BIOSPHERE RESERVES IN BULGARIA AND THEIR FOREST GENETIC RESOURCES

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Abstract

Protected territories play important role in conservation of biological diversity both in regional and global aspect. Biosphere reserves in mountains of Bulgaria include valuable populations, representatives of families Pinaceae, Fagaceae, etc. In biosphere reserves, object of this study, tree species differ according to their distribution and share in the composition of dendrocoenoses. It was determined that best represented in biosphere reserves in Bulgaria are Norway spruce and beech forests in areas over 800-900 m a.s.l., and relatively less represented are oaks, Scots pine and Austrian black pine. Large number of formed forest ecosystems in these protected territories is distinguished for their high productivity, vitality, long life and good genetic-and-breeding characteristics.

Key words: ecology, protected territories, mountains, plant biodiversity, forest phytocoenoses

INTRODUCTION

Preserving of forest tree genetic resources is of big importance for biological diversity conservation in forest ecosystems, particularly in mountain territories. Reserves are protected territories with undisturbed nature under strict regime of protection mainly because of their primary character and scientific value as nature standards. Through scientific analysis it is possible to determine the status not only of single vegetation components but also to study factors, which determine the natural productivity of ecosystems in reserves. Alexandrov (1990) has pointed out that the category maintained reserves in Bulgaria also includes small forest reserves, where, besides the big number of polytopic forest tree species typical for almost whole Europe, numerous endemic species are conserved, among them Pinus peuce Griseb. and P. heldreichii Christ., Fagus orientalis Lipsky, Aesculus hippocastanum L., Cercis siliquastrum L., etc. Specimens from parts of natural ecosystems are announced reserves, which include typical or significant wild species and their habitats. It should be underlined that all activities in reserves in Bulgaria are forbidden, with the exception of these ones concerning their protection, research activity and ecological monitoring, which responds to the classification of International Union for Conservation of Nature (IUCN), proclaimed in 1994, concerning management of territories under strict regime of management (Georgiev, 2005).

One of the basic forms for conservation of biological diversity is establishment of a network of protected natural territories and objects, among which biosphere reserves are
of particular importance (Bezlova, Lakova, 1997). Together with their environmental-protection function, biosphere reserves are used for carrying out of research studies on structure and functioning of ecosystems, as well as regularities and factors, which keep dynamic balance and sustainability of natural ecosystems. Bulgaria is among the first countries, supporting the efforts of UNESCO to establish worldwide network of protected territories, as Tsakov, Alexandrov (2005) pointed out. Their conservation and maintenance have global meaning for biodiversity conservation. The biodiversity conservation is impossible without establishment and maintenance of representative network of protected territories both on national and European levels (Bezlova, Krastev, 2004). In some of them, the number of species included in the Red Book of Bulgaria, applications of the Law for Biological Diversity and other lists of international conventions and documents of environmental protection importance, is large.

Studies on status and vegetation diversity in biosphere reserves in mountain regions of Bulgaria

Biosphere reserves in mountain regions in Bulgaria have preserved valuable populations of coniferous and deciduous tree species with rich gene pool, which are well-preserved and are distinguished for their autochthonous character, endemic component and good genetic-and-breeding indices. Velkov, Alexandrov (1983) underlined the big significance of forest tree species genetic resources in mountains. Besides, venerable trees, which have survived until today, are also genetic resource and natural phenomenon. Numerous studies have been carried out in this field (Alexandrov et al., 1998; Efremov et al., 2000). Basic factor for restoration of forest ecosystems and their sustainable development in our geographical region is the autochthonous forest tree and shrub vegetation in the Balkan Peninsula (Alexandrov, Velkov, 1996). Mountain massifs and connecting chains are main places of formed and preserved autochthonous vegetation in this part of South-Eastern Europe. Data about utilisation of forest genetic resources in Bulgaria have been analysed by Alexandrov, Pandeva (2007), who underlined the importance of their preservation. Stefanov (1943) pointed out that altitude above sea level is of significant importance for determination of single phytogeographic structures in the Balkans and this altitude to great extent determines the ecological situation in mountain regions.

