

Analysis of medicinal plants from the regions of the Strandzha mountain and southern Black Sea Coast, Bulgaria

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Abstract. This article presents summarized information about the medicinal plants distributed on the territory of Strandzha mountain and the southern Black Sea coast, Bulgaria. According to literature data, 252 medicinal taxa are found on the territory of the two floristic regions, 218 of which are included in the Medicinal Plants Act. All species included in the list are characterized by: biological type, life form, and floral element. 59 plants have conservation status, representing 23.4% of the established species composition. According to the Red List of Higher Plants in Bulgaria and the Red Book of the Republic of Bulgaria, the following species are critically endangered (CR): *Arbutus unedo* L. and *Sideritis syriaca* L. Four Balkan endemics have been identified - *Achillea clypeolata* Sm., *Opopanax chironius* (L.) W. D. J. Koch subsp. *bulgaricum* (Velen.) Andreev, *Semperivium leucanthum* Pančić, and *Thymus longedentatus* (Deg. & Urum.) Ronn.

Key words: Medicinal plants, Strandzha, Southern Black Sea coast.

Introduction

Plants play an important role in a healthy human diet. Their well-known bioactive components (proteins, fibers, polyphenols, vitamins, etc.) have high nutritional value. The increasing use of medicinal plants in the treatment of many diseases demonstrates their reliability for use in modern phytomedicine. Nearly 80% of the world's population uses medicinal plant species, which are part of a big number of pharmaceutical products, to treat many diseases.

The use of medicinal plants in Bulgarian traditional medicine dates back centuries (Kitanov, 1953; Yordanov et al., 1969). The first records of the use of medicinal plants in Bulgaria appear in the late 9th and early 10th centuries (Nedelcheva, 2009).

In recent decades, several ethnobotanical studies have been conducted to document folk knowledge about wild and cultivated plants in cultural, social, and economic aspects (Angelin et al., 2019, 2020; Jothi et al., 2019; Sivakumar, 2019; Pfeiffer et al., 2020; Thiyagarajan & Sivakumar, 2020; Sivakumar & Deepa, 2020; Moti, 2021).

Despite the recent acceleration of ethnobotanical research in Bulgaria, large areas in the country and areas of application of medicinal plants in people's everyday lives, remain unexplored.

Analyzing literary sources, it is noticeable that there is a big interest in medicinal plants among anthropologists, pharmacologists, etc. (Shikov et al., 2004; Kołodziejska-Degórska, 2012; Lardos & Heinrich, 2013). Some of the latest data concerning the species diversity of medicinal

plants in Bulgaria are from Assyov et al. (2012). The authors report 842 species belonging to 444 genera and 118 families; of these, 730 species have been included in the Medicinal Plants Act (2000).

Floristic and ethnobotanical studies can be found mainly about the territory of the northern Black Sea coast. One of the large-scale studies in this sphere is the thesis work of Atanasova (2021). Ethnobotanical research on the use of medicinal plants in cooking in the Varna region was carried out by Boycheva & Marinova (2018). In other research works, Boycheva & Kosev (2017) analyze the use of medicinal plants in the region from the village of Durankulak to the town of Obzor. Valuable information in this regard is also provided by the works of Zahariev et al. (2014), Cherneva et al. (2017), Boycheva & Zahariev (2018), Boycheva & Ivanov (2021); Boycheva et al. (2021a, b), Cherneva & Ivanov (2023).

Regarding such studies in the Strandzha Mtn region and the southern Black Sea coast, data are scarce. Vitkova et al. (2017) identified 211 species of medicinal plants distributed within the borders of the Ropotamo reserve (Southeastern Bulgaria). More work has been done on plants with medicinal properties in this region - Bondev & Velchev (1984), Gussev et al. (2003), Sidjimova (2007). Zahariev (2014) presents data on invasive species along the Rezovska, Veleka, and Mladezhka rivers. In another study, Zahariev (2016) provides information on species of the Strandzha flora distributed during the Tertiary. A few years later, Stoyanov et al. (2022) conducted a monitoring study of higher plant species in the southeastern part of Strandzha Nature Park. Gecheva et al. (2022) identified 37 species of macrophytes distributed along the Veleka river, some of which have medicinal properties.

The purpose of this article is to present a summary of the literature on medicinal plants distributed in the Strandzha Mtn and southern Black Sea regions, Bulgaria. The data obtained can

serve as a good basis and comparison for future ethnobotanical studies included in the work program of the DUEcoS project.

Materials and Methods

The results, obtained in this study, are based on a review of literature data during the period 2023-2024 and are presented in Table 1.

The taxonomic affiliation of the identified species is described according to Stoyanov et al. (2022a), noting the species included in the Medicinal Plant Act (2000). The life forms are indicated according to the classification of Raunkiaer (1934), and their determination was carried out according to the data for the biological type of the species according to Stoyanov et al. (2022a). The definition of floral elements was made following data from Assyov & Petrova (2012). The Red List of Higher Plants in Bulgaria (Petrova & Vladimirov, 2009) and the Red Book of the Republic of Bulgaria Volume 1 Plants and Fungi (Peev et al., 2015) were used to determine the conservational significant species. The conservation status follows the annexes of the Biological Diversity Act (2002), CITES (1973), and IUCN (2021).

Results and Discussion

Species composition

As a result of the literature review conducted on the territory of Strandzha Mountain and the southern Black Sea coast, 252 species of plants with medicinal properties were identified (Table 1), distributed in 210 genera and 82 families. Of these, 218 (86.5%) taxa are included in the Medicinal Plants Act (2000), which represents 29.9% of the species present in it. Comparing these data with the studies of Zahariev et al. (2014) for the northern Black Sea coast, an almost twice smaller number of species was found, based on the scarce studies on the Strandzha and the southern Black Sea coast in this sphere till now.

