

Epiphytic bryophytes of the State Dendrological Park “Olexandria” of the NAS of Ukraine

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Received: 29.10.2020 | Accepted: 28.11.2020 | Published: 30.12.2020

Abstract

Investigations of the species diversity of epiphytic bryophytes of the State Dendrological Park “Olexandria” (the historical part and the “Budynok Lisnyka” plot) were conducted in 2017–2019 and revealed 40 species representing 22 genera, 17 families, seven orders, two classes, and two divisions. This corresponds to 46.51 % of the total number of detected bryophytes in the park. The leading families in the bryoflora of the park are Orthotrichaceae (9 species), Brachytheciaceae (6), Amblystegiaceae (3), Anomodontaceae (3), Dicranaceae (3), Hypnaceae (3), and Pottiaceae (2). The leading genera are Orthotrichum (9 species), Anomodon (3), and Dicranum (3).

Among the identified taxa, five species (*Dicranum tauricum*, *Orthotrichum lyellii*, *Porella platyphylla*, *Sciuro-hypnum reflexum*, and *Syntrichia virescens*) are regionally rare within the Forest-Steppe zone of Ukraine. Most of the recorded epiphytic mosses were found on the bark of *Acer platanoides* (28 species), *Fraxinus excelsior* (27), *Quercus robur* (26), *Acer campestre* (23), and *Tilia cordata* (22). The least epiphytic mosses were found on the bark of conifers (*Pinus sylvestris*, *P. strobus*, *Picea abies*, *Larix decidua*, etc.).

The surveyed trees in the State Dendrological Park “Olexandria” were also found such epigeal mosses as *Plagiomnium cuspidatum*, *Ceratodon purpureus*, *Dicranella heteromalla*, and *Pohlia nutans*, as well as epixilic moss *Dicranum flagellare*, etc.

The “Budynok Lisnyka” plot hosts three species that do not occur in the park’s historical part. In particular, *Lophocolea heterophylla* and *Sciuro-hypnum curtum* were found there on *Quercus robur* trunks and *Sciuro-hypnum reflexum* on *Quercus rubra* bark. At the same time, the historical part of the park is characterized by the number of expansive bryophytes.

Keywords: epiphytic bryophytes, taxonomic diversity, State Dendrological Park “Olexandria”

Introduction

Biodiversity conservation is one of the essential tasks to be completed, mainly through the nature conservation areas. One of such areas is the State Dendrological Park “Olexandria” of the NAS of Ukraine, established in 1788. At present, there are

registered over 3100 species of arboreal plants and over 1500 herbs. However, the diversity of bryophytes of the park is still insufficiently investigated. Hence, our research’s objective was to reveal the taxonomic diversity of epiphytic bryophytes in this park.

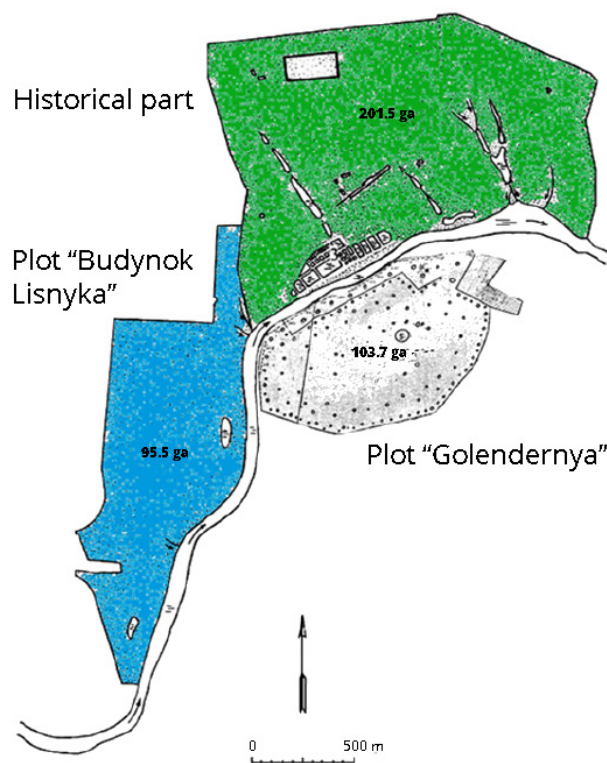


Figure 1. Scheme of the State Dendrological Park “Olexandria”.

