

THE BRYOPHYTE RICHNESS AND DIVERSITY OF TAMÁS PÓCS'S PRIVATE DOMESTIC GARDEN

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Abstract: This paper presents the bryophyte diversity of Tamás Pócs's house garden in Felsőtárkány village (NE Hungary). Altogether 49 taxa (2 liverworts and 47 mosses) were recorded from the noted bryologist's private garden. More than half of the species (57%) belong to the three families: Orthotrichaceae, Pottiaceae and Brachytheciaceae. Compared with nearby surveyed parks and botanical gardens, the private garden has outstanding bryophyte richness in relation to the size of its area. In terms of species composition the garden shows the greatest similarity to the Central park of Eger town among the nearby localities. Recent data of *Entodon concinnus* is the fifth occurrence in the country and the first from North East Hungary.

Keywords: bryophytes, residential area, house garden, Central Europe, critically endangered moss, anthropogenic habitat

INTRODUCTION

Private house gardens in residential areas represent an important element of greenspace in many urban areas of the world (Gaston *et al.* 2005; Mathieu *et al.* 2007; Lepczyk *et al.* 2017).

Domestic gardens can provide relevant habitats for several groups of organisms, including bryophytes (Smith *et al.* 2010). Few articles address the bryophyte richness and diversity of residential private gardens in towns, for example in Sheffield (Smith *et al.* 2010) and other British settlements (Stevenson 2008; Callaghan 2009).

Knowledge about the bryophytes of garden areas of settlements in Hungary is insufficient, we found only a few floristic data from garden areas in Barcs (Szűcs *et al.* 2014) and Óriszentpéter towns (Szűcs and Bidló 2010).



The bryophyte flora of Almásfüzitő (Szűcs *et al.* 2017) and Balaton village (Zsolyom and Szűcs 2018) are well documented in Hungary, but these studies did not include the private gardens.

The present paper addresses the bryophyte flora of the eminent Hungarian botanist and bryologist's house garden.

MATERIAL AND METHODS

The samples were collected in May 2021 and January 2023. Site details include data in the following order: micro-habitats, substrates, date of collection and GPS-coordinates. Based on the Central European Flora Mapping System (Király *et al.* 2003), each collection point belongs to the 8088.2 square.

The nomenclature follows Király (2009) for vascular plants, Hodgetts *et al.* (2020) for liverworts and mosses. The conservation and indicator status of taxa are according to the Hungarian Red List (Papp *et al.* 2010). For the comparison of species composition in different localities, the Sørensen index was used (Sørensen 1948). The specimens are deposited at the Cryptogamic Herbarium of the Department of Botany and Plant Physiology at the Eszterházy Károly Catholic University, Eger (EGR) and some of them also at the Herbarium of the Berlin Botanic Garden and Botanical Museum (B-Erzberger s.n.).

Study area

Tamás Pócs's house garden is situated in Felsőtárkány village, which is located in the „Tárkányi basin” micro-region, at the gate of the Bükk mountain range, on the northeastern border of Heves County, 6 km from Eger town in NW Hungary. The last estimated population of Felsőtárkány was 3601 people (in 2018) (Demeter 2018).

The studied area is situated in a colline region at an elevation of 180 to 230 m above sea level. The climate is moderately cool to moderately dry. The average annual temperature is 8.5–9°C in the micro-region. The average annual precipitation is approximately 620 mm, of which 400 mm is produced during the vegetation period. The most common wind direction is SW, with an average wind speed of 2–2.5 m/s.

The climate makes the northern parts of the area suitable for forestry, and the southern parts also for agricultural cultivation (Dövényi 2010).

The size of the garden is about 1120 square meters (Pócs *ex verb.*), and the elevation is 224 m above sea level. The location is semi-shaded with the following microhabitats: shaded rock garden, exposed mowed lawn, artificial constructions (concrete and artificial stones, etc.), bark of fruit trees and other trees (detailed in the list of species paragraph). From the south, the garden is bordered by a periodic stream. Tamás Pócs's garden is not a 'moss garden', the owner did not make any effort to increase the bryophyte diversity. The yard is an enclosure for a large dog.

The important tree species in the garden are *Betula pendula*, *Prunus cerasus*, *P. avium*, *Elaeagnus angustifolia*, *Carpinus orientalis*, *Corylus colurna*, *Picea abies*, *Pyrus communis* and *Malus domestica*. The investigation area was extended to include a parking lot and a garden in the street front (additional *ca* 100 square meters).

An interesting fact about the history of the garden is that it hosted the International Association of Bryologists (IAB) meeting and International Conference on '*Follicolous Cryptogams*' in 1995 (Orbán and Péntes-Kónya 2013).