Table 1. Checklist of the medicinal plants in Strandzha Mtn and Southern Black Sea coast, Bulgaria.

Family	Species	BT	LF	FE	SCS
Alliaceae	<i>Allium rotundum</i> L. *	3	Cr	Eur-OT	
	<i>A. siculum</i> Ucria subsp. <i>dioscoridis</i> (Sm.) K. Richt. *	3	Cr	Pont-Med	
Alismataceae	<i>Alisma plantago-aquatica</i> L. *	3	Cr	Boreal	
Amaryllidaceae	<i>Galanthus nivalis</i> L. *	3	Cr	Eur	RL [EN]; RDB [EN]; BDA; CITES;

	<i>Leucosium aestivum</i> L.	3	Cr	Eur	RL [VU]; BDA;
	<i>Pancratium maritimum</i> L.	3	Cr	Pont-Med	RL [EN]; RDB [EN]; BDA
Amaranthaceae	<i>Chenopodium album</i> L. *	1	T	Kos	
Anacardiaceae	<i>Cotinus coggygria</i> L. *	4	Ph	Med-As	
Apiaceae	<i>Anethum graveolens</i> L. *	1	T	Med-As	
	<i>Angelica sylvestris</i> L. *	2,3	Cr	Eur-Sib	
	<i>Anthriscus cerefolium</i> (L.) Hoffm. *	1	T	Eur-Med	
	<i>Chaerophyllum temulum</i> L. *	2,3	H	Eur-Med	
	<i>Eryngium campestre</i> L. *	3	H	Pont-Med	
	<i>E. maritimum</i> L. *	2,3	H	Eur-Med	RL [EN]; RDB [EN]; BDA
	<i>Ferulago sylvatica</i> (Besser) Rchb. subsp. <i>sylvatica</i> *	3	H	subMed	
	<i>Heracleum sphondylium</i> subsp. <i>sibiricum</i> (L.) Simonk. *	3	H	Eur-As	
	<i>Opopanax chironium</i> (L.) W. D. J. Koch subsp. <i>bulgaricum</i> (Velen.) Andreev *	3	H	Med	RL [VU]; RDB [VU]; BDA
	<i>Pimpinella saxifraga</i> L. *	1	H	Eur-As	
<i>Tordylium maximum</i> L. *	1,2	H	subMed		
Apocynaceae	<i>Apocynum venetum</i> L.	3	H	Pont-Med	RL [EN]; RDB [EN]; BDA
	<i>Periploca graeca</i> L. *	3,5	Ph	Pont-Med	
	<i>Vincetoxicum hirundinaria</i> Medik. *	3	Cr	Eur-Sib	
Aquifoliaceae	<i>Ilex colchica</i> Pojark.	4	Ph	Pont	RL [EN]; RDB [EN]; BDA
Araceae	<i>Arum maculatum</i> L. *	3	Cr	Eur-subMed	
	<i>Lemna minor</i> L. *	3	Cr	Kos	
Araliaceae	<i>Hedera helix</i> L. *	4	Ph	Eur-As	
Aristolochiaceae	<i>Aristolochia clematitis</i> L. *	3	H	Eur-Med	
Asclepiadaceae	<i>Cionura erecta</i> (L.) Griseb. *	4,5	Ch	Med	
Asparagaceae	<i>Polygonatum odoratum</i> (Mill.) Druce *	3	Cr	Eur-Sib	BDA
	<i>Scilla bifolia</i> L. *	3	Cr	Pont-subMed	BDA
	<i>Ruscus aculeatus</i> L. *	3	H	SPont	BDA
	<i>R. hypoglossum</i> L.	3	H	Pont	BDA
Aspleniaceae	<i>Asplenium adiantum-nigrum</i> L. *	3	H	subBoreal	
	<i>A. ruta-muraria</i> L. *	3	H	Boreal	
	<i>A. trichomanes</i> L. *	3	H	Kos	
	<i>A. scolopendrium</i> L. *	3	H	subBoreal	
Asteraceae	<i>Achillea colina</i> J. Becker ex Rchb.	3	H	Eur-subMed	
	<i>A. clypeolata</i> Sm. *	3	H	Bal	
	<i>Anthemis cotula</i> L.	1	T	Eur-Sib	
	<i>Cota tinctoria</i> (L.) J. Gay *	3	H	Eur-Sib	
	<i>Arctium lappa</i> L.	2	T	Eur-Med	
	<i>Artemisia absinthium</i> L. *	3	H	Pont-Med	
	<i>A. campestris</i> L. *	3	H	Eur-Sib	
	<i>A. santonicum</i> L. subsp. <i>patens</i> (Neilr.) Pers. *	3	H	Eur-Med	
	<i>A. vulgaris</i> L. *	3	H	subBoreal	
	<i>Bellis perennis</i> L. *	3	H	Eur-As	
	<i>Bidens tripartita</i> L. *	1	T	Boreal	
	<i>Carduus acanthoides</i> L. *	2	T	Eur	

