

Assessing the Medicinal and Aromatic Plants in Watershed of the Middle Section of Devoll River

Marjol MEÇO¹ (✉)

Alfred MULLAJ²

Summary

The watershed of the middle section of the Devoll River is located in SE Albania. Due to its complex topography, geomorphology and climate conditions, this area is very rich regarding to higher plant species diversity. More than 30% of Albanian flora is recorded there. Based on field investigation and in interviewing the companies that make plant collection in this area, we aim to give data on the actual flora richness of medicinal and aromatic plants (MAP), their economic value as well as their threats. As result, 158 species or about 14% of the flora of this basin are MAP, of which 95% are wild and 5% are cultivated. These species belong to 132 genera and 57 families, and represent about 44% of medicinal and aromatic plants of Albania. The most of MAP species belong to family Lamiaceae (18 species). The life forms spectrum indicates that there are 54 hemicryptophyta, which make the larger life form in the area; meanwhile the chorological spectrum indicates that most of the species have a Eurasian distribution, with around 24%. The month with the greatest number of MAP species in flowering is June, 110 species. About 45 species that represent only 28% of all MAP of this area are collected in the wild. The MAP are exported, by local companies, mostly in USA and Germany, and from them are generated about 546 000 \$ per year. More than 50% of this value comes from exportation of *Lavandula angustifolia* Mill., which is cultivated, and from other wild MAP such are *Primula veris* L., *Juniperus communis* L., *Juniperus oxycedrus* L., *Satureja montana* L., *Malus pumila* Mill, *Origanum vulgare* L., *Cistus incanus* L., *Sideritis raeseri* Boiss. & Heldr. etc. Not controlled and standardized collection such is harvesting method, is the main threat of MAP, which on the other side is reflected in biodiversity loss and economic profit.

Key words

watershed, Devoll River, medicinal and aromatic plants (MAP)

¹ Department of Biology, Faculty of Natural Science, University of Tirana, Albania

² Research Center for Flora and Fauna, Faculty of Natural Sciences, University of Tirana, Albania

✉ Corresponding author: mariol.meco@yahoo.com

Received: May 19, 2018 | Accepted: October 11, 2018

Introduction

The geographical position of Albania and favorable physical-geographic conditions such as geological composition, topology, diverse climate, rich hydrographical network and variety of soil types, have created suitable conditions for a large diversity of plant species. The Albanian flora is formed by about 3629 species belonging to 960 genera and 175 families (Meço et al., 2015). It represents about 30% of the European Flora and 47% of the Balkan's plant species.

The high diversity of plant species represents potential bio-resources with high values from different points of view such as ecological, economic, aesthetic and ethical. Medicinal and Aromatic Plants (MAP) are a precious asset of the Albanian biodiversity. They are formed by about 310 plant species belonging to 62 families (Papathopuli, 1976), and composed about 8.5% of the Albanian flora. About 90% of them grow in the wild and constitute an important potential value for the economy of the country.

In the communist period (1945–1990), the exports of MAP reached nearly 50 million dollars per year, while their internal consumption was limited. The export market was controlled by a single state-controlled exporter, but at the end of communism, in the early 1990s, entrepreneurial individuals saw an opportunity for private exporters and now they are the main exporters of MAP from Albania. Even today, MAP export continue to be a considerable source of revenue, roughly 28 million \$ per year, or about 18% of the total value of agricultural exports (Boban Varghese, 2014; Pazari, 2014).

The harvest of medicinal and aromatic plants is an important source of income especially for the population living in rural areas of Albania, such as the rural areas of the Gramsh District. This southeastern region of Albania has an old tradition in MAP collection. This activity is almost the main source of income especially for some of the villages such are Cingar i Poshtëm, Osoj, Lumaj, Nikollarë, Peshtan, Kodras, Gjinikas, Kuçakë, Popçisht, Lenie, Sotirë, Tunjë, Vini, Poroçan etc. Most of these residents harvest MAP that are growing in the wild, but their interest has also increased considerably for the cultivation of some plants that are highly demanded by the international market. This type of activity has considerably increased the number of self-employed in this sector as well as the economic income. The high interest of the foreign market for MAP as well as the low level of economic income of residents living in rural areas has led to an increase collection of wild MAP plants (USAID, 2009).

Based on field trip data and on the interviews with the companies that buy plants from the harvesters of MAP in the watershed of middle section of Devoll River, our goal was to provide data on the species diversity of MAP as well as to analyze their chorology, phenology and to make an economic assessment of this precious asset that supports a sustainable and long-term development of rural areas of this region.

The watershed of the middle section of the Devoll River covers the entire territory, its surface waters end up in the Banjë-Lozhan segment of the Devoll River (Fig. 1). This watershed includes territories with different climatic, edaphic and geological conditions and with a variety of relief forms. The

main characteristics of the climatic zones of the basin are dry summer and wet winter. The average annual temperatures vary from 7.5°C at the upstream reaches of the river to 14.7°C at the downstream reaches. The coldest month of the year is January. The warmest month is July with average temperature values within the watershed from 16.4°C to 23.6°C. Snow is an annual phenomenon. The number of snow-covered days varies from 30 to 35 days a year in the lower part of the watershed up to 80–90 days a year in mountainous areas (Kabo 1990–91, Norconsult, 2010).

