

CHAENOTHECA SPECIES IN THE BAKONY MOUNTAINS AND THE BALATON UPLANDS (HUNGARY)

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Abstract: The occurrences of *Chaenotheca* species in the Bakony Mts and the Balaton Uplands are mostly controlled by exposure, host species, and trunk height. Over the past decade, data on six *Chaenotheca* species (*Ch. chrysocephala*, *Ch. ferruginea*, *Ch. furfuracea*, *Ch. phaeocephala*, *Ch. stemonea*, and *Ch. trichialis*) were accumulated from 28 settlements in the study area. Among them *Chaenotheca chrysocephala* proved to be the most common and most spectacular. All the six lichen species predominantly prefer E, NE, and SE exposure of old oak trees, primarily *Quercus cerris* and *Qu. petraea*, with microhabitats where adequate microclimatic conditions are ensured.

Key words: Balaton Uplands, Bakony Mts, calicioid lichens, *Chaenotheca* species, exposure, height, Hungary, lichen floristics, microhabitat, new occurrences, old trees, pin lichens

INTRODUCTION

Calicioid lichens have ephemeral asci that disintegrate before the ascospores mature, forming a mazaedium (TIBELL 1975, 1992, 1999). This group of lichens is often referred to as “pin lichens” because of their small, needle-like fruiting bodies (PAQUETTE *et al.* 2019, SELVA 2003). Most of them occur mainly on tree bark and decaying wood. They usually prefer the base of trunks and cracks of rough bark or hanging roots in cavities being protected from rain, as well as decaying wood being hard, acidic, and dry (with low water content) in relatively shady and humid habitats of stable microclimatic conditions, with low atmospheric humidity and diffuse light (BARKMAN 1958, HOLIEN 1996). Low-light-requiring calicioid lichen species usually prefer deep bark crevices of north exposure, where their occurrence is also limited by the competition with bryophytes and macrolichens (RYDBERG 1997, SINIGLA and LÖKÖS 2015). Due to their unique morphology and special habitats, these species have received increasing attention in conservation biology research, particularly because of their role as indicator species (COPPINS and COPPINS 2002, SELVA 2003).

In many countries, the characterisation and evaluation of old-growth forests is also based on calicioid species (BELL-DOYON 2021). Most of them are sensitive to changes in the forest environment, to air pollution and to fire, and generally indicate long-term ecological continuity (DORT and HORVERS 2021, HOFFMANN and VAN LANDUYT 1997, SELVA 1994, 1996, 2002).

Chaenotheca species are rather tiny lichens that typically colonize decaying wood or bark in old, natural forests (TIBELL 1980). The presence of *Chaenotheca* species in a forest is closely related to the forest structure, the proportion of old trees, and the amount of decaying or dead wood, making them excellent bioindicators of natural or semi-natural forest ecosystems (LÖHMUS and LÖHMUS 2011, RIKKINEN 2003).

In Hungary the calicioid lichens and fungi are represented by *ca* 45 species (30 lichen-forming and 15 non-lichenized (parasitic or saprophytic) species). Among them 10 *Chaenotheca* species have been recognised up to now. These calicioid species were studied quite thoroughly in Hungary at the beginning of the last century, but with no records from the Bakony Mts (SZATALA 1926, 1927). The first specimen (*Chaenotheca stemonea*) was collected by Ödön Szatala at the Zirc Arboretum (SZATALA 1930). Later, the number of records decreased, and only a few occurrences were published from the Bakony Mts (VERSEGHY 1973).

The recent distribution and ecological role of *Chaenotheca* species in Hungary is relatively poorly known. The species *Chaenotheca phaeocephala*, *C. stemonea*, and *C. trichialis* are most commonly found on trees in Hungarian wooded pastures (SINIGLA and LÖKKÖS 2015). *Chaenotheca phaeocephala* occurred in sunnier locations than other species within the genus. In general, south-facing trunks are colonised by more lichen species (RANIUS *et al.* 2008).

