ГОДИШНИК НА СОФИЙСКИЯ УНИВЕРСИТЕТ „СВ. КЛИМЕНТ ОХРИДСКИ“
БИОЛОГИЧЕСКИ ФАКУЛТЕТ
Книга 2 – Ботаника
Том 99

ANNUAL OF SOFIA UNIVERSITY “ST. KLIMENT OHRIDSKI”
FACULTY OF BIOLOGY
Book 2 – Botany
Volume 99

FLORA, MYCOTA AND VEGETATION OF DUPKATA RESERVE (RODOPI MTS, BULGARIA)

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The paper is dedicated to Prof. D. Temniskova on the occasion of her 80th jubilee

Abstract: The study represents a pilot scientific research of flora, mycota and vegetation within the Dupkata Reserve. Twenty three species, referred to 2 divisions, 3 classes and 16 families are recorded for the bryoflora. One of them is listed in the Habitat Directive. The vascular flora is presented by 103 species from 38 families. Forty eight vascular plants are considered as medicinal plants. Forty two species of larger ascomycetes and basidiomycetes are found in the reserve. Three of them are of high conservation value. The vegetation cover is consisted mostly of floristically poor communities of Spruce forest and mixed Spruce and Scots pine forests. Habitats within the reserve are presented by six types according to the Habitat Directive classification.

Key words: bryophytes, conservation, habitats, larger fungi, medicinal plants, plant communities.

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INTRODUCTION

Dupkata was designated as a strict reserve in 1951 with an area of 65,2 ha. It is located in Western Rodopi Mts, southern slopes of Batashka Mt and includes the Valley of Devinska River. Nowadays this protected area is extended to 1210,8 ha and spread between 600 and 1300 m altitude. The reserve is declared for protection of wild flora and fauna (especially century-old Scots pine forests and the Red deer) and is listed in the UNESCO's Man and the Biosphere Programme (Executive Environment Agency).

Any data about mycota, vascular flora and bryoflora for Dupkata Reserve hasn't been published so far. The paper represents results from a pilot scientific research in the reserve and thus sets a base for further detailed studies.

MATERIAL AND METHODS

The study has been done during the vegetation period of 2014. The route method has been used to describe the biodiversity of bryophytes, larger fungi, vascular plants and habitats. In the process of field studies the taxa found have been recorded in lists, and in case of difficulties to identify the species on the field samples were gathered for further identification. Identification of taxa and nomenclature for vascular plants and bryophytes were according the main taxonomic sources for Bulgaria (Kozhuharov 1992; Delipavlov & Cheshmedzhiev 2003; Jordanov 1963, 1964, 1966, 1970, 1973, 1976, 1979; Velchev 1982, 1989; Kozhuharov 1995; Kozhuharov & Anchev 2012; Petrov 1975). Author's names of fungal taxa are abbreviated according to Kirk & Ansell (2004) and Index Fungorum. The list of medicinal plants followed Appendix 1 of Bulgarian Medicinal Plants Act (2000). Special attention has been paid to taxa of high conservation value. To evaluate the conservation status, the lists of established taxa were checked for endemics – Bulgarian and Balkan (Petrova & Vladimirov 2010), protected species (Appendix 3 of Bulgarian Biological Diversity Act 2002), rare and endangered species according to Bulgarian Red lists and Red Data books (Petrova & Vladimirov 2009; Peev et al. 2011), Red List of the Bryophytes in Bulgaria (Natcheva et al. 2006), Red List of Fungi in Bulgaria (Gyosheva et al. 2006), as well as European and international documents (*e.g.* Bern convention, Directive 92/43/EEC, IUCN Red List, CITES). The syntaxonomy follows the methodological school of Braun-Blanquet (1965). Habitats are defined according to the Habitat Directive (Council Directive 92/43/EEC).

