

ECOLOGIA BALKANICA

2018, Vol. 10, Issue 2

December 2018

pp. 1-6

Medicinal Plants on the Territory of the Waterfall Canyon Eco-trail (Soskovcheto Reserve, Western Rhodopes Mts., South Bulgaria)

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Abstract. The study presents data on the species diversity of medicinal plants on the territory of the Waterfall Canyon Eco-trail, part of the "Soskovcheto" Reserve (Western Rhodopes Mts. in South Bulgaria). Ninety-six species were recorded, grouped in 42 families - Apiaceae, Aristolochiaceae, Aspidiaceae, Aspleniaceae, Asteraceae, Athyriaceae, Balsaminaceae, Betulaceae, Boraginaceae, Brassicaceae, Campanulaceae, Caprifoliaceae, Caryophyllaceae, Crassulaceae, Cupressaceae, Ericaceae, Euphorbiaceae, Fabaceae, Fagaceae, Geraniaceae, Hypericaceae, Hypolepidaceae, Lamiaceae, Liliaceae, Orchidaceae, Oxalidaceae, Pinaceae, Plantaginaceae, Poaceae, Polygonaceae, Polypodiaceae, Primulaceae, Pyrolaceae, Ranunculaceae, Rosaceae, Rubiaceae, Salicaceae, Saxifragaceae, Scrophulariaceae, Thymelaeaceae, Urticaceae, Violaceae. Eighteen medicinal plant species were with conservation significance, including endemic, rare and protected species.

Key words: Waterfall Canyon Eco-trail, Soskovcheto Reserve, medicinal plants, conservation status.

Introduction

The Rhodopes Mountains are located in the central part of the Balkan Peninsula and they have a total area of 18000 km², over 14000 km² of them being in the territory of the Republic of Bulgaria. Orthographically they are divided into two major parts – the Western and the Eastern Rhodopes Mts. (BRAMBAROV, 2001).

The Western Rhodopes Mts. are the higher part of the mountains. They are of a medium mountain type, with a highly indented, thick and deeply incised river network. With its exceptional variety of

geomorphological forms, waterfalls, mineral springs, unique flora and fauna, beautiful landscapes, long history and hospitable population, the Rhodopes provide a great opportunity for development of alternative forms of tourism (BRAMBAROV, 2001).

The Western Rhodopes Mts. are divided into two parts: Batak-Dabrava Area and Perelik-Prespa Area. In the Perelik-Prespa part is located "Soskovcheto" Reserve. According to the administrative division of the Republic of Bulgaria, the area of the reserve is part of the territory of Smolyan Town. This reserve also includes the Waterfall Canyon Eco-trail.

Material and Methods

The species composition of the medicinal plants on the territory of the Waterfall Canyon Eco-trail (Fig. 1) was studied during the vegetation seasons of 2017 and 2018. Some of the taxa were determined on site during the botanical expeditions and others were further identified under laboratory conditions. Nomenclature followed DELIPAVLOV & CHESHMEDZHIEV (2003).

A routing method with transect transitions was used. Floristic analysis involved the development of a systematic list of species, taking into account their affiliation to botanical families.

For the determination of the conservation status of the established medicinal plants from the studied territory, the following were used: the Red Data Book of the Republic of Bulgaria. Vol. 1. Plants and Fungi (PEEV *et al.*, 2011), the Red List of Bulgarian vascular plants (PETROVA & VLADIMIROV, 2009), Conspectus of the Bulgarian Vascular Flora (ASSYOV & PETROVA, 2006), Balkan endemics in the Bulgarian flora (PETROVA & VLADIMIROV, 2010), Atlas of Bulgarian endemic plants (PETROVA, 2006), the Bulgarian Biological Diversity Act (BDA, 2002), the Bulgarian Medicinal Plants Act (MPA, 2000) and The IUCN Red List of Threatened Species, Version 2018-1 (IUCN, 2018).