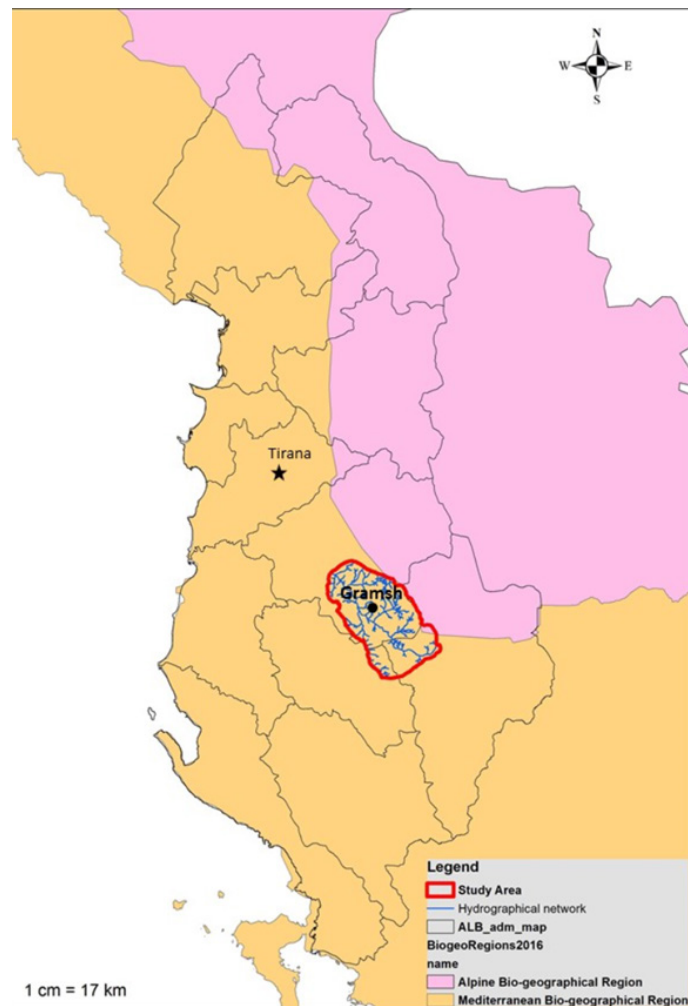


Figure 1. Administrative map of Albania where are shown the study area and biogeographical regions that cover Albania.

Materials and Methods

The study of MAP in the watershed of the middle section of Devoll River was carried out during the period 2015–2018, as part of the general floristic study of the area. Data collection in the study area was realized during field trips, mostly in the seasons of intensive vegetation and flowering (spring to autumn). After the field work and generating the floristic list for all plant species determined in the area study, were identified all MAP based on literature (Papathopuli, 1976; Demiri, 1979); and for each of them we have analyzed some floristic indicators, such as life forms and chorological forms in order to generate the life form spectrum and chorological spectrum, flowering period, as well as

their conservation status. Tree exporters that buy MAP from local harvesters in this area were interviewed for the purpose of this study.

Plant identification and nomenclature was done based on Flora of Albania, vol. 1–4 (Paparisto et al., 1988; Qosja & al., 1992, 1996; Vangjeli et al., 2000), Flora Europaea vol 1–5 (Tutin et al., 1968, 1972, 1976, 1980, 1993), Mountain Flora of Greece (Strid, 1986; Strid and Tan, 1991), Flora Hellenica (Strid and Tan, 1997, 2002) and Flora of Italy (Pignatti, 1982). The Red List of Albanian Vascular Plants (The Council of Ministers' Decision, 2013), The IUCN Red List of Threatened Species (IUCN, 2016) and European Red List of Vascular Plants (Bilz & al. 2011) were checked for the conservation status of the plant taxa.

The chorology of the MAP is based on critical comparison of information provided by Strid and Tan (1997, 2002), Davis (1965–1988), Pignatti (1982), Greuter et al. (1984, 1986, 1989) and Tutin et al. (1964–1980, 1993). Life forms of the plant taxa collected were identified according to the system of Raunkiaer (1934), Ellenberg (1956) and Ellenberg & Müller-Dombois (1967). The data about the flowering period or spore's period for ferns were taken from Flora of Albania, vol. 1–4 (Paparisto et al., 1988; Qosja et al., 1992, 1996; Vangjeli et al., 2000) and Mountainous Flora of Greece (Strid, 1986; Strid and Tan, 1991).

Results

As results of our study in the watershed of the middle section of Devoll River 158 medicinal and aromatic plants species (MAP) were identified (Appendix I). Of them 96.2% (153 species) are spermatophyte and 3.8% (five species) pteridophytes. These species belong to 132 genera and 57 families. Families with the highest number of the species (ten or more species) are: Lamiaceae (17 species), Asteraceae (15 species), Rosaceae (15 species) and Fabaceae (10 species).

Hemicryptophyta makes the major group with 54 species (34%), followed by phanerophyta (30%), geophyta (12%), therophyta (11%), chamaephyta (7%), nanophanerophyta (5%) and lianas (1%). In general, herbaceous species dominate (67%) in comparison with trees and shrubs (43%).

The medicinal and aromatic plants of the study area belong to 39 chorological groups. The highest number of the species have a

Eurasian distribution (24%, 38 species), followed by European and Mediterranean with the same number (15%, 23 species), Euro-Mediterranean (11%, 18 species), temperate (11%, 17 species), boreal (9%, 14 species), cosmopolitan / sub cosmopolitan (7%, 11 species) and 5% or eight species belong to other chorological groups (Appendix I).