The purpose of present study is to make characteristics of mountain biosphere reserves in Bulgaria on the basis of existing literature sources and some observations of the authors and to describe their territorial particularism and variety of forest tree species.

The network of biosphere reserves in Bulgaria is well developed (Alexandrov, 1988) and, according to their area, they could be grouped as follows: with area between 2500 and 3000 ha – Lopushna, Bayuvi dupki-Dzhindzhiritsa, Steneto; with area over 1500 ha and up to 2000 ha – Parangalitsa, Marichini ezera, Byala reka; with area between 1000 and 1500 ha – Kupena, Bistrishko branishte, Slavyanka, Dupkata, Boatin, Tsarichina, Chuprene; with area between 500 and 900 ha – Mantarista, Srebarna, Chervena stena, Kamchia. Big part of them includes valuable forest ecosystems, which are golden fund
of tree and shrub genetic resources. It should be underlined that Bulgarian biosphere reserves include not only populations of forest tree and shrub species from the centre of their occurrence but also peripheral (marginal) populations, which together provide more complete pool of the local gene pool. According to updated information (http://www.blriosv.hit.bg; Georgiev, 2004), today biosphere reserves in Bulgaria are: Alibotush, Bayuvi dupki-Dzhindzhiritsa, Bistrishko branishte, Boatin, Dzhendema, Dupkata, Kamchia, Kupena, Mantaritsa, Parangalitsa, Srebarna, Steneto, Uzunbodzhak, Tsarichina, Chervenata stena, Chuprene. Big treasure of representatives of higher flora and fauna is preserved there. As Raev, Dimitrov (2005) outlined, 16 biosphere reserves in Bulgaria have been included in 1977 in the list of biosphere reserves of UNESCO’s Man and Biosphere programme. Fifteen of them are forest reserves, fourteen have been also declared in the Bulgarian Protected Areas Act as category 1 – strict nature reserves. Authors point out that biosphere reserves have relatively large areas. For example, one of the smallest ‘Bistrishko branishte’ (Norway spruce forest) is 1061.6 ha and one of the largest ‘Tsarichina’ (mixed coniferous-broadleaved forest) is 3418.7 ha. It was specified that they all have a well-organised zoned structure, which includes core and buffer zones. It also important to mention that only biosphere reserve Srebarna (902.1 ha) is not forest reserve. It is situated in the north-eastern part of Bulgaria, on the right bank of the Danube River, in Karst declination surrounded by two hills. Its territory includes a lake, natural marsh-lands, belt of tree phytocoenoses along the river Danube and aquatic area between an island and the river bank. The reserve protects nesting colony of pelicans and preserves valuable biological diversity.

Numerous investigations have been carried out about the status of forest ecosystems in some reserves in Bulgaria. The contribution of Forest Research Institute (Bulgarian Academy of Sciences) refers to forest-biological and ecological investigations, carried out during decades. Results are presented in numerous scientific publications (Nedyalkov, Dimitrov, 1981; Raev, 1981, 1986; Krastanov, Belyakov, 1981; Milanov, Kostov, 1981; Kolev, Dobrev, 1982; Marinov, Stoyanova, 1985; Stoyanova, 1994, 2003, 2008; Zhiyanski, 2003; Zlatanov, Georgiev, 2006; Zlatanov et al., 2006; Hinkov et al., 2006; Efremov, Hristova, 2008). The health status of forests in protected territories has also been determined and the impact of various pests has been studied (Tsankov, Mirchev, 1985, 1991; Gueorguiev et al., 2003; Migliaccio et al., 2004; Rossnev et al., 2005; Georgiev, 2006; Georgiev et al., 2006). Representative and well-preserved ecosystems are included in biosphere reserves – standard of natural and untouched nature (Bezlova, Lakova, 1997).