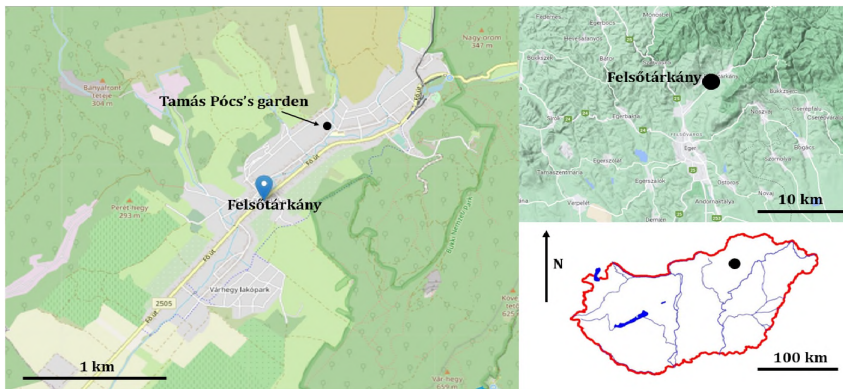


Figure 1. The location of the domestic garden in Felsőtárkány village (NE Hungary) (<https://www.google.hu/maps> and © OpenStreetMap contributors)

RESULTS AND DISCUSSION

List of species

Numbers refer to sites listed in the Appendix.

Marchantiophyta

Frullania dilatata (L.) Dumort – 1: bark of *Prunus cerasus*, *P. avium* and *Pyrus communis*

Radula complanata (L.) Dumort. – 1: bark of *Pyrus communis*

Bryophyta

Amblystegium serpens (Hedw.) Schimp. – 9: bark of *Betula pendula* and *Sambucus nigra*; 10: artificial stone

Barbula unguiculata Hedw. – 2: soil; 4, 7: soil

Brachytheciastrum velutinum (Hedw.) Ignatov & Huttunen – 8: rotten wood; bark of *Elaeagnus angustifolia*

Brachythecium glareosum (Bruch ex Spruce) Schimp. – 2: limestone; 3: soil

Brachythecium rutabulum (Hedw.) Schimp. – 4, 7, 10: soil

Bryoerythrophyllum recurvirostrum (Hedw.) P.C.Chen – 2: limestone; 10: bitumen

Bryum argenteum Hedw. – 4: soil

Bryum dichotomum Hedw. – 4: soil

Ceratodon purpureus (Hedw.) Brid. – 7: soil

Didymodon rigidulus Hedw. – 2: limestone; 10: stone

Entodon concinnus (De Not.) Paris – 3: soil

Fissidens taxifolius Hedw. – 8: shaded soil

Funaria hygrometrica Hedw. – 5, 7: soil

Homomallium incurvatum (Schrad. ex Brid.) Loeske – 2: limestone

Homalothecium lutescens (Hedw.) H.Rob. – 6, 10: artificial stone

Homalothecium philippeanum (Spruce) Schimp. – 2: limestone

Hypnum cupressiforme Hedw. – 1: bark of *Prunus cerasus* and *Pyrus communis*; 9: bark of *Betula pendula* and *Sambucus nigra*

Leskea polycarpa Hedw. – 1: bark of *Prunus avium*; 9: bark of *Betula pendula* and *Sambucus nigra*; 10: bitumen

Lewinskya affinis (Schrad. ex Brid.) F.Lara, Garilleti & Goffinet – 1: bark of *Prunus cerasus*

- Lewinskya speciosa*** (Nees) F.Lara, Garilleti & Goffinet – 1: bark of *Prunus cerasus*
- Lewinskya striata*** (Hedw.) F.Lara, Garilleti & Goffinet – 1: bark of *Prunus cerasus*
- Nyholmiella obtusifolia*** (Brid.) Holmen & E.Warncke – 1: bark of *Malus domestica*
- Orthotrichum anomalum*** Hedw. – 6: artificial stone; 8: concrete
- Orthotrichum cupulatum*** Brid. – 2: limestone; 6: artificial stone
- Orthotrichum diaphanum*** Brid. – 1: bark of *Malus domestica*; 2: limestone; 8: concrete; 9: bark of *Sambucus nigra*
- Orthotrichum pallens*** Bruch ex Brid. – 1: bark of *Malus domestica*
- Orthotrichum pumilum*** Sw. ex anon. – 8: decayed stump
- Oxyrrhynchium hians*** (Hedw.) Loeske – 3, 4, 5, 6, 7, 10: soil
- Plagiomnium cuspidatum*** (Hedw.) T.J.Kop. – 10: soil
- Plagiomnium rostratum*** (Schrad.) T.J.Kop. – 10: soil
- Platygyrium repens*** (Brid.) Schimp. – 1: bark of *Pyrus communis*
- Pleuridium subulatum*** (Hedw.) Rabenh. – 7: soil
- Pseudoleskeella nervosa*** (Brid.) Nyholm – bark of *Betula pendula*
- Ptychostomum moravicum*** (Podp.) Ros & Mazimpaka – 8: bark of *Elaeagnus angustifolia*
- Ptychostomum rubens*** (Mitt.) Holyoak & N.Pedersen – 4: soil
- Pylaisia polyantha*** (Hedw.) Schimp. – 1: bark of *Pyrus communis*
- Rhynchostegium megapolitanum*** (Blandow ex F.Weber & D.Mohr) Schimp. – 6: soil
- Schistidium elegantulum*** H.H.Blom – 2: limestone
- Sciuro-hypnum populeum*** (Hedw.) Ignatov & Huttunen – 2: limestone; 10: artificial stone
- Syntrichia papillosa*** (Wilson) Jur. – 1: bark of *Prunus cerasus* and *P. avium*
- Syntrichia ruralis*** (Hedw.) F.Weber & D.Mohr – 2: limestone
- Syntrichia virescens*** (De Not.) Ochyra – 9: slat of fence; 10: bitumen
- Tortula muralis*** Hedw. subsp. ***muralis*** var. ***muralis*** – 2: limestone; 8: concrete
- Tortula acaulon*** (With.) R.H.Zander – 5, 7: soil
- Tortula truncata*** (Hedw.) Mitt. – 7: soil
- Ulota crispula*** Bruch. – 1: bark of *Pyrus communis*
- Weissia longifolia*** Mitt. – 7: soil

