-2009, L. Lökös (BP 96558).

***Cladonia furcata* (Huds.) Schrad.**

Fumarprotocetraric acid chemotype: DIBËR: Dibër county, on the mount between villages Fushë Studë and Zabzun, 41°19'54.43"N 20°24'38.25"E, on calcareous soil in rocky grasslands, 1295 m, 18-V-2016, L. Lökös (BP 96669). DURRËS: District of Durrës, Fushë-Draçi, road cape of Rodon, 41°32'50"N 19°31'08"E, *Carpinus betulus*, *Arbutus unedo*, *Pistacia lentiscus*, *Cistus salvifolius*, sandstone, 90 m, 19-IV-2017, A.R. Burgaz (MACB 111220). ELBASAN: District of Librazhd (Rrethi i Librazhdit): Polis Mts, between villages Gurrëshpat and Vilan, 41°05'38.45"N 20°16'15.72"E, on acid soil among serpentine rocks, 1270 m, 12-X-2010, L. Lökös (BP 96574). District of Elbasan, Bradashesh, SH3 Bradashesh-Graze, 41°06'33"N 19°59'49"E, *Carpinus betulus*, *Juniperus oxycedrus*, limestone karst, 530 m, 15-IV-2017, A.R. Burgaz (MACB 111403). District of Librazhd (Rrethi i Librazhdit): Polis Mts; above village Polis, on the ridge between the valley of brook "Sut Kukit" and river Shkumbin, in bushland, 41°09'16.50"N 20°15'08.79"E, on conglomeratic flysh sediments, 555 m, 12-X-2010, L. Lökös (BP 96572). Elbasan County (Qarku i Elbananit), on the mount above bridge Ura e Murrashit, between Mirakë and Librazhd, 41°11'1.64"N 20°16'33.36"E, on acid soil in serpentine scrublands, 290 m, 3-IV-2016, L. Lökös (BP 96658). Elbasan county, in village Floq, 41°16'1.19"N 20°14'19.17"E, on soil by the roadside, 650 m, 17-V-2016, L. Lökös (BP 96665). GJIROKASTËR: District of Gjirokastrë (Rrethi i Gjirokastrës), between settlements Picar and Andon Poçi in the valley of river Vjosë near road SH4, 40°10'41.12"N 20°04'45.55"E, in grazed grassland, on flysh soil, 170 m, 28-III-2015, L.

Lökös (BP 96598). District of Tepelenë, Këlcyrë, Këlcyrë gorge, left side Vjosa river, 40°17'52"N 20°10'05"E, *Carpinus betulus*, *Pinus halepensis*, sandstone, 180 m, 18-IV-2017, A.R. Burgaz (MACB 111215). KORÇË: Kolonjë District (Rrethi i Kolonjës), between town Leskovik and village Vrëpckë, 40°10'30.62"N 20°38'22.95"E, on acid soil in rocky serpentine grasslands, 1030 m, 10-V-2015, Z. Barina, L. Lökös & D. Pifkó (BP 96639). District of Kolonjë (Rrethi i Kolonjës), c. 1.9 km W of village Pepellash, 40°28'56.18"N 20°40'21.27"E, on acid soil in moist road slope, 549 m, 18-X-2011, Z. Barina, L. Lökös & D. Pifkó (BP 96582). District of Korçë (Rrethi i Korçës), on the ridge of Mts Mali i Moravës above village Dardhë, near peak Buzeja e Boboshticës, 40°31'52.6"N 20°48'36.1"E, on acid soil in beech forest on gravel conglomerate, 1625 m, 10-VIII-2010, L. Lökös (BP 96565). District of Korçë, Dardhë, SH90 Boboshticë-Dardhë, 40°31'18"N 20°49'22"E, *Fagus sylvatica*, *Pinus nigra*, *Juniperus communis*, *Betula pendula*, *Abies* sp., limestone, 1390 m, 23-IV-2017, A.R. Burgaz (MACB 111344). District of Devoll (Rrethi i Devollit), on the mount between village Tren and lake Liqeni i Prespës së Vogël, 40°40'10.55"N 20°59'12.62"E, on calcareous soil in rocky grasslands, 910 m, 12-V-2015, Z. Barina, L. Lökös & D. Pifkó (BP 96649). Korçë County, Mali i Lenies at village Gopesh, 40°43'37.56"N 20°23'56.77"E, on calcareous soil in rocky pastures, 1005 m, 3-V-2017, L. Lökös (BP 96677). LEZHË: Pukë District (Rrethi i Pukës); Mount Rras' e Qerretit above village Qerret, 42°03'36.98"N 19°49'53.45"E, in serpentine rocky area, on acid soil in pine woodland, 735 m, 6-V-2015, L. Lökös (BP 96624). SHKODËR: District of Shkodër (Rrethi i Shkodrës), Qafa e Çelës above village Mirdicë, 42°0'11.98"N 19°43'33.16"E, on soil in roadside dry rocky grassland, 470 m, 12-X-2011, L. Lökös (BP 96579). District of Shkodër (Rrethi i Shkodrës), in the valley of river Përroi i Thatë at village Lashaj, along the road nr. E 762, 42°14'19.70"N 19°25'24.82"E, on calcareous soil in open dry rocky grasslands, 78 m, 30-III-2015, L. Lökös (BP 96604). TIRANË: Tirana County (Qarku i Tiranës); at the foot of Mt Kalaja e Dorëzit, between villages Pezë and Dorëz, 41°13'30.08"N 19°43'53.26"E, in grasslands, on flysh soil, 180 m, 2-IV-2016, L. Lökös (BP 96652). VLORË: District of Sarandë (Rrethi i Sarandës), on a hill between villages Kulluricë and Kodër, 39°48'43.85"E 20°06'34.02"E, in dry grassland, on flysh soil, 55 m, 13-X-2012, L. Lökös (BP 96591). Finiq, Bistricë, Muzinë, 39°55'08"N 20°08'48"E, *Quercus*