Large part of forest ecosystems, formed in mountain biosphere reserves in Bulgaria, have high bioproductivity, vitality, durability and good genetic-and-breeding characteristics. Studies have been carried out in this field by numerous authors, who determined range, status and species diversity of vegetation in different mountain reserves (Bondev et al., 1981; Andreev, 1981; Velchev, Rusakova, 1981; Andreev, Nikolov, 1985; Spiridonov, 1985; Sokolovska et al., 2004; Kolev, 2006, etc.) and characterised forest tree genetic resources in some preserved mountain territories (Alexandrov, 1988). Results
were also determined about status of natural regeneration processes in protected forest ecosystems (Stoyanova, 1989, 1991, 2003; Efremov, Hristova, 2008).

It was determined that valuable populations are situated in Bulgarian mountain biosphere reserves, representing families Pinaceae, Fagaceae, etc. Forest formations consist of various tree species and are characterised predominantly by high productivity and good growth indices. After analyses and general conclusions, some structural peculiarities of dendrocoenoses in forest ecosystems of determined protected territories were clarified, which have the importance of stands with standard character concerning growth and development of high-productive mountain forests (Belyakov et al., 1964; Nedyalkov, Dimitrov, 1981; Stoyanova, 1991, 1994, etc.).

Data about forest tree genetic resources in studied biosphere reserves and species composition shown in Tables 1 and 2 are obtained from some own investigations, as well as according to literature sources (Kolev, Dobrev, 1982; Marinov, Stoyanova, 1985; Nedyalkov, Nikolov, 1986; Alexandrov, 1988; Stoyanova, 1989; Andreev, 1990; Georgiev, 2004; Stoyanova, 1994, 2009).

**Biosphere reserves in mountains in South and South-West Bulgaria**

Biosphere reserves in higher mountains in Bulgaria preserve natural forest ecosystems formed predominantly by coniferous tree species.

Table 1 shows some peculiarities of these reserves, the mountain they are situated in, as well as the typical forest tree biodiversity.

One of the first Bulgarian reserves is **Biosphere reserve ‘Bistrishko branishte’** with area 1061.6 ha. It is situated in Vitosha mountain between 1430 and 2282 m a.s.l. *Picea abies* (L.) Karst. forests with big form variety of subspecies are preserved on its territory. In 2001, a tornado affected the central part of the reserve. Since then, as a result, wind throw occurred in venerable Norway spruce forest, where Efremov, Hristova (2008) investigated initial occurrence of natural regeneration of forest tree vegetation on the place of dead Norway spruce phytocoenoses. The authors determined predominence of the spruce in the composition of the undergrowth. It is pointed out that silver fir, Scots pine, Macedonian pine and mountain pine are indigenous tree species with the potential of basic forest-formers, which in the past have been converted into rare tree species in the reserve due to anthropogenic activities. According to Georgiev (2005), in 2003-2004 bark beetles destroyed Norway spruce forests within an area of 60-70 ha. The authors carried out investigations in 2009 in ‘Bistrishko branishte’ and described the variety of preserved forest tree species. The results confirmed the predominating participation of *Picea abies* (L.) Karst. in the undergrowth and composition of forming new vegetation cover, as a result of natural regeneration of tree species on the place of dead spruce dendrocoenoses in the reserve after the tornado.

**Biosphere reserve ‘Parangalitsa’** (1509 ha) is situated in Rila mountain in coniferous forests level. High-productive Norway spruce forests cover huge territories. Less coverage have forests of *Abies alba* Mill., *Fagus sylvatica* L., *Pinus sylvestris* L. and *Pinus peuce* Griseb. Dynamics of regeneration in coniferous dendrocoenoses in the reserve has been studied (Stoyanova, 1994, 2003) and structure and composition of undergrowth...
in dendrocoenoses with ediphicator _Picea abies_ (L.) Karst. has been determined. Detailed investigations were also carried out on the characteristics of root systems of Norway spruce and Scots pine trees in biosphere reserve ‘Parangalitsa’ (Zhiyanski, 2003; Zhiyanski, 2003). Our other investigations established that the following types of forests have wider occurrence in the reserve: _Abieto-Piceetum saniculosum, Piceetum oxalidosum, Pineto-Piceetum herbosum mixtum_. _Fagus sylvatica_ L. participates in the composition of dendrocoenoses in many places at lower altitudes. According to the obtained results, these are mixed forest ecosystems, which should be referred to the forest type _Fageto-Abieto-Piceetum luzulozum_. The reserve also preserves in natural condition monodominant venerable beech dendrocoenoses, situated in small areas in the lower parts of the reserve. Long-term investigations in the experimental stations on dynamics of regeneration processes and vegetation biodiversity in some of these forests were carried out, as well as dendrobiometric, ecological and forest-biological investigations (Raev, 1981; Nedyalkov, Dimitrov, 1981; Marinov, Stoyanova, 1985; Argirova et al., 1985; Stoyanova, 1993, 2003, 2009).