belong to divisions Polypodiophyta, Pinophyta and Magnoliophyta. Polypodiophyta has identified five species belonging to five families. Pinophyta is represented by four species pertaining to two families - Pinaceae and Cupressaceae. Magnoliophyta includes two classes - Magnoliopsida and Liliopsida. Predominant of the Magnoliophyta plants are dicotyledons. There are 32 families with 82 species. The largest species variety (Fig. 2) are Asteraceae (11 species), Lamiaceae (with 9 species) and Rosaceae (6 species). From the monocotyledons plants (Classis Liliopsida) we have identified 3 families with 5 species (Liliaceae - 2 species, Orchidaceae - 2 species and Poaceae - 1 species, respectively). A complete list of established medicinal plants is presented in Table 1.



Fig. 1. The location of Waterfall Canyon Eco-trail.

Results and Discussion

Registered medicinal plants on the territory of the Waterfall Canyon Eco-trail

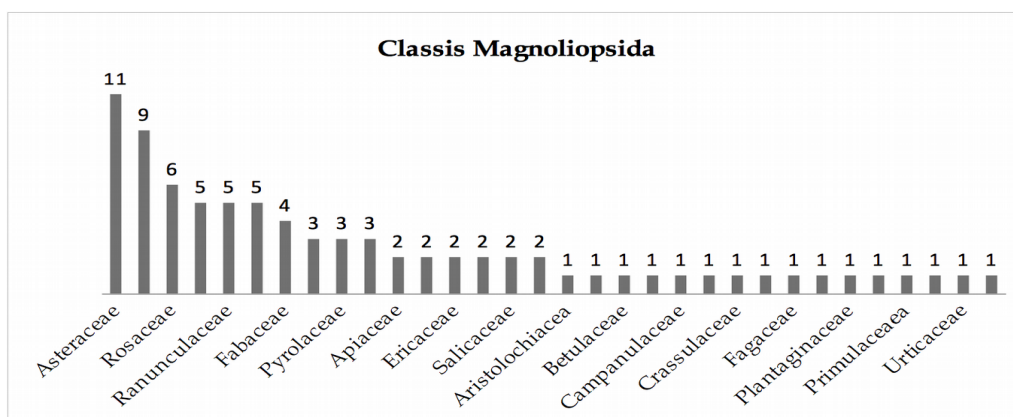


Fig. 2. Number of identified species of medicinal plants distributed by families of Classis Magnoliopsida.

The only Balkan endemic medicinal plant species from the territory of Waterfall Canyon Eco-trail was *Angelica pancicii*. The species is included in the Red List of Bulgarian vascular plants (PETROVA & VLADIMIROV, 2009) under the category Vulnerable (VU).

Seventeen of the medicinal plant species recorded in the studied area are included in

the Red List of Threatened Plants of the International Union for Conservation of Nature (IUCN, 2018). All of them are under the category of "Least Concern" (LC).

Of the registered medicinal plants six of them are included under a special regime of use (Table 2) (Order № RD-56/01.02.2018 of Ministry of Environment and Waters).

Table 1. Taxonomic composition and conservation status of the established medicinal plants on the territory of the Waterfall Canyon Eco-trail. *Legend:* E - Endemic plant; RB - Red Book of the Republic of Bulgaria; RL - Red List of Bulgarian vascular plants; BDA - Biological Diversity Act; IUCN - International Union for Conservation of Nature, Red List of Threatened Plants; LC - Least Concern; VU - Vulnerable.