Material and methods

Investigations were carried out in 2017–2019 in the historical part and the “Budynok Lisnyka” plot of the State Dendrological Park “Olexandria” of the NAS of Ukraine (Fig. 1). The species diversity of epiphytic mosses was studied predominantly on the following phorophytes: *Quercus robur* L., *Acer campestre* L., *A. platanoides* L., *A. pseudoplatanus* L., *Tilia cordata* Mill., *Fraxinus excelsior* L., *Betula pendula* Roth., *Carpinus betulus* L., *Aesculus hippocastanum* L., *Picea abies* (L.) Karst., and *Populus alba* L. The names of taxa are provided according to Boiko (2008a, 2014), and their taxonomic position is given following Boiko (2008b). Phorophytes were subdivided onto native and introduced basing on Didukh (2002a, 2002b, 2005).

Results and discussion

Our research results showed that the epiphytic bryoflora of the State Dendrological Park “Olexandria” comprises 40 species belonging to 22 genera, 17 families, seven orders, two classes, and two divisions (Table 1).

At present, the bryoflora of the State Dendrological Park “Olexandria” includes 98 species. Hence, the 40 mentioned epiphytic taxa represent 40.8% of the total bryodiversity of the park. Most of the investigated epiphytic taxa (36 species or 90%) belong to the class Bryopsida from the division Bryophyta. The leading families are Orthotrichaceae (9 species), Brachytheciaceae (6), Amblystegiaceae (3), Anomodontaceae (3), Dicranaceae (3), Hypnaceae (3), and Pottiaceae (2). These families comprise 29 species and represent 70% of the total number of explored epiphytic bryophytes. The leading genera are *Orthotrichum* (9 species), *Anomodon* (3), *Dicranum* (3), and *Sciurohypnum* (3). The division Marchantiophyta is represented only by four species from the class Jungermanniopsida, which corresponds to 10% of the total number of explored taxa.

Among the identified taxa, five species (*Dicranum tauricum*, *Orthotrichum lyellii*, *Porella platyphylla*, *Sciurohypnum reflexum*, and *Syntrichia virescens*) are regionally rare within the Forest-Steppe zone of Ukraine (Boiko, 2010).

Bryophytes, which occur on the bark, are not an ecologically homogeneous group. In addition to the true epiphytes, limited by the bark of living trees, on the trunks and roots of phorophytes settle many species with a broader ecological amplitude (Rykovsky, 1989). Thus, on the surveyed trees in the State Dendrological Park “Olexandria” such epigeal mosses as *Plagiomnium cuspidatum* (Hedw.) T.J. Kop., *Ceratodon purpureus* (Hedw.) Brid., *Dicranella heteromalla* (Hedw.) Schimp., and *Pohlia nutans* (Hedw.) Lindb., as well as epixilic moss *Dicranum flagellare* Hedw. and some others were also discovered.

The historical part of the State Dendrological Park “Olexandria” counts 37 epiphytic bryophytes and the “Budynok Lisnyka” plot – 23 taxa. In the “Budynok Lisnyka” plot, there are unique species that do not occur in the historic part of the park. In particular, *Lophocolea heterophylla* and *Sciurohypnum curtum* were found there on *Quercus robur* trunks and *S. reflexum* on *Quercus rubra* L. bark. At the same time, the historical part of the park hosts many expansive bryophytes.

The largest number of epiphytic bryophytes was recorded on the bark of *Acer platanoides* (28 species), *Fraxinus excelsior* (27), *Quercus robur*

Table 1. Taxonomic structure of epiphytic bryoflora of the State Dendrological Park "Olexandria".