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	<i>Carlina vulgaris</i> L. *	2	H	Eur-Med	
	<i>Cyanus segetum</i> Hill *	1	T	Eur-Med	
	<i>Cichorium intybus</i> L. *	3	H	Eur-Sib	
	<i>Centaurea benedicta</i> (L.) L. *	1	H	Med	
	<i>Filago germanica</i> (L.) Huds. *	1	T	Eur-As	
	<i>Inula ensifolia</i> L. *	3	H	Eur-Med	
	<i>Matricaria chamomilla</i> L.	1	T	Eur-As	
	<i>Scorzonera hispanica</i> L. *	3	H	Med	
	<i>Senecio vulgaris</i> L. *	1	T	Eur-As	
	<i>Taraxacum officinale</i> F. H. Wigg. *	3	H	Eur-Med	
	<i>Tanacetum vulgare</i> L. *	3	H	Eur-Sib	
	<i>Tragopogon pratensis</i> L. *	2,3	H	Eur-Med	
	<i>Xanthium strumarium</i> L. *	1	T	Eur	
	<i>Xeranthemum annuum</i> L. *	1	T	subMed	
Betulaceae	<i>Alnus glutinosa</i> (L.) Gaertn. *	6	Ph	Med-CAs	IUCN [LC]
	<i>Carpinus betulus</i> L. *	6	Ph	Eur-subMed	
	<i>Corylus avellana</i> L.	4	Ph	Med-CAs	IUCN [LC]
Boraginaceae	<i>Anchusa officinalis</i> L. *	2,3	H	Pont-Med	
	<i>Buglossoides purpureoaeerulea</i> (L.) I. M. Johnst. *	3	H	Eur-As	
	<i>Cynoglossum officinale</i> L. *	2	T	SPont	
	<i>Echium vulgare</i> L. *	2,3	H	Eur-As	
	<i>Lithospermum officinale</i> L. *	3	H	Eur-As	
Brassicaceae	<i>Alyssum alyssoides</i> (L.) L. *	1,2	T	Eur-Med	
	<i>Capsella bursa-pastoris</i> (L.) Medicus *	1,2	T	Kos	
	<i>Cardamine bulbifera</i> (L.) Crantz. *	3	H	subBoreal	
	<i>Lepidium ruderales</i> L. *	1,2	T	Eur-As	
	<i>Nasturtium officinale</i> R. Br. *	3	Cr	Eur-As	
	<i>Thlaspi arvense</i> L. *	2	T	Eur-As	
Butomaceae	<i>Butomus umbellatus</i> L.	3	Cr	Eur-As	
Campanulaceae	<i>Campanula persicifolia</i> L. *	3	H	Eur-Sib	
Caryophyllaceae	<i>Herniaria hirsuta</i> L. *	1,2	T	Eur-As	
	<i>Silene flos-cuculi</i> (L.) Greuter & Burdet	3	H	Eur-Sib	
	<i>S. atropurpurea</i> (Griseb.) Greuter & Burdet	3	H	Eur-Sib	
	<i>Stellaria media</i> (L.) Vill. *	1,2	T	Kos	
Caprifoliaceae	<i>Knautia arvensis</i> (L.) Coult. *	2,3	H	Eur-Sib	
	<i>Valeriana officinalis</i> L. *	3	H	Eur-Sib	
Celastraceae	<i>Euonymus europaeus</i> L. *	4,6	Ph	Eur-As	
	<i>E. verrucosus</i> Scop. *	6	Ph	Eur-Med	IUCN [LC]
Ceratophyllaceae	<i>Ceratophyllum demersum</i> L.	3	Cr	Kos	IUCN [LC]
Convolvulaceae	<i>Calystegia sepium</i> (L.) R. Br. *	3	H	Kos	IUCN [LC]
	<i>Convolvulus arvensis</i> L. *	3	H	Kos	
Cornaceae	<i>Cornus mas</i> L. *	4,6	Ph	subMed	IUCN [LC]
Colchicaceae	<i>Colchicum autumnale</i> L. *	3	Cr	Eur	
Crassulaceae	<i>Hylotelephium maximum</i> (L.) Holub. *	3	Ch	subBoreal	
	<i>Sempevium leucanthum</i> Pančić	3	H	Bul	RL [DD]
Cucurbitaceae	<i>Ecballium elaterium</i> (L.) A. Rich.	3	H	Med	
Cupressaceae	<i>Juniperus communis</i> L.	4	Ph	subBoreal	IUCN [LC]
Dioscoreaceae	<i>Dioscorea communis</i> (L.) Caddick & Wilkin. *	3	Cr	subMed	
Dennstaedtiaceae	<i>Pteridium aquilinum</i> (L.) Kuhn. *	3	H	Kos	
Ephedraceae	<i>Ephedra distachya</i> L. *	4	Ch	Pont-Med	RL [VU]; BDA;

