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MEDICINAL PLANTS IN THE ROPOTAMO RESERVE: BIODIVERSITY AND CONSERVATION SIGNIFICANCE

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Abstract. The paper presents the recent diversity and conservational importance of the medicinal plants in the Ropotamo Reserve (SE Bulgaria): 211 species from 181 genera and 68 families. They comprised significant part of the total plants biodiversity of the reserve, which consisted of 550 species.

The spread of the medicinal plants in different habitats of European significance was shown together with the threatened status of the species and their relative abundance. The distribution of all medicinal species was analyzed according to the frequency or rarity of their occurrence and it was proved that the reserve area hosted some rare for Bulgaria species of medicinal plants.

Key words: Black Sea coast, Bulgaria, rare species, threatened species

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INTRODUCTION

Ropotamo Reserve was created in 1940 to preserve the dense forests (*longozes*) along the banks of the river Ropotamo. In 1975, it was declared as Ramsar site. The reserve is a part of a wetland complex of great national and international significance and recently has been included in a Natura 2000 network protected site (Michev & Stoyneva 2007; Vassilev et al. 2013).

The reserve with its complicated relief is characterized by rich floristic diversity caused mainly by the diversity of habitats (*e.g.* dense forests along the river banks, swamps, rocky shores, dunes, open spaces and oak forests). Although the spread of some medicinal plants has been studied (Bondev & Velchev 1984; Gussev et al. 2003; Sidjimova 2007), a complex study on the recent distribution and resources of all medicinal plants in Ropotamo Reserve has not been conducted so far (Vitkova et al., in press). Therefore, the present paper represents detailed data on the species composition of the medicinal plants in the area, collected during larger study aimed at the preparation of the new Ropotamo Reserve Management Plan (2015-2025), abbreviated hereafter as RRMP.

MATERIAL AND METHODS

Ropotamo Reserve is situated between 150 and 0 metres above the sea level along the lowest stream of the Ropotamo River in South-eastern Bulgaria. It occupies an area of 1000.7 ha and falls in the European Continental and Continental-Mediterranean climatic areas characterized by mild winter and warm, dry summer (Subev & Stanev 1963).

For the implementation of the task, field trips were organized in the autumn period of 2014 and two methods were applied: Route method and Method for monitoring of higher plants (Gussev et al. 2008) with the following important features of the populations taken into account: area, horizontal structure, number, project coverage. Species identification was done in the filed with some additional cameral work, following mainly Jordanov (1963-1979), Velchev (1982, 1989), Kožuharov (1995) and Delipavlov et al. (2003). In addition to our own findings, all data concerning medicinal plants in the available literature were analyzed in terms of floristics and nature conservation significance. The list of medicinal plants was prepared after the Application to Art. 1 of the Medicinal Plants Act (2000 - MPA). The threatened status of each species was determined according to different international and national documents: Bern Convention (1979), CITES (1973), IUCN (2001), Medicinal Plants Act (2000 - MPA), Biological Diversity Act (2002), Act on Amending and Suplementing the Biological Diversity Act (2007 - BDA), Red List of Bulgarian vascular plants (Petrova & Vladimirov 2009 - RL) and Red Data Book of the Republic of Bulgaria (Peev 2015 - RDB). The habitats were classified according to EUNIS (2007).
Table 1. Medicinal plants in the Ropotamo Reserve. Abbreviations used: SCS – Species of conservation significance; RS – resources (G – group, Gs - groups, N– numerous, Sp – single plants); EHB – habitat (indicated by its relevant number); RL - Red List of vascular plants (Petrova & Vladimirov 2009); RDB - Red Data Book of the Republic of Bulgaria (Peev 2015); EN (Endangered); VU (Vulnerable); LC (Least Concern); BDA - Biological Diversity Act (2002); SRPU - Special Regime of Protection and Use according to Medicinal Plants Act (2000); BC - Bern Convention (1979); CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973); * - Literary data. Families and species are enlisted in alphabetical order.

<table>
<thead>
<tr>
<th>№</th>
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<th>SCS</th>
<th>RS</th>
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<td><em>Ecballium elaterium</em> (L.) A. Richard</td>
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<td>Dioscoreaceae</td>
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<td><em>Knautia arvensis</em> (L.) Coult.</td>
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<td>Ephedraceae</td>
<td><em>Ephedra distachya</em> L.*</td>
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<td><em>Lathyrus niger</em> (L.) Bernh.</td>
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<td>210</td>
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</table>

RESULTS

All documented medicinal plants of the Ropotamo Reserve are enlisted in Table 1. The list contains 197 species found by us during the present study, together with 14 other species which have been recorded at least once in the area and published in the relevant literature (indicated by asterisk - *). The total list of medicinal plants reported from the reserve comprised 211 species belonging to 181 genera and 68 families. This number represents 38% of all 550 species of vascular plants known form the reserve territory (for details see VITKOVA ET AL., in press) and 28% of all medicinal plants in Bulgaria (MPA).

Twenty-three species of the medicinal plants, or 11%, were threatened according to different documents (Table 1): seven were *Endangered* in the Bulgarian Red Data Book (Peev 2015), fifteen were from the Red List of Bulgarian vascular plants (Petrova & Vladimirov 2009), eighteen species were from the Biological Diversity Act (2002), four species were from the species protected under CITES and seven species were protected by the MPA with Special Regime of Protection and Use (2000).