Division Marchantiophyta	
Class Jungermanniopsida	<i>O. pumilum</i> Sw. ex anon.
Order Jungermanniales	<i>O. speciosum</i> Nees
Family Lophocoleaceae	<i>O. striatum</i> Hedw.
Genus <i>Lophocolea</i>	Order Hypnales
<i>L. heterophylla</i> (Schrad.) Dumort.	Family Amblystegiaceae
Order Porellales	Genus <i>Amblystegium</i>
Family Porellaceae	<i>A. serpens</i> (Hedw.) Schimp.
Genus <i>Porella</i>	<i>A. subtile</i> (Hedw.) Schimp.
<i>P. platyphylla</i> (L.) Preff.	Genus <i>Hygroamblystegium</i>
Family Radulaceae	<i>H. varium</i> (Hedw.) Monk.
Genus <i>Radula</i>	Family Leskeaceae
<i>R. complanata</i> (L.) Dumort.	Genus <i>Leskea</i>
Family Frullaniaceae	<i>L. polycarpa</i> Hedw.
Genus <i>Frullania</i>	Genus <i>Pseudoleskeella</i>
<i>F. dilatata</i> (L.) Dumort.	<i>P. nervosa</i> (Bryd.) Nyholm
	Family Brachytheciaceae
Division Bryophyta	Genus <i>Brachytheciastrum</i>
Class Bryopsida	<i>B. velutinum</i> (Hedw.) Ignatov et Huttunen
Order Dicranales	Genus <i>Brachythecium</i>
Family Dicranaceae	<i>B. rutabulum</i> (Hedw.) Schimp.
Genus <i>Dicranum</i>	<i>B. salebrosum</i> (Hoffm. ex F. Weber et D. Mohr) Schimp.
<i>D. montanum</i> Hedw.	Genus <i>Sciuro-hypnum</i>
<i>D. scoparium</i> Hedw.	<i>S. curtum</i> (Lindb.) Ignatov
<i>D. tauricum</i> Sap.	<i>S. populeum</i> (Hedw.) Ignatov & Huttunen
Order Pottiales	<i>S. reflexum</i> (Starke) Ignatov & Huttunen
Family Pottiaceae	Family Hypnaceae
Genus <i>Syntrichia</i>	Genus <i>Hypnum</i>
<i>S. papillosa</i> (Wills.) Jur.	<i>H. cupressiforme</i> Hedw.
<i>S. virescens</i> (De Not.) Ochyra	<i>H. pallescens</i> (Hedw.) P. Beauv.
Order Bryales	Genus <i>Pylaisia</i>
Family Bryaceae	<i>P. polyantha</i> (Hedw.) Schimp
Genus <i>Bryum</i>	Family Pylaisiadelphaceae
<i>B. moravicum</i> Podp.	Genus <i>Platygyrium</i>
Family Mniaceae	<i>P. repens</i> (Brid.) Schimp.
Genus <i>Plagiomnium</i>	Family Neckeraceae
<i>P. cuspidatum</i> (Hedw.) T.J. Kop.	Genus <i>Homalia</i>
Order Orthotrichales	<i>H. trichomanoides</i> (Hedw.) Brid.
Family Orthotrichaceae	Family Leucodontaceae
Genus <i>Orthotrichum</i>	Genus <i>Leucodon</i>
<i>O. affine</i> Schrad. ex Brid.	<i>L. sciuroides</i> (Hedw.) Schwagr.
<i>O. diaphanum</i> Schrad. ex Brid.	Family Anomodontaceae
<i>O. lyellii</i> Hook. & Taylor	Genus <i>Anomodon</i>
<i>O. obtusifolium</i> Brid.	<i>A. attenuatus</i> (Hedw.) Huebener
<i>O. pallens</i> Bruch ex Brid.	<i>A. longifolius</i> (Schleich. ex Brid.) Hartm.
<i>O. patens</i> Bruch ex Brid.	<i>A. viticulosus</i> (Hedw.) Hook et Taylor

(26), *Acer campestre* (23), and *Tilia cordata* (22) (Fig. 2). Slightly fewer species were found on *Betula pendula* (16 species), *Carpinus betulus* (16), *Populus alba* (11), *P. × canescens* (Ait.) Smith (10), *Pyrus communis* Mill. (10), *Populus tremula* L. (9), and *Alnus glutinosa* (L.) Gaerth. (7). Hence, *Acer platanoides*, *Fraxinus excelsior*, and *Quercus robur* were characterized by the richest epiphytic bryoflora. *Acer platanoides* hosted 72.5%, *Fraxinus excelsior* – 67.5%, and *Quercus robur* – 62.5% of epiphytic bryophytes of the State Dendrological Park "Olexandria".