Regarding to flowering period, June is the month with the greatest number of species in flower (110 species), followed by May (107 species) and July (89 species). The months with the fewest species in flower (less than 10 species) are the months from November to February.

The data gathered by interviews with MAP exporting companies showed that only 38 species are the most collected plants, which makes around 24% of the total MAP identified so far in this area. Eight or approximately 21% of them are cultivated such as *Lavandula angustifolia* L., *Salvia officinalis* L.,

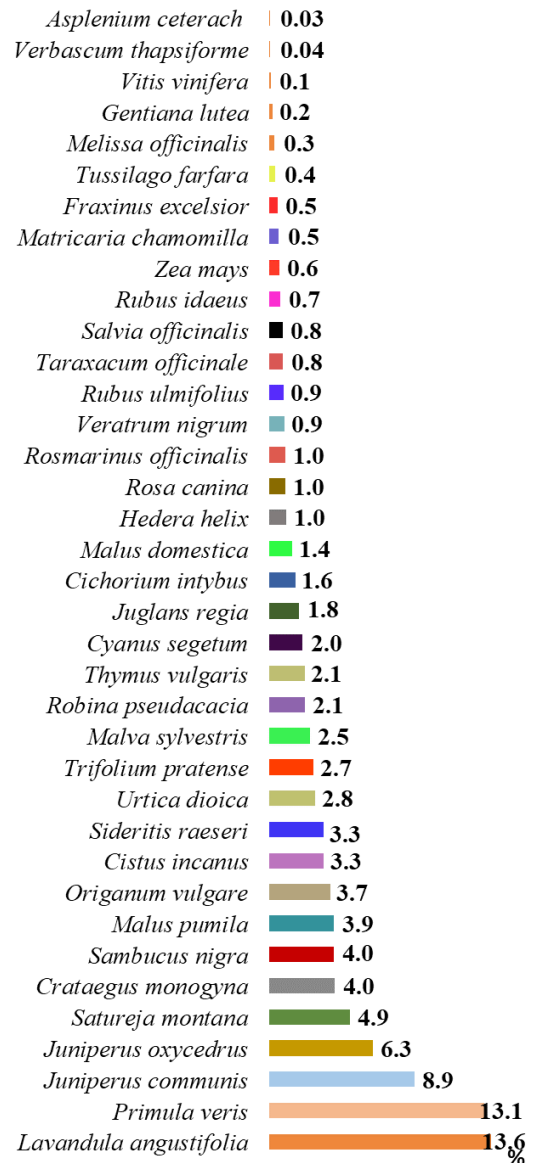


Figure 3. Percentage of income from each MAP species which are collected in the study area

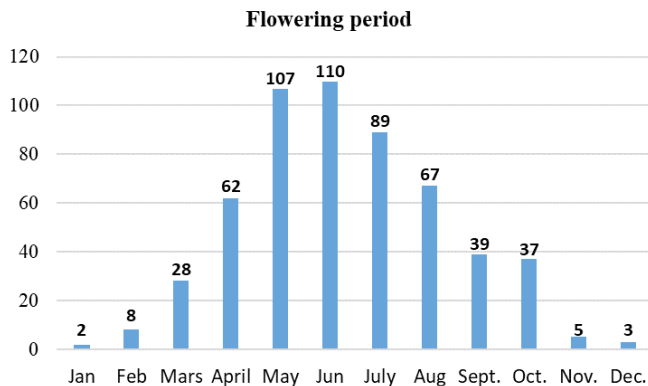


Figure 2. The number MAP in flowering for each month

Sambucus nigra L., *Malus domestica* L., *Zea mays* L., *Juglans regia* L., *Rosmarinus officinalis* L. and *Cyanus segetum*_Hill. The benefit from their sale is approximately 124 million \$ or 23% of the total value that comes from exportation of the MAP from this area. The most of the income from the cultivated plants comes from lavender. Every year approximately 75 tons of lavender is exported from this area, which generates about 76 million \$.

The most common wild plants collected are: *Asplenium ceterach* L., *Cichorium intybus* L., *Cistus incanus* L., *Sambucus nigra* L., *Fraxinus excelsior* L., *Gentiana lutea* L., *Juglans regia*_L., *Juniperus communis* L., *Juniperus oxycedrus* L., *Malus pumila* Mill., *Malva sylvestris* L., *Zea mays* L., *Matricaria chamomilla*_L., *Melissa officinalis* L., *Origanum vulgare* L., *Primula veris* L., *Robina pseudacacia* L., *Rosa canina* L., *Rubus ulmifolius* Schott, *Rubus idaeus* L., *Satureja montana* L., *Sideritis raeseri* Boiss. & Heldr., *Taraxacum officinale* F. H. Wigg., *Thymus longicaulis* C. Presl, *Trifolium pretense* Schreb., *Tussilago farfara*_L., *Cyanus segetum* Hill, *Urtica dioica* L., *Veratrum album* L., *Verbascum densiflorum* Bertol. and *Vitis vinifera* L. Profit from their export is approximately 429 million \$ or 77% of the total amount of the value that comes from exportation of the MAP from this area. The wild MAP that are exported in larger quantities are *C. incanus* (leaves), *J. communis* (fruits), *J. oxycedrus* (fruits) and *S. montana* (herba), in total approximately 141 tons per year.