Bryophyte diversity and richness

In total, 49 bryophytes were recorded from the Tamás Pócs's private garden, which include two liverworts (4%) and 47 mosses (96%). The liverworts belong to two families and two genera, while the mosses belong to 16 families and 34 genera (Figure 2). More than half of the species (57%) belong to the three families Orthotrichaceae (10 taxa), Pottiaceae (10 taxa) and Brachytheciaceae (8 taxa). These three families are also the most frequent in the Central Park of Eger town (Szűcs *et al.* 2020).

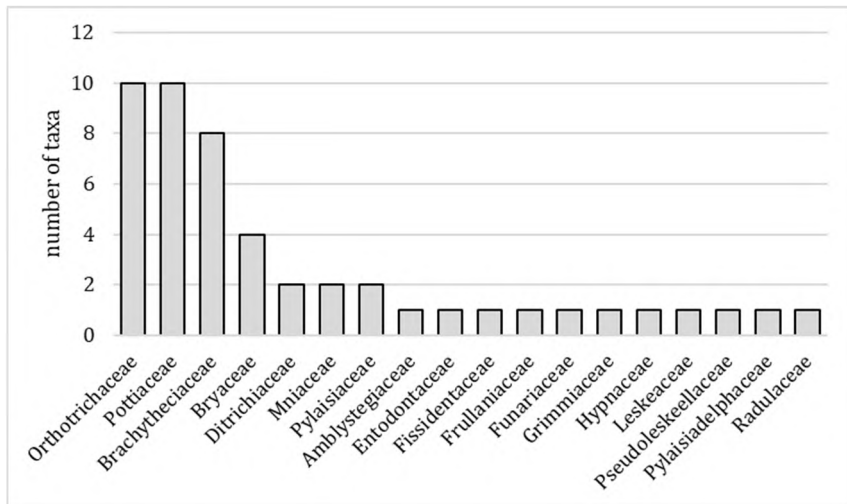


Figure 2. Distribution of bryophyte species found in the domestic garden among families (Taxonomy follows Hodgetts *et al.* 2020).

Compared with nearby surveyed parks and botanical gardens, the private garden has outstanding bryophyte richness in relation to the size of its area. The Central Park of Eger is situated 10 km from Tamás Pócs's garden, and shows the highest similarity in the bryophyte species composition according to the Sørensen index (0.67). The park of Mátrai Sanatorium is the furthest and highest locality, and shows the lowest similarity (0.46) (Table 1).

Table 1. Comparison of the area, the distance of localities from the private garden, the altitude, the number of taxa and Sørensen index of local places with Tamás Pócs's garden.

| Name of locality | area (hectare) | distance from T.P.'s garden (km) | alt (meter a.s.l.) | number of taxa | Sørensen index |
|---|-------------------|---|--------------------------|-------------------|-------------------|
| Tamás Pócs's garden (present work) | 0.12 | 0 | 224 | 49 | 1 |
| Bot. Garden of EKV (Szűcs <i>et al.</i> 2017b) | 1 | 8.7 | 230 | 46 | 0.57 |
| Central Park of Eger (Szűcs <i>et al.</i> 2020) | 14 | 9.7 | 155–165 | 59 | 0.67 |
| Aboretum of Erdőtelek (Szűcs and Fintha 2019) | 6 | 33.1 | 107–118 | 54 | 0.6 |
| Mátrai Sanatorium (Szűcs <i>et al.</i> 2018) | 14 | 35.6 | 650–700 | 65 | 0.46 |

Indicator species and bryophyte conservation

Some types of bryophytes indicate specific substrate and habitat conditions. In the studied locality, these are mainly species growing on shaded limestone rocks, such as *Bryoerythrophyllum recurvirostrum* (also on bitumen), *Didymodon rigidulus*, and *Orthotrichum cupulatum*.