RESULTS AND DISCUSSION

Bryophytes

Data on the distribution of bryophytes in Bulgaria show that 8% (of 754 species) of the species found in Bulgaria so far have localities in Western Rodopi

Mts. Bryophyte flora in the reserve comprises 23 species, referred to 2 divisions (liverworts and mosses), 3 classes and 16 families and occupies various substrata as decaying wood, rocks, bare soil (Appendix 1). Bryophytes found in the reserve are typical for such kind of areas as dense coniferous forests, well preserved and not affected by human activities. Bryophyte species *Buxbaumia viridis* (Moug. ex Lam. & DC.) Brid. ex Moug. & Nestl. is listed in the Habitat Directive and the Bulgarian Biological Diversity Act (Table 1). It grows on coniferous decaying wood (mainly spruce logs) in shady spruce, pine-spruce and fir-spruce forests with high humidity. The species was subjected to monitoring observations in the frame of the National Biodiversity Monitoring System. The localities of *Buxbaumia viridis* in the Dupkata Reserve could be included in monitoring programs as referent sites.

Vascular flora

A total list of 103 species of vascular plants has been established (see Appendix 1). This number represents some 10% of diversity of the vascular flora of Batashka planina, which counts 1024 taxa according to the last inventory study (Meshinev 2002). The plant diversity in Dupkata Reserve is presented by 38 families. Ferns (Polypodiophyta) are represented by 2 species, 4 species are conifers (Pinophyta) and others (97 species) are flowering plants (Magnoliophyta), including 17 monocots and 80 dicots. The most species rich families are Asteraceae (11 species), Poaceae (10 species), Lamiaceae (7 species), Fabaceae and Caryophyllaceae (each with 6 species). The families with the highest number of genera are Asteraceae (11 genera) followed by Poaceae (9 genera), Lamiaceae (6 genera) and Rosaceae (5 genera). The most species-rich genera are *Luzula*, *Campanula*, *Hypericum* and *Trifolium* – with 3 species each one. Seven species of conservation significance are found in the reserve (see Table 1).

Medicinal plants

Among the established vascular plants 48 species are considered as medicinal plants (Appendix 1). The richest families are Asteraceae (6 species), Lamiaceae (5 species) and Rosaceae (4 species). According to their protection status and possibilities to collect them from wild areas, medicinal plants in Bulgaria have been grouped into 5 groups as follows:

I – protected species according to Appendix 3 of the Bulgarian Biological Diversity Act: not found within this study;

II – species forbidden for collection from nature for commercial purposes but with possibility to be collected for personal purposes, according to Order RD-83/3.02.2014 of the Minister of Environment and Waters: not found;

III – species with limited permission for collection from nature for commercial purposes with annually defined regions and quantities, according to Order RD-

83/3.02.2014 of the Minister of Environment and Waters: 4 species – *Primula veris* L.; *Betonica officinalis* L.; *Carlina acanthifolia* All.; *Sedum acre* L.;

IV – species object of preservation and regulated use from nature, according to Appendix 4 of the Bulgarian Biological Diversity Act: 2 species – *Dryopteris filix-mas* (L.) Schott.; *Primula veris* L.;

V – widespread medicinal plants: 43 species. In this category as common species with abundant populations in Dupkata Reserve *Vaccinium myrtillus* L., *V. vitis-idaea* L., *Veronica officinalis* L., *Euphorbia amygdaloides* L. as well as some dominants in coniferous forests like *Pinus sylvestris* L. and *Picea abies* (L.) Karst. have to be mentioned.

Larger fungi

In total 42 species of larger fungi were registered on the territory of the reserve during the field investigation – 1 species from Ascomycota and 41 species from Basidiomycota. The species belong to 2 classes, 8 orders, 23 families and 35 genera (Appendix 1). Three species are of high conservation value and are included in the Red List of Fungi in Bulgaria (Gyosheva et al. 2006) under different threat categories: *Agaricus macrocarpus* (F. H. Møller) F. H. Møller and *Auriscalpium vulgare* Gray – both estimated as Endangered (EN), and *Macrotyphula fistilosa* (Holmsk. : Fr.) R. H. Peterson – Vulnerable (VU) (Fig. 1). *A. macrocarpus* and *A. vulgare* are included also in the Red Data Book of Republic of Bulgaria (Peev et al. 2011) – All taxa of larger fungi were registered in forest habitats – coniferous (*Picea abies, Pinus sylvestris, Abies alba* Mill.) and mixed with *Fagus sylvatica* L. woods. The prevailing number of species are saprothrophs and parasites on wood and mycorrhizal fungi.