**Biosphere reserve ‘Bayuvi dupki – Dzhindzhiritsa’** (2873 ha) is situated in Pirin mountain. Natural forests of _Pinus peuce_ Griseb., _P. heldreichii_ Christ., _Picea abies_ (L.) Karst. and _Abies alba_ Mill. have been preserved there. The forest area of the reserve is more than 50%, with predominating coniferous forests and very few deciduous forests. It also preserves huge areas with various vegetation from sub-Alpine and Alpine belt. The reserve is place for preservation of big habitats of edelweiss. Besides precious and unique for Europe forests of _Pinus heldreichii_ Christ., _P. peuce_ Griseb., _P. nigra_ Arn., considerable number of relict vegetation species are preserved here. Austrian black pine forests, as well as mixed beech-coniferous forest ecosystems occur in the lowest parts of the reserve, and with the increasing of the altitude, mixed pine-spruce-fir forests occur, with mixture of _Acer hyrcanum_ Fisch. et Mey. and _Fraxinus excelsior_ L., followed by forests of _Pinus peuce_ Griseb. and _P. heldreichii_ Christ. and mountain pine formations over 2100 m a.s.l.

**Biosphere reserve ‘Mantaritsa’** (1069.2 ha) is situated in Western Rhodopes. Its territory is at 1200-1900 m a.s.l. and includes mixed forests of _Picea abies_ (L.) Karst., _Abies alba_ Mill. and _Fagus sylvatica_ L.

**Biosphere reserve ‘Kupena’** (1764.1 ha) lies on northern slopes of the Rhodopes. Huge forest massif at altitude 550-1400 m is protected there. Natural beech stands are mostly spread but pure forests of this species are few. Second place according to distribution in the reserve take _Pinus sylvestris_ L. forests. Very valuable in genetic term are areas with domination of _Abies alba_ Mill. Mixed forests of _Pinus nigra_ Arn. and _Ostrya carpinifolia_ Scop. can also be seen in the reserve and in its lower parts – of _Quercus petraea_ Liebl. Among shrub species, most widely spread are _Cornus mas_ L., _Crataegus monogyna_ Jacq., _Corylus avellana_ L., _Syringa vulgaris_ L., etc.

**Biosphere reserve ‘Dupkata’** is a typical forest reserve and covers territories between 1000 and 1600 m a.s.l. Forests of _Pinus sylvestris_ L. predominate, typical for the reserve are also these of _Picea abies_ (L.) Karst. and _Abies alba_ Mill., and in lower parts predominate deciduous species _Fagus sylvatica_ L., _Quercus_ sp., _Alnus_ sp., willows,
**Table 1**