Other mosses are indicator species of tree bark, for example *Lewinskya speciosa*, *L. striata*, *Nyholmiella obtusifolia*, *Orthotrichum pumilum*, *Syntrichia papillosa* and *Ulota crispula*.

The largest part of the species (70%) found in the Tamás Pócs's garden are not threatened (LC) in Hungary, further taxa (20%) belong to LC-attention category, (e.g. *Bryoerythrophyllum recurvirostrum*, *Didymodon rigidulus*, *Orthotrichum cupulatum*, *Lewinskya speciosa*, *L. striata*, *Pleuridium subulatum*, *Schistidium elegantulum*, *Syntrichia papillosa*, *S. virescens*, *Weissia longifolia*).

Near threatened (NT) mosses are *Brachythecium glareosum*, *Nyholmiella obtusifolia*, *Orthotrichum pumilum* and *Ulota crispula*.

The moss *Entodon concinnus* is common in the western parts of Europe and it does not belong to the endangered species on the European scale (Hodgetts *et al.* 2019). According to the Hungarian Red List, it is a critically endangered and very rare species (Erzberger 2021). For a long time, only one location in Hungary was known in the Botanical Garden in Vácrátót village (Blockeel *et al.* 2008). In recent years several new populations of the moss were

detected close to the first occurrence mentioned above, as well as West Hungary (Fintha and Szűcs 2019).

The recent locality reported here is the fifth occurrence of *Entodon concinnus* in Hungary, and the first from North East Hungary (Figure 3). The moss grows in mowed lawn (with *Oxyrrhynchium hians*) and the actual population is about 2 dm².

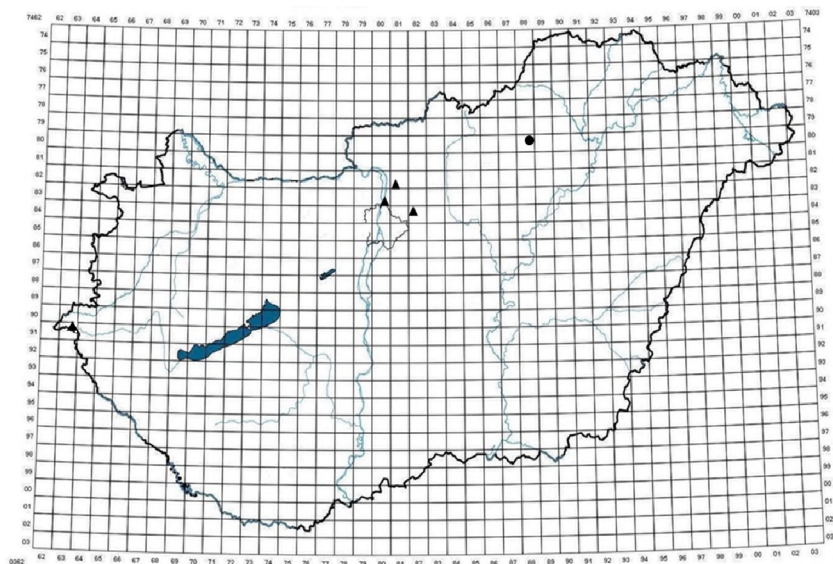


Figure 3. The distribution map of *Entodon concinnus* in Hungary; ● new occurrence, ▲ published and known occurrences (based on Fintha and Szűcs 2019).

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APPENDIX

Site details

1. fruit trees (27.05.2021.; 13.01.2023) N47.978553°, E20.422082°
2. shaded rock garden (27.05.2021.; 13.01.2023) N47.978646°, E20.422232°
3. mowed lawn, next to bushes (27.05.2021.; 13.01.2023) N47.978546°, E20.422126°
4. mowed lawn, with disturbed soil surface, site of a previous fire place (27.05.2021.; 13.01.2023) N47.978617°, E20.422276°
5. mowed lawn, with disturbed soil surface (27.05.2021.; 13.01.2023) N47.978639°, E20.422388°
6. grill place with artificial stones (13.01.2023) N47.978638°, E20.422276°
7. mowed lawn, with bare soil surface (13.01.2023) N47.978656°, E20.422336°
8. fence of the garden (27.05.2021.; 13.01.2023) N47.978692°, E20.422368°
9. entrance of garden (27.05.2021.; 13.01.2023) N47.978734°, E20.422322°
10. parking place and front garden (27.05.2021.; 13.01.2023) N47.978773°, E20.422276°