Many medicinal plants were found to grow in habitats of European significance according to EUNIS (2007) – Table 1. The mixed oak forests, which represent the habitat EUNIS G1.76A1 Euxino-Thracian [Quercus frainetto]–[Quercus cerris] forests (Fig. 1), cover large areas in the reserve reaching the coastal area north of the megalith Begliktash, the shores above the Black Sea bay St. Paraskeva (Fig. 2) and the slopes of the Vulchanovoto Kale area as well. Totally 68 medicinal plants were found there, ten of them were of conservation significance (Table 1). Three species were protected: *Cyclamen coum*, *Galanthus nivalis* and *Hypericum androsaemum.*
C. coum and Ruscus aculeatus were abundant (VITKOVA ET AL., in press).

Both banks of the Ropotamo River are covered with dense forests (Fig. 3). The periodically flooded mixed deciduous forests along the banks of the river represent the habitat EUNIS G1.2232 Helleno-Balkanic ash-oak-alder forest (Fig. 4). Thirty-one medicinal plants were found there, and two of them were of conservation significance - Leucojum aestivum and Ruscus aculeatus (Table 1).

The habitat EUNIS C3.2 Water-fringing reedbeds and tall heleophytes other than cans (Fig. 5) is represented by the vegetation of the Arkutino marsh, where we found nine medicinal plants. Two of them were with conservation status - Nymphaea alba and Nuphar lutea (Table 1).

The secondary grasslands at the sides of destroyed forests represent the

habitat EUNIS E1.4344 *Helleno-Balkanic andropogonoid grass steppe*. Twenty-two medicinal plants were found there, among which two were of conservation significance - *Anacamptis pyramidalis* and *Orchis papilionacea*e (Table 1).

Habitat B1.7. *Coastal dune woods* occupies the eastern steep and the western sloping slopes of the dune at the Cape Kaya (Fig. 6). This is the largest dune along the Bulgarian Black sea coast covered with woods. The forest communities on the dune have typical xerothermic features, the trees are low and branched. These coenoses are dominated by *Carpinus orientalis* Mill., *Fraxinus ornus*, *Quercus cerris* Morariu, *Q. frainetto*, *Q. pubescens* Schwarz and *Celtis australis* is also characteristic. Twenty-four medicinal plants were found in this habitat (Table 1).

The habitat EUNIS B1.4B11 *Southwestern Pontic fixed dunes* (Fig. 7) is widely presented in the reserve by fixed grey dunes. We found 15 medicinal plants there, two of which were of conservation significance – *Trachomitum venetum* and *Ephedra distachia* (Table 1).

The habitat EUNIS B1.313 *Pontic embryonic dunes* represents the first stages of the dune formation (Fig. 8). Four medicinal plants, mostly obligate psammophytes, were found there. Two species were of conservation significance: *Eryngium maritimum* and *Euphorbia peplis* (Table 1). During the study, we
proved that the localities of the threatened medicinal plants *Eryngium maritimum*, *Euphorbia peplis* and *Glaucium flavum* often fall into the beach area actively used for recreation.

The next habitat of European significance in the reserve is EUNIS F5.51A4 Eastern *[Phillyrea]* thickets which occupies the exposed dry slopes in the locality Luvksa Glava. There, besides the main species *Phillyrea latifolia*, four other medicinal plant species were found: *Fraxinus ornus*, *Paliurus spina-christi*, *Hedera helix*, *Ruscus aculeatus* (Table 1).

The largest number of medicinal plants was found in the habitats G1.76A1 Euxino-Thracian *[Quercus frainetto]–[Quercus cerris]* forests (68 species) followed by G1.2232 Helleno-Balkanic ash-oak-alder forest (31) B1.7. Coastal dune woods (24), E1.4344 Helleno-Balkanic andropogonoid grass steppe (22) and B1.4B11 Southwestern Pontic fixed dunes (15). The largest number (10) of conservationally significant species was found in the habitat G1.76A1.

Some of the recorded medicinal plants are of medium to high rarity in Bulgaria. Moreover, some of them are distributed only along the Black Sea coast and Strandzha Mountain (*e.g.* *Artemisia santonicum*, *Eryngium maritimum*, *Euphorbia peplis*, *Glaucium flavum*, *Hypericum androsaemum*, *Trachomitum venetum*). Worthy to note is that 58% of the medicinal species were found as single plants, in a group or in groups (14, 14 and 95 species, respectfully), and only 42% (88 species) were more abundant (Table 1).

**DISCUSSION**

The high number of medicinal plants recorded in the reserve territory (211), which represents 38% of its flora and the finding of 23 threatened species (six of which with the IUCN category *Endangered*) proves the nature conservation significance of the flora of the Ropotamo Reserve. Noteworthy, some of the threatened species occur only as single specimens in the reserve area. In addition, 140 medicinal plants in eight reserve habitats of European significance were reported. Moreover, some of the medicinal species were rare for the country and this, combined with the well-known strong recent anthropogenic pressure on the Black Sea coast, increases their vulnerability and threat of extinction.

**CONFLICT OF INTERESTS**

The authors declare that there is no conflict of interests regarding the publication of this article.

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