The most common mosses on the bark of *Tilia cordata* were *Hypnum cupressiforme*,

Pseudoleskeella nervosa, *Platygyrium repens*, *Leskea polycarpa*, and *Leucodon sciuroides*; on the bark of *Acer platanoides* – *Leskea polycarpa*, *Pseudoleskeella nervosa*, *Orthotrichum speciosum*, *Hypnum cupressiforme*, and *Leucodon sciuroides*; on the bark of *Fraxinus excelsior* – *Leskea polycarpa*, *Orthotrichum speciosum*, *Leucodon sciuroides*, *Hypnum cupressiforme*, *Pseudoleskeella nervosa*, and *Pylaisia polyantha*; on the bark of *Quercus robur* – *Hypnum cupressiforme*, *Platygyrium repens*, *Bryum moravicum*, and *Pseudoleskeella nervosa* (Fig. 3).

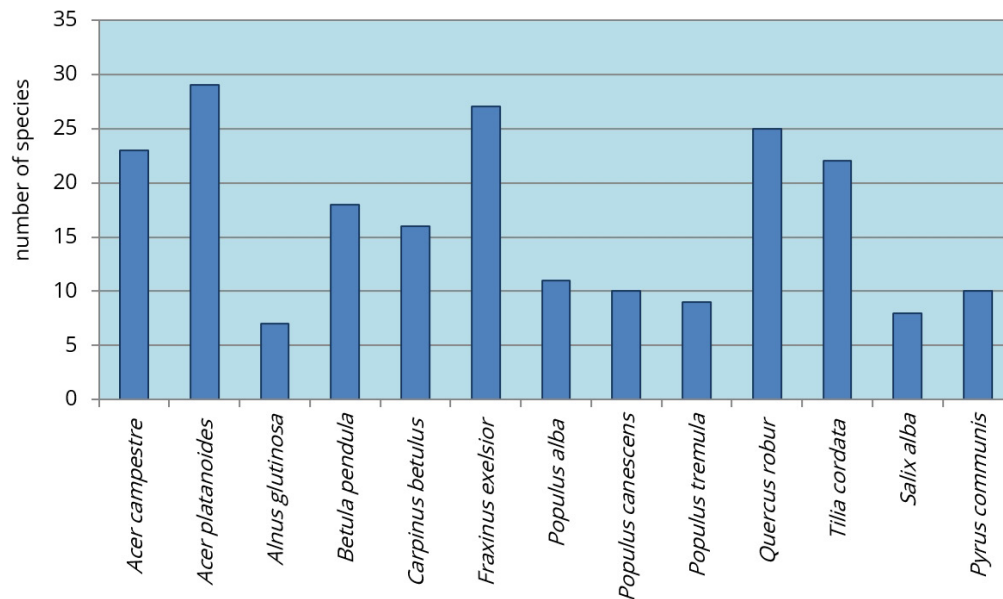


Figure 2. Species richness of epiphytic bryophytes distributed on the main park-forming and some other tree species of the State Dendrological Park "Olexandria".

Such species as *Brachythecium salebrosum*, *Brachytheciastrum velutinum*, *Bryum moravicum*, *Hypnum cupressiforme*, *Leskea polycarpa*, *Leucodon sciuroides*, *Orthotrichum patens*, *O. pumilum*, *O. speciosum*, *Platygyrium repens*, *Porella platyphylla*, *Pseudoleskeella nervosa*, and *Pylaisia polyantha* we have recorded on the bark of most arboreal plants (Fig. 3). However, some bryophytes occurred exclusively on certain tree species. For example, *Dicranum scoparium* and *D. tauricum* were found only on the bark of *Betula pendula*; *Brachythecium rutabulum* – exclusively on the bark of *Acer platanoides*; *Frullania dilatata*, *Sciuro-hypnum curtum*, and *Lophocolea heterophylla* – on the bark of *Quercus robur*; *Sciuro-hypnum reflexum* – on the bark *Quercus rubra*; *Orthotrichum striatum* – on the trunk of *Fraxinus excelsior*.