Of the 159 MAP species identified so far in the study area, about 35.5% (55 species) have a conservation status as classified in the Albanian Red List (The Council of Ministers' Decision 2013) or the IUCN Red List (IUCN, 2016) (Table 1). Eighteen of them (32.7 % of the species with conservation status) are included in Albanian Red List, approved by the Decision of Council of Ministers in 2013. According to this national conservation assessment, nine species (50%) are vulnerable (VU), seven species endangered (VU), one species (5.5 %) low risk (LR), and *Betula pendula* Roth. is critically endangered (CR). According to the IUCN Red List (IUCN, 2016) 44 species are evaluated. Conservation status for about 86% of

them is categorized as least concern (LC), 4.5% deficient data (DD), 2.3% near threatened (NT), 2.3% vulnerable (VU) and only *Sorbus aucuparia* L. is critically endangered (CR).

Discussions

The MAP plants species identified in the watershed of the middle section of Devoll River comprises about 14.5% of the total flora of the basin determined so far, and of about 51.6% of the total of MAP of Albania. Considering that the study area has a surface 1010 km² or about 28% of the territory of Albania, we can say that this territory is very rich with medicinal and aromatic plant species. The fact that 89% of these plants are perennial, makes them a safe source of incomes if their crops period and harvesting method are strictly respected. The wide range of altitude of the study area and different climatic conditions support growing of plants that are originated from different center of origin but there is no any endemic or subendemic species used as MAP in the study area. The most of the species are originated from the regions that have an old tradition in using of MAP, such is Euro Asiatic region.

The flowering period is a very important stage for the medicinal and aromatic plants, especially for honey plants. For the many MAP, flowers are the best part of the plants that have high concentration of essential oil. Knowing of the flowering period is very important for harvesting of these plants, in order to obtain a high quality product.

Even though the number of MAP that grows in the watershed of the middle section of Devoll River so far is 159 species, not all these plants are collected. It is because there is not the same interest in the trade market for all these species. These MAP are harvested by locals and sold to companies in the next segment of the value chain (exporter). About 30 species, or around 79% of the total MPA plants which are harvested in this area grow wild.

Table 1. List of vascular MAP in the watershed of the middle section of Devoll River

Latin name	Life form	Flowering period	Chorology	Collected: during communist era (+), last 25 year (*), not collected (nc)	IUCN	Albanian red list
<i>Abies alba</i> Mill.	Ph	IV-V	Orf. S Europ.	+	LC	
<i>Achillea millefolium</i> L.	H	V-VII	Europ.-Siber	+		
<i>Adiantum capillus-veneris</i> L.	G	VI-VIII	Pantropic.	nc	LC	VU A1b
<i>Agrimonia eupatoria</i> L.	H	V-VII	Sub-Cosmop.	nc		
<i>Ajuga reptans</i> L.	H	IV-VI	Eurasiat.	nc		
<i>Alnus glutinosa</i> (L.) Gaertn.	Ph	II-III	Paleotemp.	nc		
<i>Althaea officinalis</i> L.	H	V-VI	Europ.-Siber	nc		
<i>Anemone nemorosa</i> L.	G	III-VI	Circum.-Boreal	nc		
<i>Apium graveolens</i> L.	H	V-IX	Paleotemp.	nc	LC	
<i>Arbutus unedo</i> L.	Ph	X-XII	Medit.	+		
<i>Arctium lappa</i> L.	H	VI-VIII	Eurasiat.	+		
<i>Artemisia vulgaris</i> L.	H	VII-X	Circum.-Boreal	nc		