<table>
<thead>
<tr>
<th>Name of reserve</th>
<th>Mountain</th>
<th>Area (ha)</th>
<th>Dominating tree species</th>
<th>Some other typical or protected plant species (basic source after Georgiev, 2004)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bistrishko branishtе</td>
<td>Vitosha</td>
<td>1061,6</td>
<td><em>Picea abies</em> (L.) Karst.</td>
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<td></td>
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<td></td>
<td><em>Trollius europaeus</em>, <em>Aquilegia aurea</em>, <em>Anemone narcissiflora</em>, <em>Gentiana punctata</em></td>
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<tr>
<td>Parangalitsa</td>
<td>Rila</td>
<td>1509,0</td>
<td><em>Picea abies</em> (L.) Karst.</td>
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<td></td>
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<td></td>
<td><em>Abies alba</em>, <em>Primula deorum</em> <em>Geum bulgaricum</em>, <em>Potentilla montenegrina</em></td>
<td></td>
</tr>
<tr>
<td>Bayuvi dupki-Dzhindzhiritsa</td>
<td>Pirin</td>
<td>2873,0</td>
<td><em>Pinus peuce</em> Griseb.</td>
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<td></td>
<td></td>
<td></td>
<td><em>Pinus heldreichii</em>, <em>Pinus nigra</em>, <em>Picea abies</em>, <em>Fagus sylvatica</em>, <em>Abies alba</em>, <em>Pinus sylvestris</em>, <em>Poa pirinica</em>, <em>Carex pirinica</em>, <em>Campanula transsilvanica</em>, <em>Brassica jordanoffii</em>, <em>Taraxacum bithynicum</em>, <em>Leontopodium alpinum</em></td>
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<tr>
<td>Mantaritsa</td>
<td>Western Rhodopes</td>
<td>1069,2</td>
<td><em>Picea abies</em> (L.) Karst.</td>
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<td></td>
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<td></td>
<td><em>Abies alba</em>, <em>Fagus sylvatica</em></td>
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<tr>
<td>Uzunbodzhak</td>
<td>Strandzha</td>
<td>2581,5</td>
<td><em>Fagus orientalis</em> Lipsky</td>
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<td></td>
<td></td>
<td></td>
<td><em>Quercus petraea</em>, <em>Q. hartwissiana</em>, <em>Q. frainetto</em>, <em>Q. cerasis</em>, <em>Carpinus betulus</em>, <em>Fraxinus ornus</em>, <em>Laurocerasus officinalis</em>, <em>Rhododendron ponticum</em>, <em>Ilex sp.</em>, <em>Daphne pontica</em>, <em>etc.</em></td>
<td></td>
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<tr>
<td>Kupena</td>
<td>The Rhodopes</td>
<td>1764,1</td>
<td><em>Fagus sylvatica</em> L.</td>
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<td></td>
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<td><em>Pinus sylvestris</em>, <em>Abies alba</em>, <em>Pinus nigra</em>, <em>Lonicera xylosteum</em>, <em>Corylus sp.</em>, <em>Ribes nigrum</em></td>
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<tr>
<td>Dupkata</td>
<td>The Rhodopes</td>
<td>1210,8</td>
<td><em>Pinus sylvestris</em></td>
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<td></td>
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<td></td>
<td><em>Picea abies</em>, <em>Abies alba</em>, <em>Fagus sylvatica</em>, <em>Quercus sp.</em>, <em>Alnus sp.</em>, <em>willows</em>, <em>Sorbus aucuparia</em> L., <em>etc.</em></td>
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<tr>
<td>Chervenata stena</td>
<td></td>
<td>3029,0</td>
<td><em>Pinus nigra</em> Arn.</td>
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<td></td>
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<td></td>
<td><em>Abies alba</em> ssp. <em>borisii-regis</em>, <em>Carpinus betulus</em>, <em>Cypripedium calceolus</em>, <em>Tulipa rhodopaea</em>, <em>Goodyera repens</em>, <em>Morus persica</em>, <em>Taxus baccata</em>, <em>Haberlea rhodopensis</em></td>
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<tr>
<td>Alibotush</td>
<td>Slavyanka</td>
<td>1628,0</td>
<td><em>Pinus heldreichii</em></td>
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<td></td>
<td><em>Pinus nigra</em>, <em>Abies borisii-regis</em>, <em>Fagus sylvatica</em>, <em>Ostrya carpinifolia</em>, <em>Pinus peuce</em>, <em>Taxus baccata</em>, <em>Adianthum capillus-veneris</em>, <em>etc.</em></td>
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*Sorbus aucuparia* L. etc. Some Balkan endemic species are also preserved here, as well as numerous other representatives of Bulgarian higher flora.