The richness of bryophytes on introduced trees was lower than on the native arboreal species. Thus, *Acer pseudoplatanus* hosted only 15 species of epiphytic bryophytes, while *A. platanoides* – 28 species, and *A. campestre* – 23 species. *Quercus rubra* hosted 11 species, while *Q. robur* 26 species. On the bark of *Robinia pseudoacacia* we have found 13 species of bryophytes, on *Aesculus hippocastanum* – 11 species, and on *Catalpa ovata* G. Don. – eight species (Fig. 4). On the trunks of such broad-leaved species as *Platanus × acerifolia* (Ait.) Willd. and *Juglans cinerea* L. we have found only

five species of bryophytes per each tree species, on *Cercidiphyllum japonicum* Sieb. et Zucc. and *Juglans nigra* L. – four species, on *Celtis mississippiensis* Bosc. and *Gleditsia triacanthos* L. – three species. Lower species diversity of mosses on some introduced plants is probably related to their bark properties and the conditions of growing. In the State Dendrological Park "Olexandria" they were mostly planted as solitary trees or in small curtains on the lawns. Hence, such plants grow in good light, which, however, results in conditions that are not optimal for the development of most mosses.

Nevertheless, the smallest number of epiphytes occurred on the bark of conifers. Thus, on the bark of *Pinus sylvestris* L. we recorded only four species of mosses, on the bark of *Pinus strobus* L., *Picea abies* (L.) Karst., *Larix decidua* Mill. and some others – only two species. This is because their bark, unlike most deciduous trees, has higher acidity (Insarova & Insarov, 1989). Moreover, conifers constantly shed their bark, which explains the absence or a low number of hosted bryophytes (Sluka, 1975; Dymytrova, 2008).

Conclusions

Our study showed that epiphytic bryoflora of the State Dendrological Park "Olexandria" includes 40 species, which corresponds to