Fig. 1. *Macrotyphula fistilosa* (Holmsk. : Fr.) R. H. Peterson – a Vulnerable (VU) species listed in the Red List of Fungi in Bulgaria.

Table 1. Species of conservation significance.

Abbreviations used: Bal – Balkan, Bul – Bulgarian, CITES – Convention on International Trade in Endangered Species of Wild Fauna and Flora, IUCN – International Union for Conservation of Nature, LC – Least concerned, NT – Near threatened, VU – Vulnerable

Species	Bulgarian Biological Diversity Act (App. 3)	Habitat Directive	IUCN	CITES	Endemics	Red Books of Bulgaria	Red lists of Bulgaria
Bryophytes							
Buxbaumia viridis (Lam. & DC.) Moug. & Nestl.	+	+					NT
Vascular flora							
Crocus veluchensis Herb.					Bal		
Lathraea rhodopea Dingler	+				Bal		NT
Neottia nidus-avis (L.) L.C. Richard			LC	+			
Seseli rhodopaeum Vel.							NT
Silene roemerii Friv.					Bal		
Soldanella rhodopaea F.K. Meyer					Bul		VU
Viscaria vulgaris Rohl. ssp. *arthropurpurea* (Griseb.) Stoj.					Bal		
Larger fungi							
Agaricus macrocarpus (F. H. Møller) F. H. Møller						EN	EN
Auriscalpium vulgare Gray						EN	EN
Macrotyphula fistilosa (Holmsk. : Fr.) R. H. Peterson							VU

Vegetation and habitats

The reserve territory is situated in the coniferous belt (Velchev 2002). Spruce forests prevail and they are well preserved, almost wholly covering all possible exposures. Their age is different but varies between 40 and 100 years. Similar vegetation is to be found not only in the Rodopi Mts (Bondev et al. 1985; Nikolov & Valchev 1998), but in other Bulgarian mountains also – Rila Mt (Bondev et al. 1981; Nikolov & Vulchev 2001), Vitosha Mt (Bondev et al. 1983), western part of Balkan Mt (Bondev et al. 1995), Osogovska Mt (Lazarov 1995). Mixed Spruce and Scots pine forests, where *Pinus sylvestris* shares more than 20% of the

tree layer, are developed mostly on southern slopes. The stands with dominance of *Pinus sylvestris* occupy very limited area. Usually, they are on the top of the ridges or southern slopes, where the radiation is higher and sufficient for the light demanding Scots pine. Rarely *Abies alba* takes part in the forests.

Syntaxonomically the vegetation belongs to Vaccinio-Piceetea class. It is characteristic for coniferous forests in the continental and boreal zones. For the region these forests are zonal and climax vegetation which tends to sustain for long period of time. Studied communities have well developed vertical structure of tree, herbaceous and moss layers. The herbaceous stratum is species poor, while ground moss cover represents high biodiversity and significant coverage. Most common are *Vaccinium myrtillus, V. vitis-idaea, Luzula sylvatica* (Hudson) Gaudin, *L. luzuloides* (Lam.) Dandy, *Calamagrostis arundinacea* (L.) Roth, *Dicranum scoparium* Hedw., *Hylocomium splendens* (Hedw.) Schimp., *Hypnum cupressiforme* Hedw. and *Eurhynchium angustirette* (Broth.) T.J.Kop. The species composition of mixed forests and the monodominant spruce forests does not differ. Monodominant *Pinus sylvestris* forests are more biodiversity rich as a result of better lightening. There the young trees and seedlings are mostly *Picea abies* and this indicates the successional trend toward climax vegetation. Vaccinio myrtilli-Pinetum sylvestris and Calamagrostio arundinaceae-Pinetum sylvestris associations within Dicrano-Pinion alliance, and Vaccinio myrtilli-Piceetum abietis association within Piceion abietis are established. Alnetum incanae community occupies restricted area along a small river. It is related to Alnion incanae alliance of Carpino-Fagetea class.