Family	Species	E	RB	RL	BDA	IUCN
Apiaceae	<i>Angelica pancicii</i> Vandas	VU		VU		
Apiaceae	<i>Angelica sylvestris</i> L.					LC
Aristolochiaceae	<i>Asarum europaeum</i> L.					
Aspidiaceae	<i>Dryopteris filix-mas</i> (L.) Schott.					
Aspleniaceae	<i>Asplenium septentrionale</i> (L.) Hoffm.					
Asteraceae	<i>Achillea millefolium</i> L.					LC
Asteraceae	<i>Doronicum columnae</i> Ten.					
Asteraceae	<i>Hieracium pilosella</i> L.					
Asteraceae	<i>Hypochaeris maculata</i> L.					
Asteraceae	<i>Matricaria trichophylla</i> Boiss.					
Asteraceae	<i>Senecio jacobaea</i> L.					
Asteraceae	<i>Senecio nemorensis</i> L.					
Asteraceae	<i>Senecio viscosus</i> L.					
Asteraceae	<i>Taraxacum officinale</i> L.					
Asteraceae	<i>Telekia speciosa</i> (Schreber) Baumg.					
Asteraceae	<i>Tussilago farfara</i> L.					
Athyriaceae	<i>Athyrium filix-femina</i> (L.) Roth					
Balsaminaceae	<i>Impatiens noli-tangere</i> L.					LC
Betulaceae	<i>Corylus avellana</i> L.					LC
Boraginaceae	<i>Pulmonaria officinalis</i> L.					LC
Brassicaceae	<i>Cardamine amara</i> L.					
Brassicaceae	<i>Cardamine bulbifera</i> (L.) Crantz					
Campanulaceae	<i>Campanula persicifolia</i> L.					
Caprifoliaceae	<i>Sambucus racemosa</i> L.					
Caryophyllaceae	<i>Herniaria glabra</i> L.					
Caryophyllaceae	<i>Scleranthus perennis</i> L.					
Caryophyllaceae	<i>Silene italica</i> (L.) Pers.					
Caryophyllaceae	<i>Stellaria graminea</i> L.					
Caryophyllaceae	<i>Viscaria vulgaris</i> Rohl.					
Crassulaceae	<i>Sedum acre</i> L.					
Cupressaceae	<i>Juniperus communis</i> L.					LC
Ericaceae	<i>Vaccinium myrtillus</i> L.					
Ericaceae	<i>Vaccinium vitis-idaea</i> L.					LC

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Euphorbiaceae	<i>Euphorbia amygdaloides</i> L.	
Fabaceae	<i>Lathyrus pratensis</i> L.	
Fabaceae	<i>Trifolium montanum</i> L.	
Fabaceae	<i>Trifolium pratense</i> L.	LC
Fabaceae	<i>Trifolium repens</i> L.	
Fagaceae	<i>Fagus sylvatica</i> L.	
Geraniaceae	<i>Geranium macrorrhizum</i> L.	
Geraniaceae	<i>Geranium robertianum</i> L.	
Hypericaceae	<i>Hypericum cerastoides</i> (Spach) N.K.B.R.	
Hypericaceae	<i>Hypericum maculatum</i> Crantz	
Hypericaceae	<i>Hypericum perforatum</i> L.	
Hypolepidaceae	<i>Pteridium aquilinum</i> (L.) Kuhn	
Lamiaceae	<i>Acinos suaveolens</i> (Sibth. et Sm.) G. Don	
Lamiaceae	<i>Ajuga laxmanii</i> (L.) Bentham	
Lamiaceae	<i>Clinopodium vulgare</i> L.	
Lamiaceae	<i>Galeopsis speciosa</i> Miller	
Lamiaceae	<i>Mentha spicata</i> L.	LC
Lamiaceae	<i>Prunella vulgaris</i> L.	LC
Lamiaceae	<i>Salvia glutinosa</i> L.	
Lamiaceae	<i>Stachys sylvatica</i> L.	
Lamiaceae	<i>Thymus callieri</i> Borbas ex Velen.	
Liliaceae	<i>Colchicum autumnale</i> L.	LC
Liliaceae	<i>Veratrum album</i> L. ssp. <i>lobelianum</i> (Bernh.) Reichenb.	
Orchidaceae	<i>Corallorhiza trifida</i> Chatel.	
Orchidaceae	<i>Epipactis helleborine</i> (L.) Crantz	
Oxalidaceae	<i>Oxalis acetosella</i> L.	
Pinaceae	<i>Abies alba</i> Miller	LC
Pinaceae	<i>Picea abies</i> (L.) Karst.	LC
Pinaceae	<i>Pinus sylvestris</i> L.	LC
Plantaginaceae	<i>Plantago major</i> L.	LC
Poaceae	<i>Anthoxanthum odoratum</i> L.	
Polygonaceae	<i>Rumex acetosella</i> L.	
Polypodiaceae	<i>Polypodium vulgare</i> L.	
Primulaceae	<i>Primula veris</i> L.	
Pyrolaceae	<i>Moneses uniflora</i> (L.) Gray	
Pyrolaceae	<i>Orthilia secunda</i> (L.) House	
Pyrolaceae	<i>Pyrola chlorantha</i> Swartz	
Ranunculaceae	<i>Anemone nemorosa</i> L.	
Ranunculaceae	<i>Anemone ranunculoides</i> L.	
Ranunculaceae	<i>Caltha palustris</i> L.	LC
Ranunculaceae	<i>Clematis vitalba</i> L.	
Ranunculaceae	<i>Ranunculus acris</i> L.	
Rosaceae	<i>Alchemilla vulgaris</i> Compl.	
Rosaceae	<i>Fragaria vesca</i> L.	
Rosaceae	<i>Geum coccineum</i> Sibth. et Sm.	
Rosaceae	<i>Rubus hirtus</i> Waldst. et Kit.	
Rosaceae	<i>Rubus idaeus</i> L.	
Rosaceae	<i>Sorbus aucuparia</i> L.	
Rubiaceae	<i>Cruciata laevipes</i> Opiz	