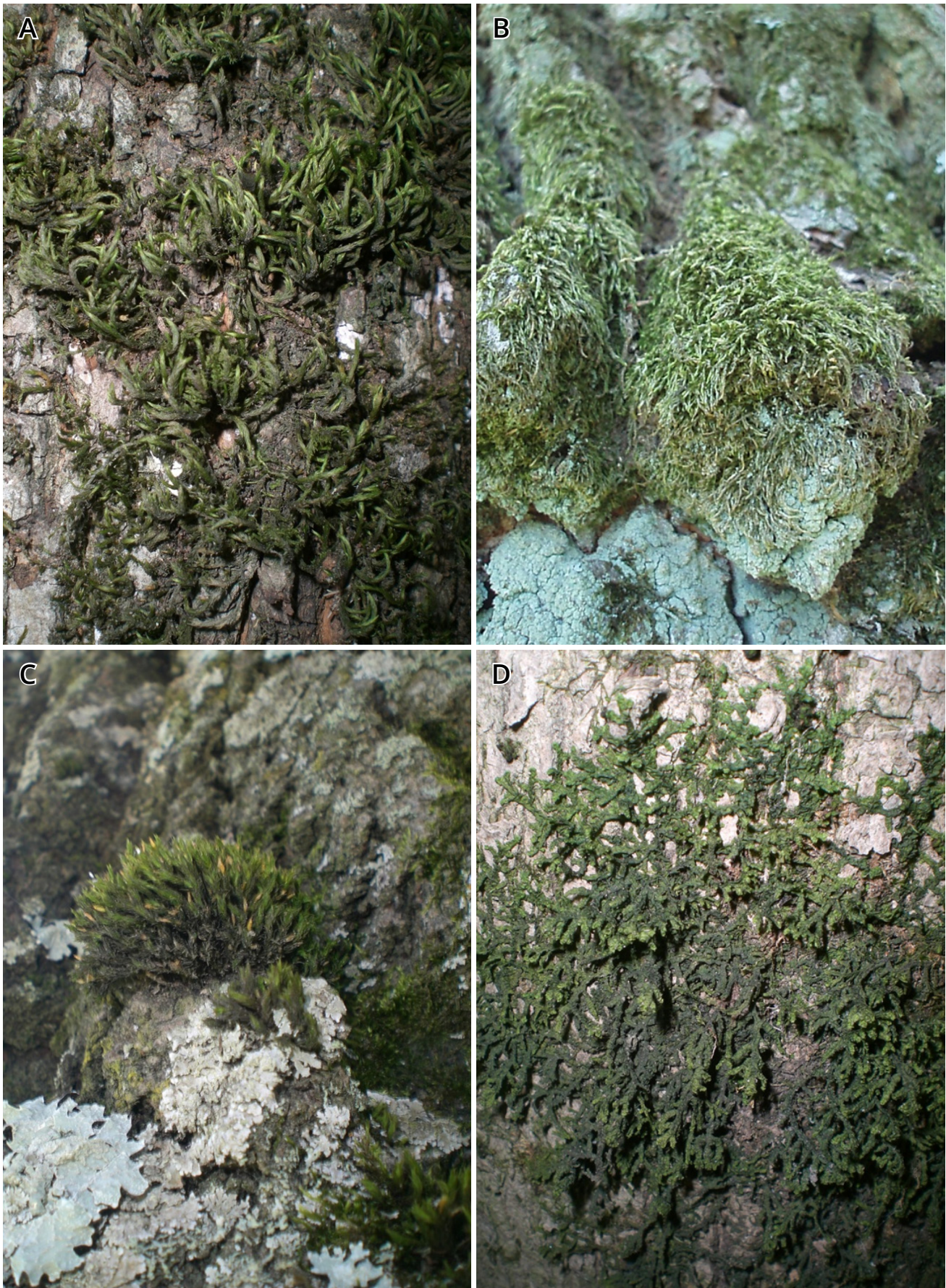


Figure 3. *Leucodon sciuroides* on the bark of *Fraxinus excelsior* (A) and *Hypnum cupressiforme* on the bark of *Quercus robur* (B); *Orthotrichum speciosum* on the bark of *Populus × canescens* (C); *Porella platyphylla* on the bark of *Acer campestre* (D).