Ericaceae	<i>Arbutus unedo</i> L.	4	Ph	subMed-As	RL [CR]; RDB [CR]; BDA;
	<i>Calluna vulgaris</i> (L.) Salisb.	4	Ch	subBoreal	RL [VU]; BDA
	<i>Monotropa hypopitys</i> L. *	3	Cr	Boreal	
Equisetaceae	<i>Equisetum arvense</i> L. *	3	Cr	Boreal	
	<i>E. sylvaticum</i> L. *	3	Cr	Boreal	
	<i>E. telmateia</i> Ehrh. *	3	Cr	Boreal	IUCN [LC]
Euphorbiaceae	<i>Euphorbia amygdaloides</i> L. *	3	H	Eur	
	<i>E. cyparissias</i> L. *	3	H	Eur	
	<i>E. peplis</i> L. *	1	T	Boreal	RL [VU]; BDA
	<i>Mercurialis perennis</i> L. *	3	H	subMed	
Fabaceae	<i>Amorpha fruticosa</i> L.	4	Ph	Adv	
	<i>Bituminaria bituminosa</i> (L.) Stirt. *	3	H	Pont-Med	
	<i>Cytisus hirsutus</i> L. subsp. <i>hirsutus</i> *	4	Ph	Eur-Med	
	<i>Securigera varia</i> (L.) Lassen *	3	H	Eur-Med	
	<i>Lathyrus niger</i> (L.) Bernh. *	3	H	Eur-Med	
	<i>L. sylvestris</i> L. *	3	H	Eur-sMed	IUCN [LC]
	<i>L. vernus</i> (L.) Bernh. *	3	H	Eur-Sib	IUCN [LC]
	<i>Lotus corniculatus</i> L. *	3	H	Eur-Med	
	<i>Melilotus officinalis</i> (L.) Pall. *	1,2	T	Eur-As	
	<i>Ononis spinosa</i> L. subsp. <i>spinosa</i> *	3	H	Eur-As	
	<i>Robinia pseudoacacia</i> L.	6	Ph	NAm (Adv)	
	<i>Trifolium pratense</i> L. *	3	H	subBoreal	IUCN [LC]
	<i>Vicia cracca</i> L. subsp. <i>cracca</i> *	3	H	Eur-As	
Fagaceae	<i>Fagus orientalis</i> Lipsky *	6	Ph	SEux	
	<i>Quercus frainetto</i> Ten. *	6	Ph	Eur	
Gentianaceae	<i>Centaurium erythraea</i> Rafn. *	2	T	subMed	
Geraniaceae	<i>Geranium robertianum</i> L. *	1,2	Cr	subBoreal	
	<i>G. sanguineum</i> L. *	3	Cr	Eur	
Haloragaceae	<i>Myriophyllum spicatum</i> L. *	3	Cr	Boreal	IUCN [LC]
Hydrocharitaceae	<i>Najas marina</i> L. *	1,2	T	Paleo (Adv)	
Hypericaceae	<i>Hypericum androsaemum</i> L. *	4	H	Eur-OT	RL [EN]; RDB [EN]; BDA
	<i>H. perforatum</i> L. *	3	H	Kos	
Iridaceae	<i>Iris pseudacorus</i> L. *	3	Cr	Eur	IUCN [LC]
Lamiaceae	<i>Ajuga chamaepitys</i> (L.) Schreb. subsp. <i>chia</i> (Schreb.) Arcang. *	1,2	T	Pont-Med	
	<i>Ballota nigra</i> L. *	3	H	Eur-Med	
	<i>Clinopodium suaveolens</i> (Sm.) Kuntze *	3	H	subMed	
	<i>C. vulgare</i> L. *	3	H	subBoreal	
	<i>Glechoma hederacea</i> L. *	3	H	Eur-As	
	<i>Lamium purpureum</i> L. *	1	T	Eur-Med	
	<i>Lycopus europaeus</i> L. *	3	Cr	Eur-As	
	<i>Marrubium peregrinum</i> L. *	3	H	subMed	
	<i>Melissa officinalis</i> L.	3	H	subMed	
	<i>Mentha arvensis</i> L. *	3	H	Eur-As	
	<i>M. spicata</i> L. *	3	H	Eur	IUCN [LC]
	<i>M. aquatica</i> L. *	3	H	Boreal	IUCN [LC]
	<i>Origanum vulgare</i> L. subsp. <i>vulgare</i> *	3	H	Eur-As	
	<i>Prunella vulgaris</i> L. *	3	H	Kos	IUCN [LC]
	<i>Salvia verticillata</i> L. *	3	H	subMed	
	<i>Sideritis montana</i> L. *	1	T	subMed	
<i>S. syriaca</i> L. *	3	H	Med	RL [CR]; RDB [CR]; BDA	

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	<i>Stachys recta</i> L. *	3	H	Eur-Med	
	<i>Teucrium chamaedrys</i> L. *	3	Ch	subMed	
	<i>T. capitatum</i> L. *	3	Ch	Pont-Med	
	<i>Thymus longedentatus</i> (Deg. & Urum.) Ronn. *	3	Ch	Bal	
	<i>T. sibthorpii</i> Benth. *	3	Ch	Bal-Dac	
Liliaceae	<i>Lilium martagon</i> L. *	3	Cr	Eur-As	BDA
Lythraceae	<i>Lythrum salicaria</i> L. *	3	Cr	subBoreal	
	<i>L. virgatum</i> L. *	1	T	Eur-As	
Malvaceae	<i>Malva sylvestris</i> L. *	1,3	H	Kos	
	<i>Tilia tomentosa</i> Moench *	6	Ph	Eur-Med	
Moraceae	<i>Ficus carica</i> L.	4,6	Ph	Med (Adv)	RL [LC]
Nymphaeaceae	<i>Nuphar lutea</i> (L.) Sm. *	3	Cr	Eur-As	RL [EN]; RDB [EN]; BDA; IUCN [LC]
	<i>Nymphaea alba</i> L. *	3	Cr	Eur-Med	RL [EN]; RDB [EN]; BDA;
Oleaceae	<i>Fraxinus ornus</i> L. *	6	Ph	subMed	
	<i>F. angustifolia</i> Vahl. subsp. <i>oxycarpa</i> (Willd.) Franco & Rocha Afonso *	6	Ph	Med	IUCN [LC]
	<i>Jasminum fruticans</i> L.	4	Ph	Pont-CAs	
	<i>Ligustrum vulgare</i> L. *	4	Ph	subMed	
	<i>Phyllirea latifolia</i> L. *	4,6	Ph	Med	
Orchidaceae	<i>Anacamptis pyramidalis</i> (L.) L. C. Rich. *	3	Cr	subMed	RL [VU]; BDA; CITES
	<i>A. papilionacea</i> (L.) R. M. Bateman, Pridgeon & M. W. Chase *	3	Cr	subMed	RL [VU]; BDA; CITES
Orobanchaceae	<i>Lathraea squamaria</i> L. *	3	Cr	Eur-As	
Paeoniaceae	<i>Paeonia peregrina</i> Mill. *	3	H	subMed	BDA
Papaveraceae	<i>Chelidonium majus</i> L. *	3	H	Eur-As	
	<i>Corydalis solida</i> (L.) Clairv. *	3	Cr	Eur-Med-CAs	
	<i>Glaucium flavum</i> Crantz *	1,3	H	subMed	
	<i>Papaver rhoeas</i> L. *	1,2	T	Eur-Sib	
Plantaginaceae	<i>Plantago lanceolata</i> L. *	3	H	Kos	
	<i>P. media</i> L. *	3	H	Boreal	
Polygonaceae	<i>Persicaria hydropiper</i> (L.) Delarbre *	1	T	Eur-As	IUCN [LC]
	<i>P. lapathifolia</i> (L.) Delarbre	1	T	Boreal	IUCN [LC]
	<i>P. mitis</i> (Schrank) Holub	1	T	Eur-Med	
	<i>Polygonum aviculare</i> L. *	1	T	Kos	
	<i>Rumex acetosella</i> L. *	3	H	Eur-subMed	
Polypodiaceae	<i>Polypodium vulgare</i> L. *	3	H	Boreal	
Portulacaceae	<i>Portulaca oleracea</i> L. *	1	T	Adv	IUCN [LC]
Primulaceae	<i>Anagallis arvensis</i> L. *	1,2	T	Kos	
	<i>Cyclamen coum</i> Mill. *	3	H	Pont-Med	RL [LC]; BDA; CITES
	<i>Lysimachia nummularia</i> L. *	1,2	T	Eur	IUCN [LC]
	<i>Primula vulgaris</i> subsp. <i>rubra</i> (Sm.) Arcang.	3	Cr	Eur	
	<i>P. veris</i> L. *	3	Cr	Eur-Med	
Ranunculaceae	<i>Adonis aestivalis</i> L. *	1	T	Eur-subMed	
	<i>Anemone ranunculoides</i> L. *	3	Cr	Eur-subMed	
	<i>Caltha palustris</i> L. *	3	H	Eur	
	<i>Clematis vitalba</i> L. *	4	Ph	Eur	
	<i>Consolida phrygia</i> (Boiss.) Soó *	1	T	Med	