**Biosphere reserve ‘Mantaritsa’** (1069.2 ha) is situated in Western Rhodopes at 1200-1900 m, where mixed forests of *Picea abies* (L.) Karst., *Abies alba* Mill., *Pinus sylvestris* L., *Fagus sylvatica* L. are preserved. In the reserve, mixed spruce-fir forests are in very good condition, and pure silver fir forests almost do not occur. *Fagus sylvatica* L. does not form pure dendrocoenoses as well, but is accompanied by silver fir and Norway spruce. In some places in beech forests in the reserve, Scots pine, *Populus tremula* L. or *Salix caprea* L. occur as solitaires or small groups.
Biosphere reserve ‘Uzunbodzhak’ is of big conservation significance and covers territory between 25 and 282 m a.s.l. It has been announced with the aim to preserve deciduous forests of oak and *Fagus orientalis* Lipsky, typical shrub and grass vegetation for the region of Strandzha Mountain, especially the orchids. Some representatives of southern Euxinic flora element can be found in forest phytocoenoses. It is known that this is one of the places in Bulgaria and Europe with highest presence of relict plants.

**Biosphere reserve ‘Chervenata stena’** (3029 ha), which is considered typical botanical reserve, should be also mentioned here. It is situated in Chernatitsa-Prespa region. Most important role in formation of vegetation cover plays *Pinus nigra* Arn., and an element of natural vegetation are also coenoses of *Abies alba* ssp. *borisii-regis*. Communities of *Carpinus betulus* L., *Fagus sylvatica* L. and *Ostrya carpinifolia* Scop. have significant share in primary (indigenous) vegetation of the reserve. Some artificial stands of *Pinus sylvestris* L. have been formed in some spots in the past, replacing destroyed forest ecosystems. Widely spread are derivative tree and shrub coenoses of *Quercus pubescens* Willd., *Carpinus orientalis* Mill. and *Juniperus oxycedrus* L.

**Biosphere reserve ‘Alibotush’** (1628 ha) is situated in Slavyanka Mountain at altitude 1140-2212 m (peak Gotsev) and has typical Karst relief. This is the largest habitat of *Pinus heldreichii* Christ. on Balkan Peninsula. Unique relict forests of *Pinus heldreichii* Christ., *P. nigra* Arn., *Abies borisii-regis*, as well as numerous rare and threatened plant species are preserved here. Predominating tree species between 1000 and 1450 m a.s.l. is *Pinus nigra* Arn. Relatively less are deciduous forests of *Fagus sylvatica* L. and *Ostrya carpinifolia* Scop. Forests of *Pinus heldreichii* Christ. are preserved in high parts of the reserve. The flora of the reserve is unique and rich of plant species.

**Biosphere reserves in Balkan range**

Table 2 shows some peculiarities of six biosphere reserves situated in the Balkan range, as well as main tree species, which occur there. According to the forest tree vegetation in this mountain it should be underlined that *Fagus sylvatica* L. forests are most widely spread.

Deciduous forests from the range of tree species of Fagaceae family are with biggest share in forest fund of Bulgaria.

In the **Biosphere reserve ‘Boatin’** (1597.2 ha), one of the most beautiful beech forests is preserved. The reserve is situated in the Balkan range and its territory spreads at an altitude from 800 to about 1750 m, where two clearly differentiated forest formations are distinguished: lower, larger, composed by pure beech forests and upper – by pure Norway spruce forests, over which there are high-mountain pastures. The higher flora is represented by over 500 species.

The protected territory of the Biosphere reserve ‘Steneto’ (3578.7 ha) is covered by primary forest ecosystems with rich genetic fund of venerable forests, composed predominantly by *Fagus sylvatica* L., and to less extent by coniferous forests, mainly Norway spruce and silver fir. Besides, some relict species occur there, which are included in the list of protected plants in Bulgaria, such as *Taxus baccata*, *Daphne laureola*, *Haberlea rhodopensis*, etc. The reserve is situated in the Balkan range. Large number of higher
plants is preserved here. It is considered that the reserve and its peripheral territories preserve the biggest massif of thermophyllic forests in Bulgaria.