coccifera, *Carpinus betulus*, *Pinus halepensis*, *Cercis siliquastrum*, limestone slopes, 125 m, 17-IV-2017, A.R. Burgaz (MACB 111197). District of Vlorë (Rrethi i Vlorës), Mts. Mali i Çikës, in the valley below Mt. "Maja e Pandelejmonit" (805.8 m), north of village Dhërmi, 40°09'32.2"N 19°38'49.4"E, in dry rocky grassland, on calcareous soil, 260 m, 29-IV-2009, L. Lökös (BP 96555). **Fumarprotocetraric and physodalic acids chemotype:** DURRËS: District of Durrës, Fushë-Draçi, San Pietro beach track, 41°31'01"N 19°31'12"E, *Pinus pinea*, sandy soil, 1 m, 19-IV-2017, A.R. Burgaz (MACB 111228). ELBASAN: Prrenjas, Urakë, SH9 Qafë Thanë, 41°04'24"N 20°36'18"E, *Quercus macrolepis*, deciduous *Quercus*, *Juniperus oxycedrus*, limestone, 1000 m, 22-IV-2017, A.R. Burgaz (MACB 111314). GJIROKASTËR: Dropull, Goranxi, to Kishae Ravenes, 40°00'56"N 20°11'15"E, limestone rocks, 268 m, 17-IV-2017, A.R. Burgaz (MACB 111206). GJIROKASTËR: District of Përmet, Piskovë, left side Lumica river, K75 to Frashër, 40°16'44"N 20°17'07"E, *Juniperus oxycedrus*, *Paliurus spinachristi*, *Arbutus unedo*, *Pistacia terebinthus*, sandstone, 230 m, 18-IV-2017, A.R. Burgaz (MACB 111218). District of Tepelenë, Këlcyrë, Këlcyrë gorge, left side Vjosa river, 40°17'52"N 20°10'05"E, *Carpinus betulus*, *Pinus halepensis*, sandstone, 180 m, 18-IV-2017, A.R. Burgaz (MACB 111213). District of Tepelenë, Dukaj, SH76 Tepelenë-Sinanaj, 40°18'45"N 19°57'46"E, *Quercus coccifera*, limestone, 280 m, 18-IV-2017, A.R. Burgaz (MACB 111221). KORÇË: District of Korçë, Dardhë, SH90 Boboshticë-Dardhë, 40°31'18"N 20°49'22"E, *Fagus sylvatica*, *Pinus nigra*, *Juniperus communis*, *Betula pendula*, *Abies* sp., limestone, 1390 m, 23-IV-2017, A.R. Burgaz (MACB 111321). District of Pogradec, Udënisht, SH3 Piskutat-Pogradec, shore Ohrid lake, 40°58'55"N 20°38'21"E, *Pinus halepensis*, *Juniperus oxycedrus*, *Buxus sempervirens*, sandstone, 710 m, 22-IV-2017, A.R. Burgaz (MACB 111315). KUKËS: District of Kukës, Kolsh, SH5 close Drin river, 42°04'18"N 20°20'32"E, deciduous *Quercus*, *Juniperus oxycedrus*, *Buxus sempervirens*, serpentine soil, 510 m, 21-IV-2017, A.R. Burgaz (MACB 111307). District of Kukës, Kukës, Rruga Tirana, 42°04'46"N 20°24'45"E, *Quercus cerris*, deciduous *Quercus*, limestone, 330 m, 21-IV-2017, A.R. Burgaz (MACB 111309). LEZHË: District of Kurbin, Milot, left side Mat river, SH25 Milot-Zogu Bridge, 41°41'54"N 19°45'10"E, *Carpinus orientalis*, *Erica arborea*, limestone, 40 m, 21-IV-2017, A.R. Burgaz (MACB 111306). SHKODËR: District of

Malësi e Madhe, Poica, SH21 Koplík-Bogë, 42°15'53"N 19°29'47"E, *Juniperus oxycedrus*, *Cupressus sempervirens*, boulders, 320 m, 20-IV-2017, A.R. Burgaz (MACB 111291). District of Malësi e Madhe, Dedaj, SH21 Koplík-Bogë, 42°18'04"N 19°32'32"E, *Carpinus betulus*, *Juniperus oxycedrus*, limestone rocks, 495 m, 20-IV-2017, A.R. Burgaz (MACB 111297). District of Malësi e Madhe, Bogë, SH21 Koplík-Bogë, 42°21'46"N 19°37'56"E, *Pinus nigra*, *Juniperus oxycedrus*, limestone, 865 m, 20-IV-2017, A.R. Burgaz (MACB 111301). VLORE: Finiq, Muzinë, Muzinë, 39°54'48"N 20°11'20"E, deciduous *Quercus*, *Erica arborea*, limestone, 186 m, 17-IV-2017, A.R. Burgaz (MACB 111200). Finiq, Bisticë, Muzinë, 39°55'08"N 20°08'48"E, *Quercus coccifera*, *Carpinus betulus*, *Pinus halepensis*, *Cercis siliquastrum*, limestone slopes, 125 m, 17-IV-2017, A.R. Burgaz (MACB 111195). **Atranorin and fumarprotocetraric acid:** KORÇË: District of Korçë (Rrethi i Korçës), on the ridge of Mts Mali i Moravës above village Dardhë, near peak Buzeja e Boboshticës (1701 m), 40°32'23.97"E 20°49'14.20"E, on acid soil in beech forest on gravel conglomerate, 1550 m, 10-VIII-2010, L. Lökös (BP 96562). **Atranorin, fumarprotocetraric and physodalic acids chemotype:** KORÇË: District of Korçë, Dardhë, SH90 Boboshticë-Dardhë, 40°31'26"N 20°48'06"E, *Fagus sylvatica*, *Juniperus communis*, *Abies* sp., sandstone, 1550 m, 23-IV-2017, A.R. Burgaz (MACB 111318). SHKODËR: District of Malësi e Madhe, Poica, SH21 Koplík-Bogë, 42°15'53"N 19°29'47"E, *Juniperus oxycedrus*, *Cupressus sempervirens*, boulders, 320 m, 20-IV-2017, A.R. Burgaz (MACB 111290). District of Malësi e Madhe, Dedaj, SH21 Koplík-Bogë, 42°18'04"N 19°32'32"E, *Carpinus betulus*, *Juniperus oxycedrus*, limestone rocks, 495 m, 20-IV-2017, A.R. Burgaz (MACB 111295, 111296). Malësi e Madhe, Bogë, SH21 Koplík-Bogë, 42°21'46"N 19°37'56"E, *Pinus nigra*, *Juniperus oxycedrus*, limestone, 865 m, 20-IV-2017, A.R. Burgaz (MACB 111300). VLORE: Finiq, Muzinë, Muzinë, 39°54'48"N 20°11'20"E, deciduous *Quercus*, *Erica arborea*, limestone, 186 m, 17-IV-2017, A.R. Burgaz (MACB 111284). District of Vlorë, Dukat i Ri, SH3 Orikum-Dhërmi, Llogora N. P., 40°15'11"N 19°32'14"E, *Quercus coccifera*, *Pinus halepensis*, limestone, 320 m, 16-IV-2017, A.R. Burgaz (MACB 111281). **Atranorin, bourgeanic and fumarprotocetraric acids:** KORÇË: Korçë County, Mt Golines at village Rakickë, 40°43'42.80"N 20°59'28.06"E, on

calcareous soil in open, rocky scrublands, 1295 m, 1-V-2017, L. Lökös (BP 96674).

Cladonia humilis (With.) J.R. Laundon

Atranorin and fumarprotocetraric acid: ELBASAN: Prrenjas, Prrenjas, SH3 Qukës-Prrenjas, 41°04'24"N 20°30'15"E, *Carpinus orientalis*, *Quercus macrolepis*, deciduous *Quercus*, *Buxus sempervirens*, limestone slopes, 540 m, 22-IV-2017, A.R. Burgaz (MACB 111444). VLORE: District of Sarandë, Pasqirave, Butrint N. P., SH81, Shengjergj monastery, 39°48'42"N 20°00'43"E, *Quercus coccifera*, limestone slopes, 50 m, 17-IV-2017, A.R. Burgaz (MACB 111407).

Cladonia macilenta Hoffm.

Barbatic and thamnolic acids: LEZHË: District of Mirditë (Rrethi i Mirditës); in the valley of stream Fani i Vogël above village Thirrë; in serpentine rocky area, on bark (*Pinus nigra*). 42° 0' 20.98"N 20°14'33.25"E, 905 m, 6-V-2015, L. Lökös (BP 96626).