	<i>Helleborus odorus</i> Waldst. & Kit. *	3	Cr	Eur-sMed	
	<i>Nigella damascena</i> L. *	1	T	subMed	
	<i>Ficaria verna</i> Huds. *	3	Cr	Eur-Sib	
	<i>Ranunculus repens</i> L. *	3	Cr	subMed	
Rhamnaceae	<i>Paliurus spina-christi</i> Mill. *	4	Ph	Eur-As	
	<i>Rhamnus cathartica</i> L. *	4,6	Ph	Eur-As	
	<i>Agrimonia eupatoria</i> L. *	3	H	Eur-Med	
	<i>Crataegus monogyna</i> Jacq. *	4,6	Ph	subBoreal	
	<i>C. pentagyna</i> Waldst. & Kit. Ex Willd. *	4,6	Ph	subMed	
	<i>Filipendula vulgaris</i> Moench *	3	H	Eur-Med	
	<i>Fragaria vesca</i> L. *	3	H	subBoreal	
	<i>Geum urbanum</i> L. *	3	H	subBoreal	
	<i>Malus sylvestris</i> Mill. *	4,6	Ph	Eur	IUCN [DD]
	<i>Mespilus germanica</i> L.	4,6	Ph	Pont-Med	RL [LC]
	<i>Pyracantha coccinea</i> M. J. Roemer	4	Ph	Pont-Med	RL [LC]
	<i>Potentilla reptans</i> L. *	3	H	Kos	
	<i>Prunus laurocerasus</i> L. *	4,6	Ph	Eux	IUCN [LC]
	<i>P. spinosa</i> L. *	4	Ph	SPont	
	<i>Rosa gallica</i> L. *	4	Ph	Eur-Med	
	<i>Rubus caesius</i> L. *	4	Ph	Eur-As	
	<i>Sanguisorba minor</i> Scop. *	3	H	subBoreal	
	<i>Sorbus aucuparia</i> L. *	6	Ph	subBoreal	IUCN [LC]
	<i>S. domestica</i> L. *	6	Ph	Eur-Med	
	<i>S. torminalis</i> (L.) Crantz *	6	Ph	Pont-Med	IUCN [LC]
Rubiaceae	<i>Cruciata laevipes</i> Opiz	3	H	sMed-CAs	
	<i>Galium aparine</i> L. *	1	T	Eur-As	
	<i>G. verum</i> L. *	3	H	Eur-As	
Rutaceae	<i>Dictamnus albus</i> L. *	3	H	Eur-As	
Salicaceae	<i>Salix alba</i> L. *	6	Ph	Eur-As	
Santalaceae	<i>Viscum album</i> L. *	4	Ch	Eur-As	
	<i>Digitalis lanata</i> Ehrh. *	2,3	H	subMed	
	<i>Scrophularia nodosa</i> L. *	3	Cr	subBoreal	
	<i>Verbascum densiflorum</i> Bertol. *	2	T	subMed	
	<i>V. phlomoides</i> L. *	2	H	Eur	
	<i>V. phoeniceum</i> L. *	3	H	Eur-Sib	
	<i>Veronica officinalis</i> L. *	3	H	Eur-Sib	
Simaroubaceae	<i>Ailanthus altissima</i> (Mill.) Swingle *	6	Ph	Adv	
Smilacaceae	<i>Smilax excelsa</i> L. *	4	Ph	subMed	
	<i>Datura stramonium</i> L. *	1	T	Am (Adv)	
	<i>Hyoscyamus niger</i> L. *	1,2	T	Eur-As	
	<i>Solanum dulcamara</i> L. *	4	H	Eur-As	
	<i>S. nigrum</i> L. *	1	T	Kos	
Sapindaceae	<i>Acer platanoides</i> L. *	6	Ph	subMed	IUCN [LC]
	<i>A. tataricum</i> L. *	6	Ph	subMed	
Taxaceae	<i>Taxus baccata</i> L. *	4,6	Ph	Eur-NAm	RL [EN]; RDB [EN]; BDA; IUCN [LC]
Thymelaeaceae	<i>Daphne pontica</i> L.	4	Ph	Pont	RL [EN]; RDB [EN]; BDA
	<i>Sparganium erectum</i> L. *	3	Cr	Boreal	IUCN [LC]
	<i>Typha angustifolia</i> L. *	3	Cr	Kos	
	<i>T. latifolia</i> L.	3	Cr	Kos	IUCN [LC]
Ulmaceae	<i>Celtis australis</i> L. *	6	Ph	Med	
	<i>Ulmus minor</i> Mill. *	6	Ph	Eur-Med	