Five habitat types of Council Directive 92/43 EEC are found in Dupkata Reserve: 9410 Acidophilous *Picea* forests of the montane to alpine levels (Vaccinio-Piceetea), 91CA Rhodopide and Balkan Range Scots pine forests, 91E0 * Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae), 3260 Water courses of plain to montane levels with Ranunculion fluitantis and Callitricho-Batrachion vegetation and 8220 Siliceous rocky slopes with chasmophytic vegetation.

It could be stated that the reserve territory has high natural value. It preserves an example of natural primary coniferous forests at the southern distribution boundary. Currently forests develop completely naturally and we observed places with high abundance of fallen trees which slowly will be replaced by new generation of spruce. The studied vegetation could be used as a standard for conservation measures in other part of the Rodopi Mts as a model for potential natural vegetation, for education and scientific purposes, or as a source of genetic material.

Appendix 1. List of established taxa in the Dupkata Reserve

Bryophytes
Marchantiophyta (Liverworts)
Jungermanniopsida
Plagiochilaceae*: *Plagiochila porelloides (Torrey ex Nees) Lindenb.,
Geocalycaceae: *Lophocolea heterophylla*
Cephaloziaceae: *Nowellia curvifolia*
Bryophyta (Mosses)
Polytrichopsida
Buxbaumiaceae: *Buxbaumia viridis (*Moug. ex Lam. & DC.) Brid. ex Moug. & Nestl.
Polytrichaceae: *Polytrichum piliferum* Hedw., *P. formosum* Hedw.
Bryopsida
Grimmiaceae: *Racomitrium canescens* (Hedw.) Brid.
Dicranaceae: *Dicranum scoparium* Hedw., *D. tauricum* Sapjegin
Hedwigiaceae: *Hedwigia stellata* Hedenäs
Rhabdoweisiaceae: *Dicranoweisia crispula* (Hedw.) Milde
Orthotrichaceae: *Orthotrichum rupestre* Schleich. ex Schwägr.
Bryaceae: *Bryum moravicum* Podp.
Mniaceae: *Plagiomnium affine* (Blandow ex Funck) T.J.Kop.
Campyliaceae: *Sanionia uncinata* (Hedw.) Loeske
Hylocomiaceae: *Hylocomium splendens* (Hedw.) Schimp., *Pleurozium schreberi* (Willd. ex Brid.) Mitt.
Pterigynandraceae: *Pterigynandrum filiforme* Hedw.
Brachytheciaceae: *Brachytheciastrum velutinum* (Hedw.) Ignatov & Huttunen, *Eurhynchium angustirete* (Broth.) T.J.Kop., *Isothecium alopecuroides* (Lam. ex Dubois) Isov.
Hypnaceae: *Hypnum cupressiforme* Hedw., *Herzogiella seligeri* (Brid.) Z.Iwats.