Cladonia merochlorophaea Asahina

Fumarprotocetraric and merochlorophaeic acids: KORÇË: District of Korçë (Rrethi i Korçës), on the ridge of Mts Mali i Moravës above village Dardhë, near peak Buzeja e Boboshticës, on calcareous soil, 40°31'52.6"N 20°48'36.1"E, 1625 m, 10-VIII-2010, L. Lökös (BP 96566).

Cladonia parasitica (Hoffm.) Hoffm.

Barbatic and thamnolic acids: VLORE: District of Delvinë (Rrethi i Delvinës), Mali i Gjerë, on the southern slope of 1331 m high mount above Delvinë; in chestnut woodland, on bark (*Castanea sativa*), 39°57'42.12"N 20° 07'59.66"E, 828 m, 1-V-2009, Z. Barina & D. Pifkó (BP 96545).

Cladonia peziziformis (With.) J.R. Laundon

Fumarprotocetraric acid: SHKODËR: Vau i Dejës, SH25 Vau i Dejës-Koman, 42°00'55"N 19°39'37"E, *Pinus pinaster*, *Carpinus orientalis*, serpentine soil, 120 m, 20-IV-2017, A.R. Burgaz (MACB 111418).

Cladonia polycarpoides Nyl. (= *C. subcariosa* auct.)

Norstictic acid chemotype: SHKODËR: Vau i Dejës, SH25 Vau i Dejës-Koman, 42°03'01"N 19°39'45"E, *Pinus pinaster*, *Juniperus oxycedrus*, *Quercus cerris*, *Erica arborea*, *Cotinus coggygria*,

serpentine soil, 130 m, 20-IV-2017, A.R. Burgaz (MACB 111427). **Atranorin and norstictic acid chemotype:** KUKËS: District of Kukës, Kolsh, SH5 close Drin river, 42°04'18"N 20°20'32"E, deciduous *Quercus*, *Juniperus oxycedrus*, *Buxus sempervirens*, serpentine soil, 510 m, 21-IV-2017, A.R. Burgaz (MACB 111432).

***Cladonia pyxidata* (L.) Hoffm.**

Fumarprotocetraric acid chemotype: DIBËR: Dibër county, Golloborde, in the dry valley Gropa Gjugarica above village Sebisht, 41°23'34.22"N 20°25'16.33"E, on calcareous soil in rocky grasslands, 1015 m, 19-V-2016, L. Lökös (BP 96670). Dibër county, Mt Serakoli above village Ploshtan, 41°50'44.99"N 20°26'43.85"E, on calcareous soil in rocky pastures, 1200 m, 21-V-2016, L. Lökös (BP 96671). DURRËS: District of Krujë, Krujë, SH38 to Qafë-Shtamë N. P., 41°31'03"N 19°49'27"E, *Carpinus betulus*, pasturelands, limestone, 720 m, 19-IV-2017, A.R. Burgaz (MACB 111229). ELBASAN: Elbasan county, in open boxwood scrubland above village Kutërman, 41°13'40.99"N 20°14'41.04"E, on acid soil in rocky serpentine area, 510 m, 16-V-2016, L. Lökös (BP 96661). FIER: Fier District (Rrethi i Fierit), Mali i Kalivaçit, S of village Kalivaç, above river Vjosë, 40°24'14.86"N 19°48'4.08"E, on calcareous soil in *Quercus coccifera* scrubland, 100 m, 8-V-2015, L. Lökös (BP 96629). GJIROKASTËR: Gjirokastrë County, Bredhi i Sotirës above village Sotirë, 39°48'53.21"N 20°21'41.98"E, on mossy rocks in dry scrublands, 550 m, 6-V-2017, L. Lökös (BP 96681). Gjirokastrë County, at village Dervičian, 40°01'24.45"N 20°10'39.21"E, on calcareous soil in rocky grasslands, 260 m, 7-V-2017, L. Lökös (BP 96684). District of Përmet (Rrethi i Përmetit), c. 1.3 km SE of village Kosinë, along river Vjosë, 40°15'40.11"N 20°19'8.84"E, on calcareous conglomerate rocks, 215 m, 17-X-2011, Z. Barina, L. Lökös, D. Pifkó (BP 96581). District of Përmet (Rrethi i Përmetit), left part of river Vjosë, between town Këlcyrë and village Mbrezhdan, 40°18'17.42"N 20°12'17.52"E, in scrubland, on flysh soil, 205 m, 9-V-2015, L. Lökös (BP 96686). Tepelenë District (Rrethi i Tepelenës), in village Mezhgoran, 40°19'11.24"N 20°05'43.54"E, on calcareous soil, 660 m, 9-V-2015, Z. Barina, L. Lökös, D. Pifkó (BP 96634). KORÇË: District of Pogradec, Udënisht, SH3 Piskutat-Pogradec, shore Ohrid lake, 40°58'55"N 20°38'21"E, *Pinus halepensis*, *Juniperus oxycedrus*, *Buxus sempervirens*, sandstone, 710 m, 22-IV-2017, A.R. Burgaz

(MACB 111341). District of Korçë (Rrethi i Korçës); Mali i Strugarit above village Belorta, 40°39'56.56"N 20° 50' 9.79"E, open grasslands on conglomerate rocks, 1010 m, 11-V-2015, Z. Barina, L. Lökös, D. Pifkó (BP 96644). District of Devoll (Rrethi i Devollit), on the mount between village Tren and lake Liqeni i Prespës së Vogël, 40°40'10.55"N 20°59'12.62"E, on calcareous soil in rocky grasslands, 910 m, 12-V-2015, Z. Barina, L. Lökös, D. Pifkó (BP 96650). Korçë County, Mt Golines at village Rakickë, 40°43'8.88"N 20°59'0.97"E, on calcareous soil in rocky grasslands, 1105 m, 1-V-2017, L. Lökös (BP 96673). District of Korçë (Rrethi i Korçës), Thatë Mountains (Mali i Thatë), c. 3.0 km north of village Zvezdë, c. 1.85 km south-southeast of the peak of Mount "maja e Shëngjergjit" (1921 m), 40°44'37.16"N 20°52'35.53"E, on calcareous soil in rocky grasslands, 1165 m, 18-X-2011, L. Lökös (BP 96589). SHKODËR: Vau i Dejës, SH25 Vau i Dejës-Koman, 42°03'01"N 19°39'45"E, *Pinus pinaster*, *Juniperus oxycedrus*, *Quercus cerris*, *Erica arborea*, *Cotinus coggygria*, serpentine soil, 130 m, 20-IV-2017, A.R. Burgaz (MACB 111423). Shkodër District (Rrethi i Shkodrës), in the valley of stream Përroi i Çibunit E of village Prekal, 42°10'50.54"N 19°43'42.57"E, on calcareous soil in scrubland, 250 m, 5-V-2015, L. Lökös (BP 96615). District of Malësi e Madhe, Dedaj, SH21 Koplik-Bogë, 42°18'04"N 19°32'32"E, *Carpinus betulus*, *Juniperus oxycedrus*, limestone rocks, 495 m, 20-IV-2017, A.R. Burgaz (MACB 111326). District of Malësi e Madhe, Bogë, SH21 Koplik-Bogë, 42°21'46"N 19°37'56"E, *Pinus nigra*, *Juniperus oxycedrus*, limestone, 865 m, 20-IV-2017, A.R. Burgaz (MACB 111327). Malësi e Madhe District (Rrethi i Malësisë së Madhe), on Mount Bukovik above village Rrapshë-Starë, 42°23'6.12"N 19°29'25.56"E, on calcareous soil in rocky grasslands, 715 m, 3-V-2015, L. Lökös (BP 96609). TIRANË: District of Tiranë, Mushqeta, SH3 Mushqeta-Gracen, 41°12'38"N 19°57'09"E, *Arbutus unedo*, *Erica arborea*, *Platanus orientalis*, boulders, 480 m, 22-IV-2017, A.R. Burgaz (MACB 111337). Tirana County (Qarku i Tiranës), between village Pëllumbas and cave Shpella e Pëllumbasit, 41°15'4.10"E 19°57'34.16"E, on calcareous soil in *Carpinus orientalis* woodland, 445 m, 3-IV-2016, L. Lökös (BP 96654). Tirana County (Qarku i Tiranës), near cave Shpella e Pëllumbasit above village Pëllumbas, 41°15'21.11"N 19°57'50.31"E, on calcareous soil in *Carpinus orientalis* woodland, 450 m, 3-IV-2016, L. Lökös (BP 96656). VLORË: District of Sarandë (Rrethi i Sarandës),