Urticaceae	<i>Parietaria officinalis</i> L. *	3	H	Eur	
	<i>Urtica dioica</i> L.	3	H	Boreal	IUCN [LC]
Verbenaceae	<i>Verbena officinalis</i> L. *	3	H	Kos	
Viburnaceae	<i>Sambucus ebulus</i> L. *	3	H	Eur-Med	
	<i>S. nigra</i> L. *	4,6	Ph	Eur-Med	
Violaceae	<i>Viola odorata</i> L. *	3	H	Eur-Med	
Vitaceae	<i>Vitis vinifera</i> L.	4	Ph	subMed	
Zygophyllaceae	<i>Tribulus terrestris</i> L. *	1	T	Eur-As	

Legend: **BT** (Biological type); **LF** (Life form); **FE** (Floral element); **SCS** (Species with conservation status); **1** (Annual); **2** (Biennial); **3** (Perennial); **4** (Shrub); **5** (Subshrub); **6** (Tree); **Cr** (Cryptophytes); **T** (Therophytes); **Ph** (Phanerophytes); **H** (Hemicryptophytes); **Ch** (Chamaephytes); **BDA** (Biological Diversity Act); **RL** (Red list of Bulgarian vascular plants); **RDB** (Red Data Book of the Republic of Bulgaria); **IUCN** (IUCN Red List of Threatened Species); **CITES** (Convention on International Trade in Endangered Species); **LC** (Least Concern); **EN** (Endangered); **VU** (Vulnerable); **CR** (Critically endangered); **DD** (Data Deficient); **Eur** (European); **Eur-OT** (European-Oriental-Turanian); **Eur-Sib** (European-Siberian); **Eur-Med** (European-Mediterranean); **Eur-As** (European-Asiatic); **Eur-subMed** (European-subMediterranean); **Eur-sMed** (European-south Mediterranean); **Eur-Med-CAs** (European-Mediterranean-centralAsiatic); **Eur-NAm** (European-north American); **Pont-Med** (Pontic-Mediterranean); **Kos** (Cosmopolitan); **Med-As** (Mediterranean-Asiatic); **subMed** (subMediterranean); **Med** (Mediterranean); **Pont** (Pontic); **Pont-subMed** (Pontic-subMediterranean); **sPont** (southPontic); **Bal** (Balkan); **Med-CAs** (Mediterranean-centralAsiatic); **sPont** (southPontic); **Bul** (Bulgarian); **subMed-As** (subMediterranean-Asiatic); **Adv** (Adventive); **NAm (Adv)** (northAmerican - Adventive); **SEux** (southEuxinian); **Paleo (Adv)** (Paleoadventive); **Bal-Dac** (Balkan-Dacian); **Med (Adv)** (Mediterranean-Adventive); **Pont-CAs** (Pontic-centralAsiatic); **Eux** (Euxinian); **sMed-CAs** (south Mediterranean-centralAsiatic); **Am (Adv)** (American-Adventive).

The families including more than 5 genera are 8 in number, which represents 9.8%. The largest number of genera are Asteraceae (22), Lamiaceae (16) and Rosaceae (14). After them are Fabaceae (11), Apiaceae (10), Ranunculaceae (9), Brassicaceae (6), and Boraginaceae (5). The other 74 families include between 1 and 4 genera.

Figure 1 presents the families that include more than 4 types of medicinal plants. These results showed similarities with studies on other floristic regions of the country (Zahariev et al. 2014; Nanova et al., 2015; Dragoeva et al., 2021).