Latin name	Life form	Flowering period	Chorology	Collected: during communist era (+), last 25 year (*), not collected (nc)	IUCN	Albanian red list
<i>Arundo donax</i> L.	G	VII-IX	Asia	nc	LC	
<i>Asplenium ceterach</i> L.	H	V-VII	Eurasiat.	+, *		
<i>Asplenium trichomanes</i> L.	H	V-VII	Cosmop.	nc		
<i>Bellis perennis</i> L.	H	I-XII	Europ.-Caucas.	+		
<i>Betula pendula</i> Roth.	Ph	III-IV	Europ.-Siber	nc	LC	CR
<i>Bidens tripartita</i> L.	T	VII-X	Eurasiat.	nc	LC	
<i>Buxus sempervirens</i> L.	NPh	III-IV	Medit.-Atlant.	+		
<i>Capsella bursa-pastoris</i> (L.) Medik.	T	III-XII	Cosmop.	+		
<i>Carlina acanthifolia</i> All.	H	VI-IX	S Europ.	nc		
<i>Centaurium erythraea</i> Rafn	T	V-VIII	Paleotemp.	nc	LC	
<i>Centaurium pulchellum</i> (Sw.) Druce	T	V-IX	Paleotemp.	nc	LC	
<i>Cichorium intybus</i> L.	H	V-IX	Cosmop.	*	LC	
<i>Cistus incanus</i> L.	NPh	V-VI	Steno-Medit.	*		
<i>Colchicum autumnale</i> L.	G	VIII-X	C Europ.	nc	LC	EN A1b
<i>Colutea arborescens</i> L.	Ph	V-VI	Eurimedit.	nc		
<i>Cornus mas</i> L.	Ph	II-IV	SE-Europ.	+		
<i>Cornus sanguinea</i> L.	Ph	V-VI	Eurasiat.	nc		
<i>Corylus avellana</i> L.	Ph	II-III	Europ.-Caucas.	+	LC	
<i>Cotinus coggygria</i> Scop.	NPh	V-VI	S Europ.	+		
<i>Crataegus heldreichii</i> Boiss.	Ph	V-VI	Balkan.	nc		
<i>Crataegus monogyna</i> Jacq.	Ph	IV-VI	Paleotemp.	+, *		
<i>Cruciata laevipes</i> Opiz	H	IV-VII	Eurasiat.	nc		
<i>Cupressus sempervirens</i> L.	Ph	II-IV	WAsia	nc		
<i>Cyanus segetum</i> Hill	T/H	V-VII	S Europ	*		
<i>Cynodon dactylon</i> (L.) Pers.	G	V-X	Cosmop.	+		
<i>Daphne mezereum</i> L.	NPh	III-V	Europ.-Siber	nc		
<i>Datura stramonium</i> L.	T	VI-X	Cosmop.	nc		
<i>Daucus carota</i> L.	T/H	IV-X	Paleotemp.	nc	DD	
<i>Dictamnus albus</i> L.	Ch	V-VI	Europ.-Siber	nc		VU A1b
<i>Digitalis grandiflora</i> Mill.	H	VI-VIII	S Europ.-Pont.	+		
<i>Digitalis lanata</i> Ehrh.	H	V-VII	Sub-Balkan.	nc	LR	
<i>Dittrichia viscosa</i> (L.) Greuter	H	VII-X	Eurimedit.	nc		
<i>Dryopteris filix-mas</i> (L.) Schott	G	VI-VIII	Sub-Cosmop.	nc		LR cd
<i>Ecballium elaterium</i> (L.) A. Rich.	G	V-IX	Eurimedit.	nc		
<i>Equisetum arvense</i> L.	G	IV-VI	Circum.-Boreal	nc	LC	
<i>Erica arborea</i> L.	Ph	III-V	Steno-Medit.	+		
<i>Eryngium campestre</i> L.	H	VII-IX	Eurimedit.	nc		
<i>Fagus sylvatica</i> L.	Ph	V-VI	C Europ.	nc		

Latin name	Life form	Flowering period	Chorology	Collected: during communist era (+), last 25 year (*), not collected (nc)	IUCN	Albanian red list
<i>Ficus carica</i> L.	Ph	V-VIII	Asia Orient.	nc	LC	
<i>Foeniculum vulgare</i> Mill.	H	VI-VIII	S-Medit	nc		
<i>Fragaria vesca</i> L.	H	V-VI	Europ.-Siber	+	LC	
<i>Frangula alnus</i> Mill.	Ph	IV-VI	Europ.-Caucas.	nc		
<i>Fraxinus excelsior</i> L.	Ph	IV-V	Europ.-Caucas.	+, *		
<i>Galega officinalis</i> L.	H	V-VII	Europ-Orient.	nc		
<i>Galium odoratum</i> (L.) Scop.	G	V-VII	Eurasiat.	+		
<i>Galium verum</i> L.	H	VI-IX	Eurasiat.	nc		
<i>Genista tinctoria</i> L.	Ch	V-VII	Europ.-Caucas.	+		
<i>Gentiana lutea</i> L.	H	VI-VII	Orf. S Europ.	+, *	LC	EN A1b
<i>Geranium macrorrhizum</i> L.	G	VI-VIII	S Europ.	nc		
<i>Geum urbanum</i> L.	H	V-VIII	Circum.-Boreal	nc		
<i>Hedera helix</i> L.	Liane	IX-X	Sub-Medit.	+, *		
<i>Helleborus odorus</i> Waldst. & Kit. ex Willd	G	I-III	SE-Europ.	+		
<i>Humulus lupulus</i> L.	G	VI-IX	Europ.-Caucas.	nc		
<i>Hypericum perforatum</i> L.	H	V-VIII	Paleotemp.	+		EN A1b
<i>Ilex aquifolium</i> L.	Ph	IV-V	Medit.-Atlant.	nc		
<i>Iris pallida</i> Lam.	G	IV-V	Sub-Balkan.	nc		
<i>Juglans regia</i> L.	Ph	IV-V	Eurasiat.	+, *	NT	EN A1b
<i>Juniperus communis</i> L.	Ph	IV-V	Circum.-Boreal	+, *	LC	VU A1b
<i>Juniperus oxycedrus</i> L.	Ph	IV-V	Eurimedit.	+	LC	VU A1b
<i>Laurus nobilis</i> L.	Ph	III-IV	Steno-Medit.	nc		EN A1b
<i>Lavandula angustifolia</i> Mill.	Ch	VI-IX	Steno-Medit.	*	LC	
<i>Lomelosia crenata</i> Greuter&Burdet	Ch	VI-VIII	Orf. Medit.	nc		
<i>Malus domestica</i> L.	Ph	IV-V	Cosmop.	*		
<i>Malus pumila</i> Mill.	Ph	IV-V	Europ.-Caucas.	+, *	DD	
<i>Malva sylvestris</i> L.	H	V-VIII	Europ.-Siber	*		
<i>Marrubium vulgare</i> L.	H	V-VIII	Eurimedit.	nc		
<i>Matricaria chamomilla</i> L.	T	V-VIII	Asia Orient.	*		
<i>Melilotus officinalis</i> (L.) Lam.	H	VII-IX	Eurasiat.	+	LC	
<i>Melissa officinalis</i> L.	H	V-VIII	Eurimedit.	*		
<i>Mentha aquatica</i> L.	H	VI-X	Paleotemp.	nc	LC	
<i>Mentha longifolia</i> (L.) L.	H	VI-X	Paleotemp.	nc	LC	
<i>Mentha × piperita</i> L.	H	V-X	America	nc		
<i>Morus alba</i> L.	Ph			nc		
<i>Morus nigra</i> L.	Ph			nc		
<i>Myrtus communis</i> L.	Ph			nc		
<i>Nasturtium officinale</i> W. T. Aiton	H			nc	LC	