Vascular plants [medicinal plants are marked by asterix (*)]:
Polypodiophyta:
Athyriaceae:*Athyrium filix-femina* (L.) Roth; ***Aspidiaceae: ****Dryopteris filix-mas* (L.) Schott.;
Pinophyta:
Cupressaceae:*Juniperus communis* L; ***Pinaceae:****Abies alba* Mill.; **Picea abies* (L.) Karst.; **Pinus sylvestris* L
Magnoliophyta:
Magnoliopsida: Aceraceae: *Acer campestre L.; Acer pseudoplatanus* L.; ***Apiaceae: ****Heracleum verticillatum* Pančič; **Sanicula europaea* L.; *Seseli rhodopaeum* Vel.; ***Asteraceae*: ****Carlina acantifolia* All.; *Centaurea nervosa* Willd.; *Cirsium appendiculatum* Griseb.; **Doronicum columnae* Ten.; *Hieracium murorum gr.;Leontodon autumnalis* L.; *Mycelis muralis* (L.) Dumort.; **Petasites albus* (L.) Gaertn.; **Senecio nemorensis* L;. **Taraxacum officinale* F.H. Wigg; **Tussilago farfara* L.; ***Betulaceae: ****Carpinus betulus* L; ***Boraginaceae:*** *Myosotis arvensis* (L.) Hill; *Myosotis sylvatica* Ehrh. ex Hoffm.; *Pulmonaria rubra* Schott; *Symphytum tuberosum* L.; ***Brassicaceae:*** *Rorippa sylvestris* (L.) Besser*;* ***Campanulaceae:*** *Campanula patula* L.; *Campanula persicifolia* L.; *Campanula*

rapunculoides L; ***Caryophyllaceae:*** *Moehringia pendula* (Waldst. & Kit.) Fenzl; *Moehringia trinervia* (L.) Clairv.; *Silene roemeri* Friv.; *Silene vulgaris* (Moench) Garcke; **Stellaria media* (L.) Vill.; **Viscaria vulgaris* Röhl; ***Chenopodiaceae:*** ***Chenopodium bonus-henricus* L.; ***Crassulaceae:*** ***Sedum acre* L.; ***Ericaceae:*** *Bruckenthalia spiculifolia* (Salisb.) Rchb.; **Vaccinium myrtyllus* L.; **Vaccinium vitis-idaea* L.; ***Euphorbiaceae:*** ***Euphorbia amygdaloides* L.; ***Fabaceae:*** ***Chamaespartim sagittale* (L.) Gibbs; *Genista carinalis* Griseb.; *Trifolium aureum* Poll.; *Trifolium medium* L.; **Trifolium pratense* L.; *Vicia cassubica* L.; ***Fagaceae:*** ***Fagus sylvatica* L.; *Quercus dalechampii* Ten.; ***Geraniaceae:*** ***Geranium macrorrhizum* L.; **Geranium robertianum* L.; ***Hypericaceae:*** ***Hypericum maculatum* Crantz; *Hypericum olympicum* L; **Hypericum perforatum* L.; ***Lamiaceae:*** *Ajuga genevensis* L.; *Ajuga reptans* L.; **Betonica officinalis* L.; **Clinopodium vulgare* L.; **Lamium purpureum* L.; **Mentha arvensis* L; **Prunella vulgaris* L.; ***Oxalidaceae:*** ***Oxalis acetosella* L.; ***Plantaginaceae:*** ***Plantago major* L.; ***Primulaceae:*** ***Primula veris* L.; *Soldanella rhodopaea* F.K. Meyer; ***Pyrolaceae:*** *Pyrola minor* L.; ***Ranunculaceae:*** ***Caltha palustris* L.; **Ranunculus polyanthemos* L.; ***Rosaceae:*** ***Aremonia agrimonoides* (L.) DC.; **Fragaria vesca* L.; **Potentilla erecta* (L.) Raeusch.; *Rosa tomentosa* Sm.; **Rubus idaeus* L.; ***Rubiaceae:*** *Cruciata glabra* (L.) Ehrend.; **Cruciata laevipes* Opiz; ***Salicaceae:*** ***Populus tremula* L; ***Saxifragaceae:*** ***Chrysosplenium alternifolium* L.; ***Scrophulariaceae:*** *Lathraea rodopaea* Dingler; *Melampyrum sylvaticum* L.; *Verbascum longifolium* Ten.; **Veronica chamaedrys* L.; **Veronica officinalis* L.; ***Urticaceae:*** *Urtica dioica* L.; ***Violaceae:*** ***Viola tricolor* L.;