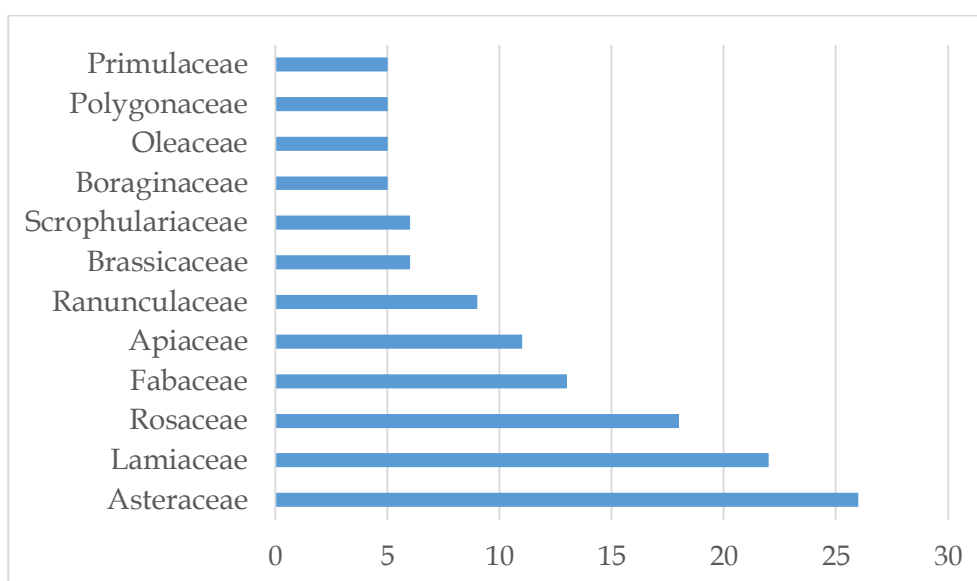


Fig. 1. Plant families with the largest number of species.

Biological type

Analyzing the literature sources on the biological type of plants, the largest group is perennial species – 135. Annual plants and shrubs are ranked in the next 2 positions, including 29 and 24 representatives, respectively. The distribution in the floristic region of the northern Black Sea coast is similar (Atanasova, 2021), which can be explained by the geographical proximity of the floristic regions, as well as similar soil and climatic

conditions. There were 18 tree taxa and 8 biennial taxa. Transitional forms included annual -biennial (14), shrubs-trees (12), and biennial-perennial (8). On Figure 2, The percentage distribution of species by biological type is presented. The species *Malva sylvestris* and *Glaucium flavum* are classified according to literature as annual-perennial. The perennial-semi-shrub group is represented by *Periploca graeca*, and the semi-shrubs-shrubs - by *Cionura erecta*.

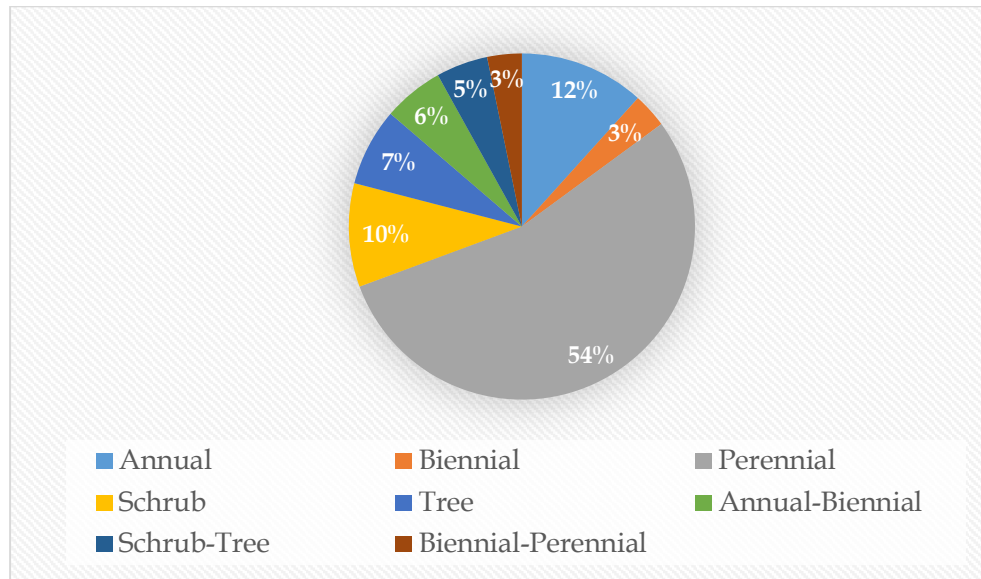


Fig. 2. Percentage distribution of the species according to biological type.

Life forms

The trend in the distribution of life forms is in accordance with the studies of Atanasova (2021) and Zahariev & Ivanov (2014) for the floristic regions of the Northern Black Sea Coast and Northeastern Bulgaria. The dominant group is hemicryptophytes – 104 species (41.3%), followed by phanerophytes – 50 species (19.8%), therophytes – 45 species (17.9%) and cryptophytes – 44 species (17.5%). The flora of the temperate climate zone is characterized by a predominance of hemicryptophytes, which was confirmed in the present study even when analyzing a sample of it – medicinal plants. The group of chamaephytes with the fewest representatives was recorded – 9 species (3.6%).

Floral elements

The geographical location of Bulgaria determines a significant diversity of floral elements (Assyov & Petrova, 2012). In the present study, the

distribution of medicinal plants by floral elements can be attributed to 35 groups. The floral elements occupying leading positions with more than 5 representatives are 11 in number (Fig. 3), and the total number of taxa included in them is 219, or 86.9% of the species indicated for the two floristic regions. The remaining 33 plants are assigned to 24 floral elements.

The group of Euxine species characteristic of the flora of Strandzha is represented by *Fagus orientalis* and *Prunus laurocerasus*. Of the Pontic species distributed along the Northern Black Sea Coast and the Caspian Sea, literature data prove the presence of *Daphne pontica*, *Ilex colchica*, and *Ruscus hypoglossum*. Of the medicinal plants, described so far in the two floristic regions, the following belong to the group of alien (adventurous) species that have settled in our country as a result of human activity: *Amorpha fruticosa*, *Ailanthus altissima*, and *Portulaca oleracea*.