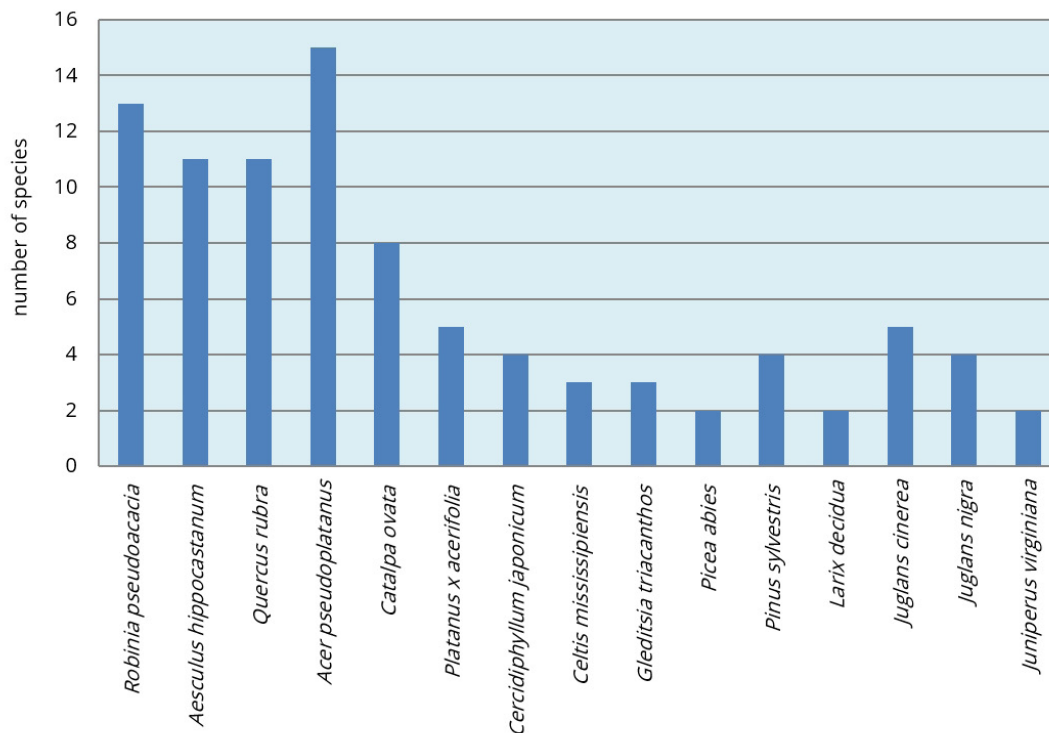


Figure 4. Species richness of epiphytic bryophytes distributed on some exotic tree species of the State Dendrological Park "Olexandria".

46.51% of the total number of bryophytes detected in the park. It includes five species (*Dicranum tauricum*, *Orthotrichum lyellii*, *Porella platyphylla*, *Sciuro-hypnum reflexum*, and *Syntrichia virescens*), which are regionally rare within the Forest-Steppe zone of Ukraine.

The largest number of epiphytic bryophytes species was recorded on the bark of such native trees as *Acer platanoides*, *A. campestre*, *Fraxinus excelsior*, *Quercus robur*, and *Tilia cordata*. Introduced plants hosted a relatively small number of bryophytes. The smallest number of epiphytic bryophytes was found on the bark of conifers *Pinus sylvestris*, *P. strobus*, *Picea abies*, *Larix decidua*, and some other species.

Such epiphytic bryophytes as *Brachythecium salebrosum*, *Brachytheciastrum velutinum*, *Bryum moravicum*, *Hypnum cupressiforme*, *Leskea polycarpa*, *Leucodon sciuroides*, *Orthotrichum patens*, *O. pumilum*, *O. speciosum*, *Platygyrium repens*, *Porella platyphylla*, *Pseudoleskeella nervosa*, and *Pylaisia polyantha* were recorded on the bark of most of the studied tree species.

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Епіфітні бріофіти Державного дендрологічного парку “Олександрія” НАН України

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Дослідження дендропарку “Олександрія” (історичної частини та урочища “Будинок лісника”), виконані у 2017–2019 роках дали змогу виявити 40 видів епіфітних мохоподібних, що представляють 22 роди, 17 родин, сім порядків, два класи та два відділи. Це відповідає 46,51% від загального числа виявлених бріофітів парку. Провідними родинами є Orthotrichaceae (9 видів), Brachytheciaceae (6), Amblystegiaceae (3), Anomodontaceae (3), Dicranaceae (3), Hypnaceae (3) та Pottiaceae (2). Провідними родами – *Orthotrichum* (9 видів), *Anomodon* (3) та *Dicranum* (3).

Серед виявлених видів п'ять (*Dicranum tauricum*, *Orthotrichum lyellii*, *Porella platyphylla*, *Sciuro-hypnum reflexum* та *Syntrichia virescens*) є регіонально рідкісними в межах лісостепової зони України. Більшість епіфітних мохоподібних було виявлено на корі *Acer platanoides* (28 видів), *Fraxinus excelsior* (27), *Quercus robur* (26), *Acer campestre* (23) і *Tilia cordata* (22). А найменше видове різноманіття епіфітних мохоподібних було на корі хвойних (*Pinus sylvestris*, *P. strobus*, *Picea abies*, *Larix decidua* тощо).

Окрім того, у дендропарку “Олександрія” на обстежених деревах було виявлено епігейні види *Plagiomnium cuspidatum*, *Ceratodon purpureus*, *Dicranella heteromalla* та *Pohlia nutans*, а також епікільні мохи *Dicranum flagellare* та ін.

В урочищі “Будинок лісника” виявлено три види мохоподібних, які не трапляються в історичній частині парку. Зокрема, *Lophocolea heterophylla* та *Sciuro-hypnum curtum* було виявлено на стовбурах *Quercus robur*, а *Sciuro-hypnum reflexum* – на корі *Quercus rubra*. Водночас з'ясовано, що історична частина парку відрізняється присутністю значного числа експансивних видів бріофітів.

Ключові слова: епіфітні бріофіти, таксономічне різноманіття, Державний дендрологічний парк “Олександрія”