Our aim was to register as many occurrences of *Chaenotheca* species as possible in the Bakony Mts and in the Balaton Uplands and to study their habitat preferences according to the new collections.

MATERIAL AND METHODS

A total of 107 specimens of six *Chaenotheca* species (*Ch. chrysocephala* (Ach.) Th. Fr. 1860, *Ch. ferruginea* (Turner ex Sm.) Lettau 1912, *Ch. furfuracea* L.) Tibell 1984, *Ch. phaeocephala* (Turner) Th. Fr. 1861, *Ch. stemonea* (Ach.) Müll. Arg. 1862, and *Ch. trichialis* (Ach.) Th. Fr. 1860) collected between 2015 and 2024 around 28 settlements in the Bakony Mts and the Balaton Uplands were deposited in the HNHM Bakony Natural History Museum (HNHM-BMCRY). Coordinates of localities were recorded by GPS devices (Garmin eTrex 20, Garmin GPSMAP 65sA) in HD72/EOV (Hungarian Unified National Projection). During the field trips all observed exposures of the given

lichen species on the phorophyte trunks have been registered and included in the habitat analysis. The phytosociological names follow the work of KEVEY (2008).

The specimens were examined and identified using standard microscopic techniques (Olympus SZX-7, Olympus CX-41, Nikon 6012867, and Zeiss Amplital). Nomenclature of the lichen species follows Index Fungorum (IFP 2025) and MycoBank (ROBERT *et al.* 2018).

RESULTS

Altogether 107 specimens of six *Chaenotheca* species (*Ch. chrysocephala*, *Ch. ferruginea*, *Ch. furfuracea*, *Ch. phaeocephala*, *Ch. stemonea*, and *Ch. trichialis*) collected around 28 settlements as new records for the Bakony Mts and the Balaton Uplands in the past decade, were studied in relation to their environmental traits, like exposure, host tree species, and collecting height on the trunks. Specimen information together with differences in habitat and substrate preferences is presented in detail in each species.

Chaenotheca chrysocephala

(Figs 1–2)

The 35 specimens of the conspicuous *Chaenotheca chrysocephala* have mainly been found on *Quercus cerris* trunks (28), but it also occurred on *Alnus glutinosa*, *Qu. petraea*, *Qu. pubescens*, and *Tilia platyphyllos*. They were localized at heights between 40 cm and 200 cm on the tree trunks, mostly on the eastern side (18 specimens) (Fig. 1), but southeastern exposure was also preferred (Fig. 2).

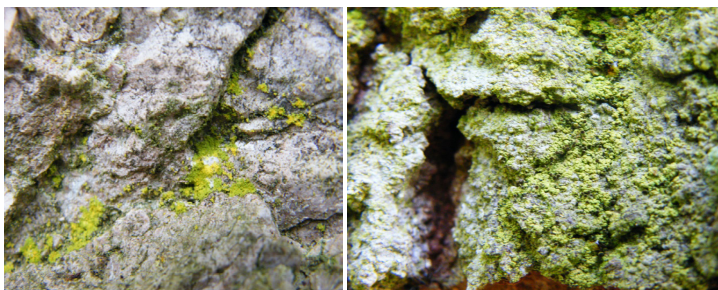


Fig. 1. Conspicuous bright yellow thalli of *Chaenotheca chrysocephala*.

Comit. Győr-Moson-Sopron, in loci “Alsó-Cuha-szurdok”, “Kenyeri-hegy”, prope pag. Bakonyszentlászló, in *Quercetum cerris*, ad corticem *Qu. cerris*. (x-y): 226085-558092, alt. cca. 260 m.s.m. Leg.: Sinigla, M., 12.03.2016 (HNHM-

BMCRY 002334). – Comit. Veszprém, in valle “Hajagos-völgy” prope pag. Balatonszőlős, in cacuminum *Quercetum*, ad corticem *Qu.s cerris*, (x-y): 183534-556310, alt. cca. 323 m.s.m. Leg.: Sinigla, M., 23.04.2015 (HNHM-BMCRY 001556). – Comit. Veszprém, ad margines viam vallis “Malom-völgy”, prope