Liliopsida: Cyperaceae: *Scirpus sylvaticus* L.; ***Juncaceae:*** *Juncus conglomeratus* L.;*Luzula forsteri* (Sm.) DC.; *Luzula luzuloides* (Lam.) Dandy; *Luzula sylvatica* (Hudson) Gaudin; ***Iridaceae:*** *Crocus veluchensis* Herbert; ***Orchidaceae:*** *Neottia nidus-avis* (L.) Rich.; ***Poaceae:*** *Agrostis capillaris* L.; *Brachypodium pinnatum* (L.)Beauv.; *Brachypodium sylvaticum* (Hudson) Beauv.; **Briza media* L.; *Calamagrostis arundinacea* (L.) Roth; *Dactylis glomerata* L.; *Deschampsia caespitosa* (L.) Beauv.; *Festuca drymeja* Mert. et Koch.; *Lerchenfeldia flexuosa* (L.) Schur; *Poa nemoralis* L.

Larger fungi

Ascomycota:

Leotiomycetes*: Chlorociboria aeruginascens* (Nyl.) Kanouse ex C.S. Ramamurthi, Korf & L. R. Batra.

Basidiomycota:

Agaricomycetes*: Agaricus arvensis* Schaeff.; *A. macrocarpus* (F. H. Møller) F. H. Møller; *Amanita battarrae* (Buod.) Bon; *A. gemmata* (Fr.) Bertill.; *A. rubescens* Pers. : Fr.; *A. vaginata* (Bull. : Fr.) Lam.; *Auriscalpium vulgare* Gray; *Boletus chrysenteron* Bull.; *B. edulis* Bull. : Fr.; *Bovista plumbea* Pers. : Pers.; *Cerrena unicolor* (Bull. : Fr.) Murril var. *unicolor*; *Chroogomphus helveticus* (Singer) M. M. Moser; *Clitocybe gibba* (Pers. : Fr.) P. Kumm.; *Coltricia perennis* (L. : Fr.) Murril var. *perennis; Fomes fomentarius* (L. : Fr.) J. J. Kickx; *Fomitopsis pinicola* (Sw. : Fr.) P. Karst.; *Galerina hypnorum* (Schrank : Fr.) Kühner; *Gomphidius glutinosus* (Schaeff. : Fr.) Fr.; *Hydnum repandum* L. : Fr.; *Inocybe lacera* (Fr. : Fr.) P. Kumm.; *Kuchneromyces mutabilis* (Schaeff. Fr.) Singer & A. H. Sm.; *Lactarius aurantiacus* (Pers. : Fr.) Gray; *Lepiota clypeolaria* (Bull. : Fr.) P. Kumm.; *L. cristata* (Bolton. : Fr.) P. Kumm.; *Lycoperdon perlatum* Pers. : Pers.; *Macrotyphula fistulosa* (Holmsk. : Fr.) R. H. Peterson; *Megacollybia platyphylla* (Pers. : Fr.) Kotl. & Pouzar;

Mycena epipterygia (Scop. : Fr.) Gray var. *viscosa; Pluteus cervinus* (Schaeff.) P. Kumm.; *Polyporus leptocephalus* (Jacq. : Fr.) Fr.; *Ramaria formosa* (Pers. : Fr.) Quél.; *Rhizopogon roseolus* (Corda) Th. Fr.; *Rhodocollybia butyracea* (Bull. : Fr.) Lennox f. *butyracea*; *Russula queletii* Fr.; *Setulipes andrasaceus* (L. : Fr.) Antonín; *Stereum hirsutum* (Willd. : Fr.) Gray; *S. subtomentosus* Pouzar; *Suillus luteus* (L. : Fr.) Roussel; *Trametes versicolor* (L. : Fr.) Lloyd; *Trichaptum abietinum* (Pers. ex J. F. Gmel. : Fr.) Ryvarden; *Xerula radicata* (Relhan & Fr.) Dörfelt.

ACKNOWLEDGMENTS

Authors are grateful to Prizma-Nishava Consortium for funding and positive collaboration.

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Accepted 26 November 2014