Latin name	Life form	Flowering period	Chorology	Collected: during communist era (+), last 25 year (*), not collected (nc)	IUCN	Albanian red list
<i>Olea europaea</i> L.	Ph	V-VI	Steno-Medit.	nc		
<i>Ononis spinosa</i> L.	Ch	V-IX	Eurimedit.	+		
<i>Orchis coriophora</i> L.	G	IV-VI	Eurimedit.	nc		
<i>Orchis morio</i> L.	G	IV-VI	Euroaziatike	nc		
<i>Origanum vulgare</i> L.	H	VI-IX	Eurasiat.	+, *		EN A1b
<i>Paliurus spina-christi</i> Mill.	Ph	IV-VI	SE-Europ.	+		
<i>Papaver rhoeas</i> L.	T	III-VII	Medit.-Orient	nc		
<i>Parietaria officinalis</i> L.	H	V-X	Eurasiat.	nc		
<i>Persicaria hydropiper</i> (L.) Delarbre	T	VI-IX	Circum.-Boreal	nc	LC	
<i>Pilosella officinarum</i> Vaill.	H	VI-X	Europ.-Caucas.	nc		
<i>Pinus halepensis</i> Mill.	Ph	IV-V	Steno-Medit.	nc		
<i>Pinus heldreichii</i> H. Christ	Ph	V-VI	Balkan.	nc	LC	
<i>Pinus nigra</i> J. F. Arnold	Ph	IV-V	S Europ.	+	LC	
<i>Pistacia lentiscus</i> L.	Ph	IV-VI	Steno-Medit.	nc		
<i>Pistacia terebinthus</i> L.	NPh	IV-VII	Eurimedit.	nc		
<i>Plantago lanceolata</i> L.	H	IV-XI	Eurasiat.	+		
<i>Plantago major</i> L.	H	IV-VIII	Eurasiat.	nc		
<i>Platanus orientalis</i> L.	Ph	IV-V	Sub-Balkan.	+	LC	
<i>Polygonum aviculare</i> L.	T	VI-IX	Cosmop.	nc		
<i>Polypodium vulgare</i> L.	H	III-XI	Circum.-Boreal	nc		
<i>Populus nigra</i> L.	Ph	III-IV	Paleotemp.	nc		
<i>Populus tremula</i> L.	Ph	III-IV	Europ.-Siber	nc		
<i>Primula veris</i> L.	H	V-VI	Orf. E Medit.	*		
<i>Prunella vulgaris</i> L.	H	IV-X	Circum.-Boreal	nc		
<i>Prunus spinosa</i> L.	Ph	IV-V	Europ.-Caucas.	+		
<i>Pulmonaria officinalis</i> L.	H	III-V	C Europ.	nc		
<i>Pyrus spinosa</i> Forssk.	Ph	IV-V	Medit.	nc		
<i>Rhus coriaria</i> L.	Ph	IV-VIII	S-Medit	nc		
<i>Robinia pseudoacacia</i> L.	Ph	IV-VI	N-Am	+, *		
<i>Rosa canina</i> L.	Ph	V-VI	Eurasiat.	+, *		
<i>Rosmarinus officinalis</i> L.	NPh	IV-VIII	Steno-Medit.	*		
<i>Rubus idaeus</i> L.	NPh	V-VI	Circum.-Boreal	+, *		
<i>Rubus ulmifolius</i> Schott	NPh	V-VII	Eurimedit.	*		
<i>Rumex acetosella</i> L.	H	IV-VIII	Sub-Cosmop.	nc		
<i>Ruscus aculeatus</i> L.	Ch	II-IV	Eurimedit.	nc	LC	
<i>Salix alba</i> L.	Ph	III-IV	Paleotemp.	+	LC	
<i>Salix elaeagnos</i> Scop.	Ph	IV-V	S Europ.	+		
<i>Salvia officinalis</i> L.	Ch	III-VI	Steno-Medit.	+, *	LC	VU A1b