**Biosphere reserve ‘Tsarichina’** (3418.7 ha) is situated in the Balkan range at an altitude varying between 850 m and 2198 m. Most typical of this reserve is the only one natural habitat of *Pinus peuce* Griseb. in the Balkan range. The area of *Fagus sylvatica* L. forests, however, is the largest one. Mixed beech-silver fir and beech-spruce phytocoenoses also occur, and more rarely – beech-sycamore. In lower parts of the reserve there is significant occurrence of hornbeam in the composition of beech forests. Small relict communities of mountain ash have been preserved in some spots. This reserve is the only one in Bulgaria, where beech, beech-silver fir, Macedonian pine, Norway spruce and spruce-Macedonian pine forests are represented together.

**Biosphere reserve ‘Dzhendema’** covers an area of 4220.6 ha at an altitude between 1400 and 2000 m. Forests are predominantly deciduous. This is the place where venerable forests formed by *Fagus sylvatica* L. are preserved, as well as mixed forests of *Fagus sylvatica* L. and *Carpinus betulus* L. Species, which also occur, are *Quercus petraea*
Liebl., Corylus colurna L., Acer pseudoplatanus L., A. platanoides L., Ostrya carpinifolia Scop., Fraxinus ornus L., Fr. excelsior L., Betula pendula Roth., Sorbus aucuparia L., etc. Coniferous forests are smaller and are represented predominantly by Norway spruce with solitary participation of silver fir. The flora in the reserve is very rich and it is known that it is represented by almost 1900 species and subspecies of higher plants.

Biosphere reserve ‘Chuprene’ is typical forest reserve with an area of 1439.2 ha. It is situated from about 1100 m up to 2004 m in the Western Balkan range with the aim to preserve venerable Norway spruce forests, which are the only compact forests of this tree species in this part of the mountain range. They are relatively well preserved from anthropological impact. Forests, dominated by Picea abies (L.) Karst., are with biggest share, followed by mixed coniferous-deciduous forests, as well as deciduous, predominantly beech, forests. Besides these tree species, Abies alba Mill., Betula pendula Roth., Acer heldreichii Orph., Acer platanoides L., Populus tremula L., Acer pseudoplatanus L., Alnus viridis (Chaix) DC, etc. occur as well. Some rare and endangered grass plant species have been recorded here.

Venerable floodplain forests are preserved in the Biosphere reserve ‘Kamchia’ (842.1 ha) in the lower stream of the river Kamchia. Big part of the watershed basin of this river is situated in the Eastern Balkan range. Forests are composed by the following tree species: Fraxinus oxycarpa Willd., Acer campestre L., Acer tataricum L., Quercus pedunculiflora Ehrh., Ulmus minor Mill., Ulmus laevis Pall., Alnus glutinosa Gaertner, and the understorey is composed mainly by Crataegus monogyna Jacq., Cornus sanguinea L., Cornus mas L. and Euonymus europaea L. This vegetation is characterised by numerous liana-like (most of all Smilax excelsa) and climbing plants (Periploca graeca, Vitis sylvestris, Clematis vitalba L., Hedera helix L.), which intertwist with each other or go down from trees.

These data show that biosphere reserves in Bulgaria best represent terrains at over 800-900 m. with Norway spruce and beech forests, and to less extent native oak species, Scots and Austrian black pine. Valuable populations of coniferous and deciduous tree species with rich gene pool have been preserved in biosphere reserves in Bulgarian mountains. They are distinguished for their autochthonous character, endemic component and good genetic and breeding characteristics.

CONCLUSION

In conclusion it should be outlined that in all 12 biosphere reserves in Bulgarian mountains, mentioned in this article, tree species differ according to their range and participation in the composition of dendrocoenoses, which depends on the influence of complex of ecological factors of growth environment in this part of the Balkan Peninsula.

In biosphere reserves in Bulgaria best represented are Norway spruce and beech forests at over 800-900 m, and to less extent – native oak species, Scots and Austrian black pine.
Valuable populations from representatives of families Pinaceae, Fagaceae, etc., occur in biosphere reserves in Bulgarian mountains. They are distinguished for their autochthonous character, endemic component and good genetic and breeding characteristics.

In the preservation of plant biodiversity in forest ecosystems, the conservation of forest tree genetic resources there is of particular importance, which is important prerequisite for the sustainable development of mountain territories in this part of South-eastern Europe.

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