on the eastern slope of Mt Maja e Milletit, above village Sopik, 39°46'12.49"N 20°06'20.58"E, on calcareous soil in rocky grasslands, 160 m, 13-X-2012, L. Lökös (BP 96594). District of Sarandë (Rrrethi i Sarandës), on a hill between villages Kulluricë and Kodër, 39°48'43.85"N 20° 06' 34.02"E, in dry grassland, on flysh soil, 55 m, 13-X-2012, L. Lökös (BP 96592). Ilias, Himarë, 40°08'29"N 19°40'11"E, *Quercus coccifera*, *Cupressus sempervirens*, Cistaceae shrubs, limestone, 300 m, 16-IV-2017, A.R. Burgaz (MACB 110961). District of Vlorë (Rrrethi i Vlorës); on the E ridge of Mt maja e Thanasit (1352.1 m) above Llogora pass, 40°11'51.54"N 19°35'27.82"E, on calcareous soil in mixed forest, 1075 m, 12-VIII-2010, L. Lökös (BP 96569). **Fumarprotocetraric and physodalic acids chemotype:** GJIROKASTËR: Dropull, Grapsh, SH78, 39°56'50"N 20°14'31"E, deciduous *Quercus*, limestone slope rocks, 440 m, 17-IV-2017, A.R. Burgaz (MACB 111201, 111203). Dropull, Goranxi, to Kishae Ravenes, 40°00'56"N 20°11'15"E, limestone rocks, 268 m, 17-IV-2017, A.R. Burgaz (MACB 111205). District of Tepelenë, Kodër, left Vjosa river bank, 40°17'20"N 20°04'25"E, *Paliurus spina-christi*, *Spartium junceum*, *Phlomis* shrubs, limestone slopes, 160 m, 18-IV-2017, A.R. Burgaz (MACB 111208, 111209). District of Tepelenë, Këlcyrë, Këlcyrë gorge, left side Vjosa river, 40°17'52"N 20°10'05"E, *Carpinus betulus*, *Pinus halepensis*, sandstone, 180 m, 18-IV-2017, A.R. Burgaz (MACB 111212, 111214). VLORË: Finiq, Bistricë, Muzinë, 39°55'08"N 20°08'48"E, *Quercus coccifera*, *Carpinus betulus*, *Pinus halepensis*, *Cercis siliquastrum*, limestone slopes, 125 m, 17-IV-2017, A.R. Burgaz (MACB 111192). District of Vlorë, Dukat i Ri, SH3 Orikum-Dhërmi, Llogora N. P., 40°12'00"N 19°35'26"E, *Pinus nigra*, *Juniperus oxycedrus*, *Buxus sempervirens*, limestone, 1030 m, 16-IV-2017, A.R. Burgaz (MACB 110957, 110958). District of Vlorë, Dukat i Ri, SH3 Orikum-Dhërmi, Llogora N. P., 40°15'11"N 19°32'14"E, *Quercus coccifera*, *Pinus halepensis*, limestone, 320 m, 16-IV-2017, A.R. Burgaz (MACB 110954, 110955). **Fumarprotocetraric and psoromic acids chemotype:** BERAT: District of Berat (Rrethi i Beratit), Tomor Mountains (Mali i Tomorrit), c. 1800 m SSW of village Tomor; in Mediterranean scrubland, on calcareous soil in rocky grassland, 40°40'53.98"N 20° 07'06.64"E, 1080 m, 25-V-2004, Z. Barina & Cs. Németh (BP 96539). ELBASAN, Prrenjas, Prrenjas, SH3 Qukës-Prrenjas, 41°04'24"N 20°30'15", *Carpinus orientalis*, *Quercus macrolepis*, deciduous

Quercus, *Buxus sempervirens*, limestone slopes, 540 m, 22-IV-2017, A.R. Burgaz (MACB 111312).

***Cladonia ramulosa* (With.) J.R. Laundon**

Fumarprotocetraric acid: DURRËS:

District of Durrës, Fushë-Draçi, San Pietro beach track, 41°31'01"N 19°31'12"E, *Pinus pinea*, sandy soil, 1 m, 19-IV-2017, A.R. Burgaz (MACB 111226). LEZHË: Kurbin, Milot, left side Mat river, SH25 Milot-Zogu Bridge, 41°41'54"N 19°45'10"E, *Carpinus orientalis*, *Erica arborea*, limestone, 40 m, 21-IV-2017, A.R. Burgaz (MACB 111332, GenBank accession n°: MK543954).

***Cladonia rangiformis* Hoffm.**

Atranorin and rangiformic acid chemotype:

BERAT: District of Berat (Rrethi i Beratit), Tomor Mountains (Mali i Tomorrit), c. 700 m north of village Karkanjoz, 40°41'55.61"N 20°03'28.69"E, in Mediterranean scrubland, on calcareous soil in rocky grassland, 490 m, 25-V-2004, Z. Barina, Cs. Németh (BP 96541). ELBASAN: Elbasan county, in open boxwood scrubland above village Kutërman, 41°13'40.99"N 20°14'41.04"E, on acid soil in rocky serpentine area, 510 m, 16-V-2016, L. Lökös (BP 96662). GJIROKASTËR: District of Përmet (Rrethi i Përmetit), left part of river Vjosë, between town Këlcyrë and village Mbrezhdan, 40°18'17.42"N 20°12'17.52"E, in scrubland, on flysh soil, 205 m, 9-V-2015, L. Lökös (BP 96636). KORÇË: Kolonjë District (Rrethi i Kolonjës); between town Leskovik and village Vrëpckë, 40°10'30.62"N 20°38'22.95"E, on acid soil in rocky serpentine grasslands, 1030 m, 10-V-2015, Z. Barina, L. Lökös & D. Pifkó (BP 96640). District of Devoll (Rrethi i Devollit), on the hills above village Ponçarë, 40°31'17.63"N 20°57'54.23"E, in dry grasslands, on flysh soil, 1035 m, 11-V-2015, Z. Barina, L. Lökös & D. Pifkó (BP 96647). Korçë County, Mal Moravë above village Hoçisht, 40°36'12.59"N 20°54'33.39"E, on calcareous soil in oak woodland, 1030 m, 2-V-2017, L. Lökös (BP 96675). District of Korçë (Rrethi i Korçës), Mali i Strugarit above village Belorta, 40°39'56.56"N 20°50'9.79"E, open grasslands on conglomerate rocks, 1010 m, 11-V-2015, Z. Barina, L. Lökös & D. Pifkó (BP 96645). District of Devoll (Rrethi i Devollit), on the mount between village Tren and lake Liqeni i Prespës së Vogël, 40°40'10.55"N 20°59'12.62"E, on calcareous soil in rocky grasslands, 910 m, 12-V-2015, Z. Barina, L. Lökös & D. Pifkó (BP 96651). District of Pogradec,

Udënisht, SH3 Piskutat-Pogradec, shore Ohrid lake, 40°58'55"N 20°38'21"E, *Pinus halepensis*, *Juniperus oxycedrus*, *Buxus sempervirens*, sandstone, 710 m, 22-IV-2017, A.R. Burgaz (MACB 111342). KUKËS: District of Kukës, Kolsh, SH5 close Drin river, 42°04'18"N 20°20'32"E, deciduous *Quercus*, *Juniperus oxycedrus*, *Buxus sempervirens*, serpentine soil, 510 m, 21-IV-2017, A.R. Burgaz (MACB 111334). LEZHË: District of Lezhë (Rrethi i Lezhës), on the slope of Mt Guri i Kuq above village Fregën, 41°51'41.58"N 19°44'11.22"E, on acid soil in open serpentine grasslands, 575 m, 30-III-2015, L. Lökös (BP 96607). SHKODËR: Shkodër District (Rrethi i Shkodrës), c. 1.5 km NE of village Gomsiqe e Epërme, near road SH5, 41°59'31.61"N 19°48'12.99"E, on acid soil in dry serpentine grasslands, 533 m, 6-V-2015, L. Lökös (BP 96619). Pukë District (Rrethi i Pukës); Mount Rras' e Qerretit above village Qerret, 42°03'36.98"N 19°49'53.45"E, in serpentine rocky area, on acid soil in pine woodland, 735 m, 6-V-2015, L. Lökös (BP 96625). District of Shkodër (Rrethi i Shkodrës), in the valley of river Përroi i Thatë at village Lashaj, along the road nr. E 762, 42°14'19.70"N 19°25'24.82"E, on calcareous soil in open dry rocky grasslands, 78 m, 30-III-2015, L. Lökös (BP 96605). VLORË: District of Vlorë (Rrethi i Vlorës), at seashore rugët e Bardha west of village Palasë, 40°10'30.46"N 19°36'9.32"E, on calcareous soil in dry roadside scrubland, 225 m, 12-X-2012, L. Lökös (BP 96590). **Atranorin, fumarprotocetraric and rangiformic acids chemotype:** BERAT: District of Skrapar (Rrethi i Skraparit), above the gorge of river Osum next to village Dhorës, 40°28'27.79"N 20°15'16.11"E, in open bushland, on calcareous soil, 420 m, 13-X-2010, L. Lökös (BP 96576). DIBËR: District of Mat (Rrethi i Matit), Mali i Skënderbeut, on the northern forehills of Mt. "maja e Mëllezit", near village Shkopet, 41°41'28.5"N 19°49'14.8"E, on soil, 222 m, 24-IV-2009, L. Lökös (BP 96550). ELBASAN: Prrenjas, SH3 Qukës-Prrenjas, 41°04'24"N 20°30'15"E, *Carpinus orientalis*, *Quercus macrolepis*, deciduous *Quercus*, *Buxus sempervirens*, limestone slopes, 540 m, 22-IV-2017, A.R. Burgaz (MACB 111339). Prrenjas, Urakë, SH9 Qafë Thanë, 41°04'24"N 20°36'18"E, *Quercus macrolepis*, deciduous *Quercus*, *Juniperus oxycedrus*, limestone, 1000 m, 22-IV-2017, A.R. Burgaz (MACB 111340). District of Elbasan, Bradashesh, SH3 Bradashesh-Graze, 41°06'05"N 20°00'26"E, *Olea europea*, limestone karst, 390 m, 15-IV-2017, A.R. Burgaz (MACB 111401). District of Elbasan, Bradashesh, SH3

Bradashesh-Graze, 41°06'33"N 19°59'49"E, *Carpinus betulus*, *Juniperus oxycedrus*, limestone karst, 530 m, 15-IV-2017, A.R. Burgaz (MACB 111404). District of Librazhd (Rrethi i Librazhdit): Polis Mts, above village Polis, on the ridge between the valley of brook "Sut Kukit" and river Shkumbin, 41°09'16.50"N 20°15'08.79"E, in bushland, on conglomeratic flysh sediments, 555 m, 12-X-2010, L. Lökös (BP 96573). Elbasan County (Qarku i Elbasanit), on the mount above bridge Ura e Murrashit, between Mirakë and Librazhd, 41°11'1.64"N 20°16'33.36"E, on acid soil in serpentine scrublands, 290 m, 3-IV-2016, L. Lökös (BP 96659). Elbasan county, in village Floq, 41°16'1.19"N 20°14'19.17"E, on soil by the roadside, 650 m, 17-V-2016, L. Lökös (BP 96666). FIER: District of Fier (Rrethi i Fierit), Pishë-Poro Nature Reserve, between village Pishë and the Adriatik Sea, 40°40'3.67"N 19°22'17.76"E, on soil in stone pine forest, 5 m, 12-VIII-2010, L. Lökös (BP 96567). Lushnjë District (Rrethi i Lushnjës), Golda e Kullarit W of village Kular, ca 4 km NW of Divjakë, 41°01'6.54"N 19°29'24.54"E, in pine woodland on sandy seacoast area, 5 m, 7-V-2015, L. Lökös (BP 96628). Fier District (Rrethi i Fierit), Mali i Kalivaçit, S of village Kalivaç, above river Vjosë, 40°24'14.86"N 19°48'4.08"E, on calcareous soil in *Quercus coccifera* scrubland, 100 m, 8-V-2015, L. Lökös (BP 96630). Fier County, Pylli i Levanit, above village Levan, 40°40'48.99"N 19°30'11.70"E, on calcareous soil in oak woodland, 95 m, 5-V-2017, L. Lökös (BP 96679). GJIROKASTËR: Gjirokastrë County, Bredhi i Sotirës above village Sotirë, 39°48'53.21"N 20°21'41.98"E, on mossy rocks in dry scrublands, 550 m, 6-V-2017, L. Lökös (BP 96682). Gjirokastrë County, N of village Koshovicë, in *Platanus* woodland, 39°50'11.52"N 20°23'51.90"E, on soil in rocky grasslands, 430 m, 6-V-2017, L. Lökös (BP 96683). Dropull, Grapsh, SH78, 39°56'50"N 20°14'31"E, deciduous *Quercus*, limestone slope rocks, 440 m, 17-IV-2017, A.R. Burgaz (MACB 111204). Dropull, Goranxi, to Kishae Ravenes, 40°00'56"N 20°11'15"E, limestone rocks, 268 m, 17-IV-2017, A.R. Burgaz (MACB 111207). Gjirokastrë District (Rrethi i Gjirokastrës), Mount Maja e Lalucit above village Saraqinishtë, 40°06'57.10"N 20°14'20.54"E, on calcareous soil in rocky grasslands, 1055 m, 9-V-2015, L. Lökös (BP 96632). District of Gjirokastrë (Rrethi i Gjirokastrës), between settlements Picar and Andon Poçi in the valley of river Vjosë near road SH4, 40°10'41.12"N 20°04'45.55"E, in grazed grassland, on flysh soil, 170 m, 28-III-2015, L.