Latin name	Life form	Flowering period	Chorology	Collected: during communist era (+), last 25 year (*), not collected (nc)	IUCN	Albanian red list
<i>Salvia sclarea</i> L.	H	VI-VII	Eurimedit.	nc		
<i>Sambucus ebulus</i> L.	G	VI-VIII	Eurimedit.	+		
<i>Sambucus nigra</i> L.	Ph	IV-VI	Europ.-Caucas.	+, *		VU A1b
<i>Sanguisorba officinalis</i> L.	H	V-VIII	Circum.-Boreal	nc	LC	
<i>Saponaria officinalis</i> L.	H	VI-VIII	Europ.-Siber	nc		
<i>Satureja montana</i> L.	Ch	VII-IX	Steno-Medit.	*		VU
<i>Sideritis raeseri</i> Boiss. & Heldr.	H	VI-VII	Balkan.	+, *		EN A1c
<i>Silybum marianum</i> (L.) Gaertn.	H	VI-VIII	Medit.-Turan.	nc		
<i>Sinapis arvensis</i> L.	T	III-VI	Medit.	nc	LC	
<i>Sisymbrium officinale</i> (L.) Scop.	T	III-VIII	Paleotemp.	nc		
<i>Sorbus aucuparia</i> L.	Ph	V-VI	Europ.	nc	CR	
<i>Sorbus domestica</i> L.	Ph	IV-V	Eurimedit.	nc		
<i>Spartium junceum</i> L.	Ch	V-VI	Illir.(Anfiadriat.)	+		
<i>Taraxacum officinale</i> F. H. Wigg.	H	III-IX	Circum.-Boreal	*		
<i>Teucrium chamaedrys</i> L.	Ch	V-VII	Eurimedit.	+		
<i>Teucrium polium</i> L.	Ch	VI-VIII	Steno-Medit.	+		
<i>Thymus longicaulis</i> C. Presl	H	IV-VIII	Eurimedit.	*		
<i>Trifolium arvense</i> L.	T	IV-VI	Paleotemp.	*	LC	
<i>Trifolium pratense</i> Schreb.	T	V-VII	S Europ.	nc	LC	
<i>Tussilago farfara</i> L.	G	I-III	Paleotemp.	+, *		
<i>Urtica dioica</i> L.	H	V-IX	Sub-Cosmop.	+, *		
<i>Vaccinium myrtillus</i> L.	Ch	V-VII	Circum.-Boreal	+		VU
<i>Veratrum album</i> L.	G	VII-VIII	Europ.-Caucas.	+, *		
<i>Verbascum densiflorum</i> Bertol.	H	VI-VIII	S Europ.	+		
<i>Verbena officinalis</i> L.	H	V-IX	Paleotemp.	nc		
<i>Veronica officinalis</i> L.	H	V-VII	Europ.-Siber	nc		
<i>Viola odorata</i> L.	H	III-VI	Eurimedit.	nc		
<i>Viola tricolor</i> L.	T/H	VI-VII	Eurasiat.	+		
<i>Viscum album</i> L.	Ph	III-V	Eurasiat.	+		VU A1c
<i>Vitex agnus-castus</i> L.	Ph	V-IX	Steno-Medit.	nc		
<i>Vitis vinifera</i> L.	Liane	V-VI	S Europ.	*	LC	
<i>Zea mays</i> L.	T	VIII-X	Neotropic.	*		

Note: H = Hemicryptophyte, Ph = phanerophyte, G = geophyte, T = therophyte, Ch = chamaephyte, NPh = nanophanerophyte, L = lianas; DD = Data Deficient, LC = Least Concern, NT = Near Threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered, VU A1b = Vulnerable / The rapid decline, more than 50% per 20 years; EN A1b = Endangered / The rapid decline, more than 50% per 20 years; LR cd = low risk, depends on the conservation measures; EN A1c (Endangered /The rapid decline, more than 50% per 30 years; VU A1c = Vulnerable / The rapid decline, more than 50% per 30 years

The high interest of the foreign market for medicinal and aromatic plants has increased the interest for the cultivation of some MAP plants even in this area. Lavender is one of the most common plants cultivated extensively in agriculture land which are poor in nutrients and not so suitable for cultivation of other agricultural plants.

In the communist era, nearly 52 species of herbs were collected in this area. The income from that export of these MAP was close to 18 million \$ (IKPK, 1988). Eighteen MAP species not collected in the past are collected these last 25 years because of new market demands (Table 1). The potential to profit from them is much higher because about 86 species or 53.7% of MAP identified so far in the area are not collected. From conservation point of view this is good but on the other hand, collection of only certain species makes them seriously threatened. Although companies involved in plant collection in this area affirm that the harvest method and period of plants collection is respected by approximately 85%, the fact that 55 species of the MAP of the area have a conservation status, make it necessary to strictly observe the methods of plants collection.

Acknowledgements

The authors would like to thank Mr. Rrodhe and Mr. Çarçiu, who are the administrators of exporter companies, for providing information about MAP in research area.