Rubiaceae	<i>Galium odoratum</i> (L.) Scop.	
Rubiaceae	<i>Galium lucidum</i> All.	
Salicaceae	<i>Populus tremula</i> L.	
Salicaceae	<i>Salix caprea</i> L.	
Saxifragaceae	<i>Chrysosplenium alternifolium</i> L.	
Saxifragaceae	<i>Saxifraga rotundifolia</i> L.	
Scrophulariaceae	<i>Digitalis viridiflora</i> Lindley	
Scrophulariaceae	<i>Euphrasia rostkoviana</i> Hayne	
Scrophulariaceae	<i>Verbascum longifolium</i> Ten.	
Scrophulariaceae	<i>Veronica chamaedrys</i> L.	
Scrophulariaceae	<i>Veronica officinalis</i> L.	
Thymelaeaceae	<i>Daphne mezereum</i> L.	
Urticaceae	<i>Urtica dioica</i> L.	LC
Violaceae	<i>Viola tricolor</i> L.	

Table 2. Taxonomic list of medicinal plants on the Waterfall Canyon Eco-trail included in the usage regimes.

Species	Medicinal plant species under special regime of protection and use	
	Protected medicinal plants	Regulated by annual quotas
<i>Alchemilla vulgaris</i> compl.		*
<i>Angelica pancicii</i> Vand.	*	
<i>Asarum europaeum</i> L.	*	
<i>Galium odoratum</i> (L.) Scop.		*
<i>Primula veris</i> L.		*
<i>Sedum acre</i> L.		*

Conclusions

The geographic location, the natural conditions and the peculiarities of the Waterfall Canyon Eco-trail determine a considerable variety of floral elements. Ninety-six medical plants were found. They are grouped in 42 families belonging primarily to the Magnoliophyta phylum. Asteraceae, Lamiaceae and Rosaceae families are represented by the largest species diversity. The medicinal plants of conservation importance on the territory of the Waterfall Canyon Eco-trail represent 18.75% of all the species described. This study complements the botanical characterization of the "Soskovcheto" Reserve as a protected area and part of a protected area under the Birds Directive BG0002113 and the Western Rhodopes Protected Zone BG0001030 - a protected area under the Habitats Directive.

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Received: 08.10.2018
Accepted: 10.11.2018