Lökös (BP 96599). District of Gjirokastrë (Rrethi i Gjirokastrës); Kurvelesh i Sipërm uplands above village Picar, 40°11'0.39"N 20°02'31.51"E, on calcareous soil in rocky grasslands, 750 m, 29-III-2015, L. Lökös (BP 96601). District of Tepelenë, Kodër, left Vjosa river bank, 40°17'20"N 20°04'25"E, *Paliurus spina-christi*, *Spartium junceum*, *Phlomis* shrubs, limestone slopes, 160 m, 18-IV-2017, A.R. Burgaz (MACB 111210). Tepelenë District (Rrethi i Tepelenës), in village Mezhgoran, 40°19'11.24"N 20°05'43.54"E, on calcareous soil, 660 m, 9-V-2015, Z. Barina, L. Lökös, D. Pifkó (BP 96635). District of Tepelenë (Rrethi i Tepelenës), c. 1.4 km S of village Vasjar, 40°21'27.84"N 19°55'57.13"E, on calcareous soil in exposed rocky grasslands, 155 m, 14-X-2012, L. Lökös (BP 96597). KORÇË: Kolonjë District (Rrethi i Kolonjës); between town Leskovik and village Vrëpckë, 40°10'30.62"N 20°38'22.95"E, on acid soil in rocky serpentine grasslands, 1030 m, 10-V-2015, Z. Barina, L. Lökös, D. Pifkó (BP 96640). District of Kolonjë (Rrethi i Kolonjës), c. 1.9 km W of village Pepellash, 40°28'56.18"E 20°40'21.27"N, on acid soil in moist road slope, 549 m, 18-X-2011, Z. Barina, L. Lökös, D. Pifkó (BP 96583). District of Devoll (Rrethi i Devollit), on the hills above village Ponçarë, 40°31'17.63"N 20°57'54.23"E, in dry grasslands, on flysh soil, 1035 m, 11-V-2015, Z. Barina, L. Lökös, D. Pifkó (BP 96647). District of Korçë (Rrethi i Korçës), above the water reservoir c 2.5 km WSW of village Ujëbardhë, 40°31'17.31"N 20°39'50.62"E, on acid soil in dry rocky grassland, 1105 m, 18-X-2011, L. Lökös (BP 96588). District of Korçë, Boboshticë, SH90 Boboshticë-Dardhë, 40°32'37"N 20°47'11"E, *Juniperus oxycedrus*, pastureland, sandstone, 1200 m, 23-IV-2017, A.R. Burgaz (MACB 111343). District of Korçë (Rrethi i Korçës); Mts Mali i Moravës, near the peak of Mt Maja e Shëndëllisë (1365 m) above village Mborje, 40°36'39.81"E 20° 48' 55.00"N, on acid soil in serpentine rocky area, 1330 m, 9-VIII-2010, L. Lökös (BP 96560). KUKËS: District of Kukës, Kolsh, SH5 close Drinriver, 42°04'18"N 20°20'32"E, deciduous *Quercus*, *Juniperus oxycedrus*, *Buxus sempervirens*, serpentine soil, 510 m, 21-IV-2017, A.R. Burgaz (MACB 111333). District of Kukës, Rruga Tirana, 42°04'46"N 20°24'45"E, *Quercus cerris*, deciduous *Quercus*, limestone, 330 m, 21-IV-2017, A.R. Burgaz (MACB 111335). SHKODËR: Vau i Dejës, SH25 Vau i Dejës-Koman, 42°00'55"N 19°39'37"E, *Pinus pinaster*, *Carpinus orientalis*, serpentine soil, 120 m, 20-IV-2017, A.R. Burgaz (MACB 111422). Vau i Dejës, SH25 Vau i Dejës-Koman, 42°03'01"N 19°39'45"E,

Pinus pinaster, *Juniperus oxycedrus*, *Quercus cerris*, *Erica arborea*, *Cotinus coggygria*, serpentine soil, 130 m, 20-IV-2017, A.R. Burgaz (MACB 111329). Vau i Dejës, Karmë, SH25 Vau i Dejës-Koman, 42°04'02"N 19°40'59"E, *Quercus macrolepis*, *Q. pubescens*, *Juniperus oxycedrus*, *Erica arborea*, slates, 130 m, 20-IV-2017, A.R. Burgaz (MACB 111331). District of Shkodër (Rrethi i Shkodrës), in the valley of river Përroi i Thatë at village Lashaj, along the road nr. E 762, 42°14'19.70"N 19°25'24.82"E, on calcareous soil in open dry rocky grasslands, 78 m, 30-III-2015, L. Lökös (BP 96605). LEZHË: District of Lezhë (Rrethi i Lezhës), Mali i Rrencit, near the peak of Mt Burga (262 m), above village Shëngjin, 41°49'28.2"N 19°35'03.9"E, in open oak woodland, on limestone together with bryophytes, 255 m, 22-IV-2009, L. Lökös (BP 96547). SHKODËR: Shkodër District (Rrethi i Shkodrës), in the valley of stream Përroi i Çibunit E of village Prekal, 42°10'50.54"N 19°43'42.57"E, on calcareous soil in scrubland, 250 m, 5-V-2015, L. Lökös (BP 96616). Shkodër District (Rrethi i Shkodrës), between villages Linaj-Egç-Lepurosh and Kurtaj, 42°11'10.22"N 19°33'19.74"E, on calcareous soil in dry scrubland, 260 m, 4-V-2015, Z. Barina, L. Lökös, D. Pifkó (BP 96614). Malësi e Madhe District (Rrethi i Malësisë së Madhe), on Mount Bukovik above village Rrapshë-Starë, 42°23'6.12"N 19°29'25.56"E, on calcareous soil in rocky grasslands, 715 m, 3-V-2015, L. Lökös (BP 96610). TIRANË: District of Kavajë (Rrethi i Kavajës), by the coast of the Adriatic Sea between villages Spille and Rreth (Rreth-Greth), 41°05'07.6"N 19°27'31.5"E, on sandy soil in sand dune area, 10 m, 27-IV-2009, L. Lökös (BP 96553). Tirana County (Qarku i Tiranës), at the foot of Mt Kalaja e Dorëzit, between villages Pezë and Dorëz, 41°13'30.08"N 19°43'53.26"E, in grasslands, on flysh soil, 180 m, 2-IV-2016, L. Lökös (BP 96653). Tirana County (Qarku i Tiranës), between village Pëllumbas and cave Shpella e Pëllumbasit, 41°15'4.10"N 19°57'34.16"E, on calcareous soil in *Carpinus orientalis* woodland, 445 m, 3-IV-2016, L. Lökös (BP 96655). VLORË: Sarandë, Pasqirave, Butrint N. P., SH81, Shengjergj monastery, 39°44'51"N 20°00'24"E, *Quercus coccifera*, *Olea europea*, *Phlomis* sp., limestone, 60 m, 17-IV-2017, A.R. Burgaz (MACB 111408). District of Sarandë (Rrethi i Sarandës), Mt maja e Dhema, between village Ksamil and Pasqyrë, 39°47'28.03"N 20°0'31.43"E, on calcareous soil, 60 m, 17-X-2010, L. Lökös (BP 96577). District of Sarandë (Rrethi i Sarandës), on a hill between villages Kulluricë and