References

- Bilz M., Shelagh P. K., Maxted N., Lansdown R. V. (2011): European Red List of Vascular Plants. Available at: <https://portals.iucn.org/library/sites/library/files/documents/RL-4-016.pdf> [Accessed 12 Sept. 2013]
- Boban Varghese P. (2014). Assessing the Medicinal and Aromatic Plants in Albania Value chain analysis. Center for International Development, Harvard University. Available at: https://albania.growthlab.cid.harvard.edu/files/albania-growthlab/files/medicinal_aromatic_plants.pdf [Accessed 16 May 2016]
- Council of Europe (1979). Convention on the Conservation of European Wildlife and Natural Heritage. Bern, Switzerland.
- Davis P.H. (1965-1988). Flora of Turkey and the East Aegean Islands. Vol. 1-9. Edinburgh.
- Decision of Council of Ministers (2013). Miratimi i listës së kuqe të florës dhe faunës së egër. Demiri M. (1979). Bimët e egra të dobishme dhe të dëmshme të Shqipërisë. Tiranë, p. 15 -35
- Ellenberg H. (1956). Aufgaben und Methoden der Vegetationskunde. – p. 1-136 in: Walter, H. (ed.), Einführung in die Phytologie 4(1). – Stuttgart. & Müller-Dombois, D. 1967: A key to Raunkiaer plant forms with revised subdivisions. – Ber. Geobot. Inst. ETH, Stiftung Rübél 37: 3-43.
- Greuter W., Burdet H. M., Long G. (1984). Med-checklist. A critical inventory of vascular plants of the circum-mediterranean countries. 1. Pteridophyta [2nd ed.], Gymnospermae, Dicotyledones (Acanthaceae-Cneoraceae). – Genève: Conservatoire et Jardin botaniques de la Ville de Genève.
- Greuter W., Burdet H. M., Long G. (1986). Med-checklist. A critical inventory of vascular plants of the circum-mediterranean countries. 3. Dicotyledones (Convolvulaceae-Labiatae). – Genève: Conservatoire et Jardin botaniques de la Ville de Genève.
- Greuter W., Burdet H. M., Long G. (1989). Med-checklist. A critical inventory of vascular plants of the circum-mediterranean countries. 4. Dicotyledones (Lauraceae-Rhamnaceae). Genève: Conservatoire et Jardin botaniques de la Ville de Genève.
- IKPK (1988). Studim për inventarizimin e bimëve mjekësore, etero-vajore dhe tanifere në RPSSH (dorëshkrim). Stacioni i Pyjeve dhe Kulturave Etero-Vjaore, Tiranë. 317 pp.
- IUCN (2016). The IUCN Red List of Threatened Species. Version 2016-3. Available at: <http://www.iucnredlist.org> [Accessed 11 June 2017]
- Kabo, M. (1990, 1991). Gjeografia Fizike e Shqipërisë, 1-2. Tiranë.
- Meço M., Mullaj A. (2015). Phenological aspects of Albanian flora. Proceedings of International Conference on Soil. 04-06 May 2015, Agricultural University of Tirana, Tirana, Albania: Proceedings, p. 164.
- Norconsult (2010). Devoll Hydropower Project. Development Phase (ESIA Report), Tirana.
- Paparisto K., Demiri M., Mitrushi I., Qosja Xh. (1988). Flora e Shqipërisë. Vol. 1. Akademia e Shkencave e Republikës të Shqipërisë, Qendra e Kërkimeve Biologjike, Tiranë
- Papathopuli G. (1976). Bimët mjekësore dhe aromatike të Shqipërisë. Tiranë.
- Pazari F. (2014). Vlerësimi ekonomik dhe ekologjik i bimëve mjekësore dhe aromatike të shqipërisë në funksion të zhvillimit të ekonomisë rurale. Disertacion. Universiteti i Tiranës, Fakulteti i Historisë dhe i Filologjisë Departamenti i Gjeografisë, Tiranë.
- Pignatti S. (1982): Flora d'Italia. Vol. 1-3. Bologna
- Qosja Xh., Paparisto K., Demiri I., Vangjeli J., Balza E. (1992). Flora e Shqipërisë. Vol. 2, Akademia e Shkencave e Republikës të Shqipërisë, Qendra e Kërkimeve Biologjike, Tiranë
- Qosja Xh., Paparisto K., Vangjeli J. & Ruci B. (1996). Flora e Shqipërisë. Vol. 3, Akademia e Shkencave e Republikës të Shqipërisë, Qendra e Kërkimeve Biologjike, Tiranë
- Raunkiaer C. (1934). The life forms of plants and statistical plant geography. Oxford.
- Strid A. (1986). Mountain flora of Greece. Vol. 1. Cambridge: Cambridge Univ. Press.
- Strid A., Tan K. (1991). Mountain flora of Greece. Vol. 2, Edinburgh: Edinburgh Univ. Press.
- Strid A., Tan K. (1997). Flora Hellenica. Vol. 1. Königstein: Koeltz.
- Strid A., Tan K. (2002). Flora Hellenica. Vol. 2. Ruggell: A. R. G. Gantner.
- Tutin T. G., Burges N. A., Chater A. O., Edmondson J. R., Heywood V. H., Moore D. M., Valentine D. H., Walters S. M., Webb D. A. (1993). Flora Europaea. Vol. 1, Second Edition. Cambridge: Cambridge Univ. Press.
- Tutin T. G., Burges N. A., Heywood V. H., Valentine D. H., Walters S. M., Webb D. A. (1964). Flora Europaea. Vol. 1. Cambridge: Cambridge Univ. Press.
- USAID (2009). The medicinal and Aromatic plants value Chain in Albania. DAI. Available at: https://www.academia.edu/28718869/THE_MEDICINAL_AND_AROMATIC_PLANTS_VALUE_CHAIN_IN_ALBANIA_USAID_ALBANIA_AGRICULTURE_COMPETITIVENESS_AAC_PROGRAM [Accessed June 2010]
- Vangjeli J., Ruci B., Mullaj A., Paparisto K., Qosja Xh. (2000). Flora e Shqipërisë. Vol. 4, Akademia e Shkencave e Republikës të Shqipërisë, Qendra e Kërkimeve Biologjike.
- Webb D. A. (1980). Flora Europaea. Vol. 5, Cambridge: Cambridge Univ. Press.