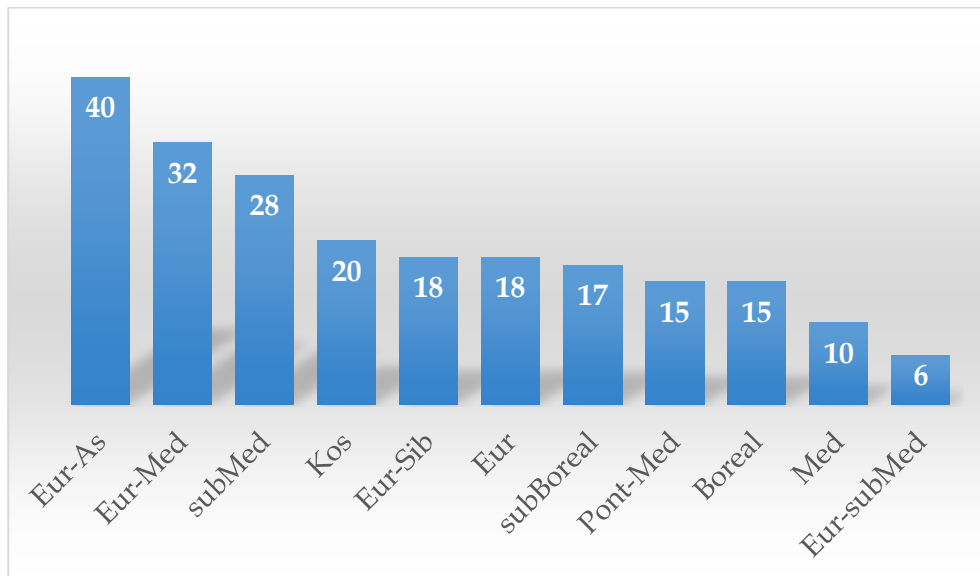


Fig. 3. Floral elements with the largest number of medicinal plants.

Species with conservation status

Analyzing the literature data, of the medicinal plants reported so far for the region of Strandzha and the southern Black Sea coast, 59 taxa have conservation status, representing 23.4% of the total species composition. The largest number of species included in the IUCN Red List for Bulgaria is 31 taxa, followed by the Biological Diversity Act - 26 medicinal plants, and 24 species included in the Red List of higher plants in Bulgaria. In the Red Book of the Republic of Bulgaria, Volume 1 Plants and Fungi, 13 plants are present. Of these *Opopanax chironium* subsp. *bulgaricum*,

Eryngium maritimum, *Galanthus nivalis*, *Nuphar lutea* and *Nymphaea alba* are indicated by Atanasova (2021) and for the northern Black Sea coast. Appendix II of the CITES Convention includes *Anacamptis pyramidalis*, *Anacamptis papilionacea*, *Cyclamen coum* and *Galanthus nivalis*.

Four Balkan endemics were identified in the present study - *Achillea clypeolata*, *Opopanax chironium* subsp. *bulgaricum*, *Semperiolum leucanthum*, and *Thymus longedentatus*.

On Figure 4, the distribution of medicinal plants with nature conservation status and the corresponding category are presented.

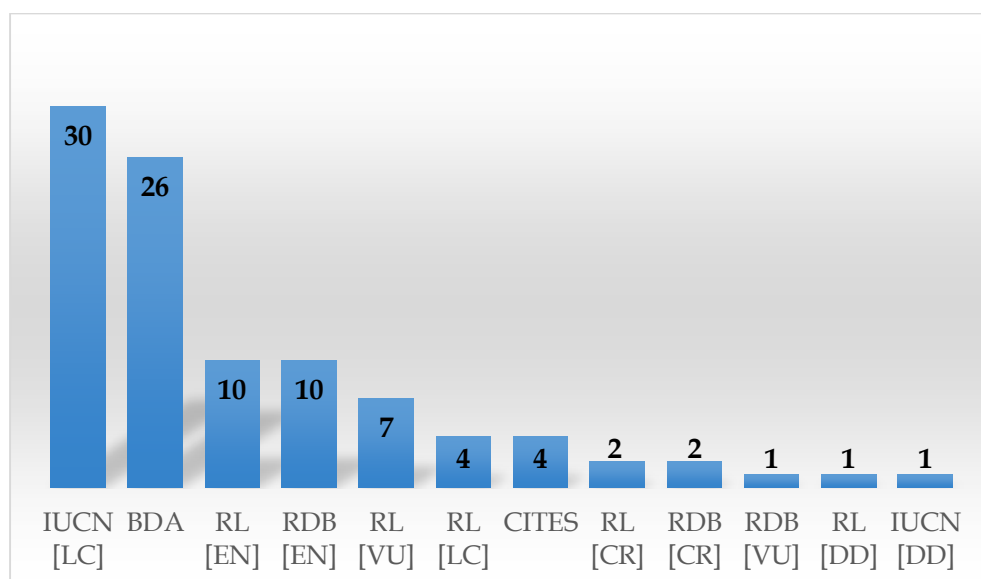


Fig. 4. Medicinal plants with conservation status.

Conclusions

The literature analysis on medicinal plants, distributed in the territory of Strandzha Mtn and the southern Black Sea coast, shows relatively few studies in this field carried out within the borders of the two floristic regions. Targeted and systematic studies are needed to establish the actual plant diversity, in particular, the diversity of medicinal plants in the two territories. In the course of these studies, through observations and studies on the traditions and lifestyle of the local population concerning the medicinal plants used, the ethnobotanical characteristics of the people in the two floristic regions will be clarified. Through the use of modern methods of phytochemistry, the reasons for the use of specific medicinal plants from a scientific point of view will be established. The popularization of the results obtained would enrich both the scientific data on the medicinal flora of the country as a whole, and the culture of the local population regarding the use and conservation of medicinal plant resources.

Acknowledgments

This study is financed by the European Union-NextGenerationEU, through the National Recovery and Resilience Plan of the Republic of Bulgaria, project № BG-RRP-2.004-0001-C01.

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Received: 27.01.2025

Accepted: 07.05.2025