Kodër, 39°48'43.85"N 20°06'34.02"E, in dry grassland, on flysh soil, 55 m, 13-X-2012, L. Lökös (BP96593). District of Sarandë (Rrethi i Sarandës), north of village Gjashtë, towards Delvinë, 39°53'34.58"N 20°01'58.26"E, in open rocky grassland, on limestone together with bryophytes, 45 m, 1-V-2009, Z. Barina, L. Lökös & D. Pifkó (BP 96546). Finiq, Muzinë, Muzinë, 39°54'48"N 20°11'20"E, deciduous *Quercus*, *Erica arborea*, limestone, 186 m, 17-IV-2017, A.R. Burgaz (MACB 111202). Finiq, Bisticë, Muzinë, 39°55'08"N 20°08'48"E, *Quercus coccifera*, *Carpinus betulus*, *Pinus halepensis*, *Cercis siliquastrum*, limestone slopes, 125 m, 17-IV-2017, A.R. Burgaz (MACB 111194). Himarë, Ilias, Himarë, 40°08'29"N 19°40'11"E, *Quercus coccifera*, *Cupressus sempervirens*, Cistaceae shrubs, limestone, 300 m, 16-IV-2017, A.R. Burgaz (MACB 111406). District of Vlorë (Rrethi i Vlorës), Mts. Mali i Çikës, in the valley below Mt. "Maja e Pandelejmonit" (805.8 m), north of village Dhërmi, 40°09'32.2"N 19°38'49.4"E, in dry rocky grassland, on calcareous soil, 260 m, 29-IV-2009, L. Lökös (BP 96556). District of Vlorë (Rrethi i Vlorës), on the E ridge of Mt maja e Thanasit (1352.1 m) above Llogora pass, 40°11'51.54"N 19°35'27.82"E, on calcareous soil in mixed forest, 1075 m, 12-VIII-2010, L. Lökös (BP 96570). **Atranorin, fumarprotocetraric, rangiformic and physodalic acids chemotype:** DURRËS: District of Durrës, Fushë-Draçi, San Pietro beach track, 41°31'01"N 19°31'12"E, *Pinus pinea*, sandy soil, 1 m, 19-IV-2017, A.R. Burgaz (MACB 111227). Krujë, Krujë, SH38 to Qafë-Shtamë N. P., 41°31'03"N 19°49'27"E, *Carpinus betulus*, pasturelands, limestone, 720 m, 19-IV-2017, A.R. Burgaz (MACB 111289). District of Durrës, Fushë-Draçi, road cape of Rodon, 41°32'50"N 19°31'08"E, *Carpinus betulus*, *Arbutus unedo*, *Pistacia lentiscus*, *Cistus salvifolius*, sandstone, 90 m, 19-IV-2017, A.R. Burgaz (MACB 111223). ELBASAN: District of Elbasan, Bradashesh, SH3 Bradashesh-Graze, 41°06'05"N 20°00'26"E, *Olea europaea*, limestone karst, 390 m, 15-IV-2017, A.R. Burgaz (MACB 110952). District of Elbasan, Bradashesh, SH3 Bradashesh-Graze, 41°06'33"N 19°59'49"E, *Carpinus betulus* *Juniperus oxycedrus*, limestone karst, 530 m, 15-IV-2017, A.R. Burgaz (MACB 110953). GJIROKASTËR: District of Tepelenë, Kodër, left Vjosa river bank, 40°17'20"N 20°04'25"E, *Paliurus spina-christi*, *Spartium junceum*, *Phlomis* shrubs, limestone slopes, 160 m, 18-IV-2017, A.R. Burgaz (MACB 111211). District of Tepelenë, Këlcyrë, Këlcyrë gorge, left side Vjosa river, 40°17'52"N

20°10'05"E, *Carpinus betulus*, *Pinus halepensis*, sandstone, 180 m, 18-IV-2017, A.R. Burgaz (MACB 111216). District of Tepelenë, Dukaj, SH76 Tepelenë-Sinaj, 40°18'45"N 19°57'46"E, *Quercus coccifera*, limestone, 280 m, 18-IV-2017, A.R. Burgaz (MACB 111219). District of Përmet, Piskovë, left side Lumica river, K75 to Frashër, 40°16'44"N 20°17'07"E, *Juniperus oxycedrus*, *Paliurus spina-christi*, *Arbutus unedo*, *Pistacia terebinthus*, sandstone, 230 m, 18-IV-2017, A.R. Burgaz (MACB 111217). SHKODËR: Vau i Dejës, SH25 Vau i Dejës-Koman, 42°00'55"N 19°39'37"E, *Pinus pinaster*, *Carpinus orientalis*, serpentine soil, 120 m, 20-IV-2017, A.R. Burgaz (MACB 111304). Karmë, SH25 Vau i Dejës-Koman, 42°04'02"N 19°40'59"E, *Quercus macrolepis*, *Q. pubescens*, *Juniperus oxycedrus*, *Erica arborea*, slates, 130 m, 20-IV-2017, A.R. Burgaz (MACB 111330). District of Malësi e Madhe, Poica, SH21 Koplík-Bogë, 42°15'53"N 19°29'47"E, *Juniperus oxycedrus*, *Cupressus sempervirens*, boulders, 320 m, 20-IV-2017, A.R. Burgaz (MACB 111324). District of Malësi e Madhe, Dedaj, SH21 Koplík-Bogë, 42°18'04"N 19°32'32"E, *Carpinus betulus*, *Juniperus oxycedrus*, limestone rocks, 495 m, 20-IV-2017, A.R. Burgaz (MACB 111325). District of Malësi e Madhe, Bogë, SH21 Koplík-Bogë, 42°21'46"N 19°37'56"E, *Pinus nigra*, *Juniperus oxycedrus*, limestone, 865 m, 20-IV-2017 m, A.R. Burgaz (MACB 111328). TIRANË: Rrogzhinë, Grethi i Mesem, 41°05'00"N 19°27'35"E, *Pinus pinaster*, *Juniperus oxycedrus*, sandy soil, 1 m, 15-IV-2017, A.R. Burgaz (MACB 110951). VLORË: District of Sarandë, Pasqirave, Butrint N. P., SH81, Shengjergj monastery, 39°44'51"N 20°00'24"E, *Quercus coccifera*, *Olea europaea*, *Phlomis* sp., limestone, 60 m, 17-IV-2017, A.R. Burgaz (MACB 110964). District of Sarandë, Pasqirave, Butrint N. P., SH81, Shengjergj monastery, 39°48'42"N 20°00'43"E, *Quercus coccifera*, limestone slopes, 50 m, 17-IV-2017, A.R. Burgaz (MACB 110963). Himarë, Ilias, Himarë, 40°08'29"N 19°40'11"E, *Quercus coccifera*, *Cupressus sempervirens*, Cistaceae shrubs, limestone, 300 m, 16-IV-2017, A.R. Burgaz (MACB 110962). Himarë, Gjilek, Rruget te bardha, 40°10'29"N 19°36'09"E, *Quercus coccifera*, *Pistacia lentiscus*, limestone, 225 m, 16-IV-2017, A.R. Burgaz (MACB 110960). District of Vlorë, Dukat i Ri, SH3 Orikum-Dhërmi, Llogora N. P., 40°12'00"N 19°35'26"E, *Pinus nigra*, *Juniperus oxycedrus*, *Buxus sempervirens*, limestone, 1030 m, 16-IV-2017, A.R. Burgaz (MACB 110959). Vlorë, Dukat i Ri, SH3 Orikum-

Dhërmi, Llogora N. P., 40°15'11"N 19°32'14"E, *Quercus coccifera*, *Pinus halepensis*, limestone, 320 m, 16-IV-2017, A.R. Burgaz (MACB 110956).

***Cladonia rei* Schaer.**

Homosekikaic acid chemotype: VLORË: Finiq, Muzinë, Muzinë, 39°54'48"N 20°11'20"E, deciduous *Quercus*, *Erica arborea*, limestone, 186 m, 17-IV-2017, A.R. Burgaz (MACB 111198).

Homosekikaic and fumarprotocetraric acids chemotype: DURRËS: District of Durrës, Fushë-Draçi, road cape of Rodon, 41°32'50"N 19°31'08"E, *Carpinus betulus*, *Arbutus unedo*, *Pistacia lentiscus*, *Cistus salvifolius*, sandstone, 90 m, 19-IV-2017, A.R. Burgaz (MACB 111222). KUKËS: District of Kukës, Kukës, Rruga Tirana, 42°04'46"N 20°24'45"E, *Quercus cerris*, deciduous *Quercus*, limestone, 330 m, 21-IV-2017, A.R. Burgaz (MACB 111336).

***Cladonia subulata* (L.) F.H. Wigg.**

Fumarprotocetraric acid chemotype: KUKËS: District of Kukës, Rruga Tirana, 42°04'46"N 20°24'45"E, *Quercus cerris*, deciduous *Quercus*, limestone, 30 m, 21-IV-2017, A.R. Burgaz (MACB 111439).

***Cladonia symphycarpa* (Flörke) Fr.**

Atranorin and norstictic acid chemotype: KORÇË: District of Kolonjë (Rrethi i Kolonjës), c. 1.9 km W of village Pepellash, 40°28'56.18"N 20°40'21.27"E, on acid soil in moist road slope, 549 m, 18-X-2011, Z. Barina, L. Lökös, D. Pifkó (BP 96584). District of Korçë, Dardhë, SH90 Boboshticë-Dardhë, 40°31'18"N 20°49'22"E, *Fagus sylvatica*, *Pinus nigra*, *Juniperus communis*, *Betula pendula*, *Abies* sp., limestone, 1390 m, 23-IV-2017, A.R. Burgaz (MACB 111461). District of Korçë (Rrethi i Korçës), on the ridge of Mts Mali i Moravës above village Dardhë, near peak Buzeja e Boboshticës (1701 m), 40°32'23.97"N 20°49'14.20"E, on acid soil in beech forest on gravel conglomerate, 1550 m, 10-VIII-2010, L. Lökös (BP 96564). ELBASAN: Elbasan county, in open boxwood scrubland above village Kutërman, 41°13'40.99"N 20°14'41.04"E, on acid soil in rocky serpentine area, 510 m, 16-V-2016, L. Lökös (BP 96663). SHKODËR: District

of Malësi e Madhe, Dedaj, SH21 Koplik-Bogë, 42°18'04"N 19°32'32"E, *Carpinus betulus*, *Juniperus oxycedrus*, limestone rocks, 495 m, 20-IV-2017, A.R. Burgaz (MACB 111415). District of Malësi e Madhe, Bogë, SH21 Kopik-Bogë, 42°21'46"N 19°37'56"E, *Pinus nigra*, *Juniperus oxycedrus*, limestone, 865 m, 20-IV-2017, A.R. Burgaz (MACB 111416). Malësi e Madhe District (Rrethi i Malësisë së Madhe), on Mount Bukovik above village Rrapshë-Starë, 42°23'6.12"N 19°29'25.56"E, on calcareous soil in rocky grasslands, 715 m, 3-V-2015, L. Lökös (BP 96611). Malësi e Madhe District (Rrethi i Malësisë së Madhe); Rrapshë Gorge between villages Grabom and Lagjja e Re, 42°25'12.46"N 19°30'30.02"E, on calcareous soil in rocky grasslands, 225 m, 3-V-2015, L. Lökös (BP 96612). Shkodër County, at the foot of Mt Maja e Sokolit between villages Tamarë and Selcë, 42°29'0.61"N 19°35'0.98"E, on calcareous soil in rocky grasslands, 385 m, 8-V-2017, L. Lökös (BP 96685). VLORË: District of Vlorë, Dukat i Ri, SH3 Orikum-Dhërmi, Llogora N. P., 40°12'00"N 19°35'26"E, *Pinus nigra*, *Juniperus oxycedrus*, *Buxus sempervirens*, limestone, 1030 m, 16-IV-2017, A.R. Burgaz (MACB 111405). **Atranorin, norstictic acid and fatty acid chemotype:** ELBASAN: Elbasan county, in village Floq, 41°16'1.19"E 20°14'19.17"E, on soil by the roadside, 650 m, 17-V-2016, L. Lökös (BP 96667). **Atranorin, norstictic and fumarprotocetraric acids chemotype:** ELBASAN: Prrerjas, Urakë, SH9 Qafë Thanë, 41°04'24"N 20°36'18"E, *Quercus macrolepis*, deciduous *Quercus*, *Juniperus oxycedrus*, limestone, 1000 m, 22-IV-2017, A.R. Burgaz (MACB 111450).

***Cladonia* sp.**

Fumarprotocetraric acid chemotype. SHKODËR: Vau i Dejës, SH25 Vau i Dejës-Koman, 42°00'55"N 19°39'37"E, *Pinus pinaster*, *Carpinus orientalis*, serpentine soil, 120 m, 20-IV-2017, A.R. Burgaz. VLORË: Finiq, Bisticë, Muzinë, 39°55'08"N 20°08'48"E, *Quercus coccifera*, *Carpinus orientalis*, *Pinus halepensis*, *Cercis siliquastrum*, limestone slopes, 125 m, 17-IV-2017, A.R. Burgaz.