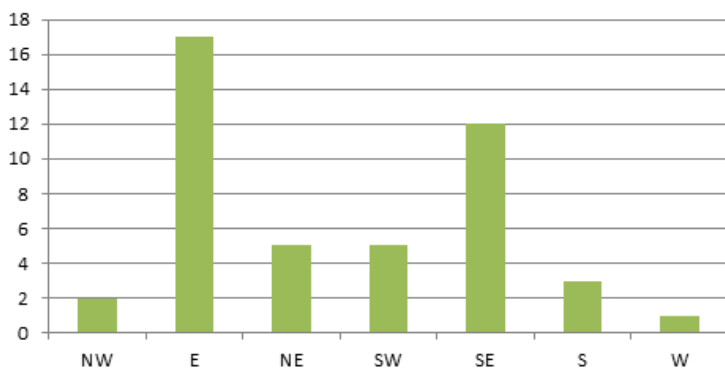


Fig. 2. Proportions of exposures of *Chaenotheca chrysocephala* occurrences.

pag. Felsőörs, ad corticem *Qu. cerris*, (x-y): 187111-565067, alt. cca. 247 m.s.m. Leg.: Sinigla, M., 07.05.2015 (HNHM-BMCRY 001557). – Comit. Veszprém, ad margines viam vallis “Malom-völgy”, prope pag. Felsőörs, ad corticem *Qu. cerris*, (x-y): 187001-565232, alt. cca. 230 m.s.m. Leg.: Sinigla, M., 07.05.2015 (HNHM-BMCRY 001558). – Comit. Veszprém, in vallem “Malom-völgy”, prope pag. Felsőörs, in *Quercetum petraeae-cerridis*, ad corticem *Qu. cerris*, (x-y): 186973-565259, alt. cca. 232 m.s.m. Leg.: Sinigla, M., 07.05.2015 (HNHM-BMCRY 002119). – Comit. Veszprém, in loci “pécselyi Felső-erdő”, prope pag. Pécsely, in *Carpinetis Quercetum*, ad corticem *Qu. petraea*, (x-y): 180100-551392, alt. cca. 321 m.s.m. Leg.: Sinigla, M., 12.05.2015 (HNHM-BMCRY 002120). – Comit. Veszprém, in loci “Felső-erdő”, prope pag. Balatonfüred, in *Quercetum petraeae-cerridis*, ad corticem *Qu.s petraea*, (x-y): 559038-184332, alt. cca. 388 m.s.m. Leg.: Sinigla, M., 13.05.2015 (HNHM-BMCRY 002121). – Comit. Veszprém, in cacumine “Koloska-tető”, prope opp. Balatonfüred, in *Quercetum cerris pubescentis*, ad corticem *Qu.s cerris*, (x-y): 184012-561300, alt. cca. 262 m.s.m. Leg.: Sinigla, M., 13.05.2015 (HNHM-BMCRY 002122). – Comit. Veszprém, in loci “Koloska-felső”, prope opp. Balatonfüred, in *Quercetum petraeae-cerridis*, ad corticem *Qu. cerris*, (x-y): 185064-560983, alt. cca. 291 m.s.m. Leg.: Sinigla, M., 14.05.2015 (HNHM-BMCRY 002123). – Comit. Veszprém, in

loci “Káptalani-erdő”, prope pag. Csopak, in *Quercetum cerris-Pinetum* vallis, ad corticem *Qu. cerris*, (x-y): 185064-560983, alt. cca. 269 m.s.m. Leg.: Sinigla, M., 14.05.2015 (HNHM-BMCRY 002124). – Comit. Veszprém, in loci “Fajszifás-legelő”, prope pag. Veszprémfajsz, ad margines viam, in *Quercetum cerris pubescentis*, ad corticem *Qu. s. cerris*, (x-y): 185673-562394, alt. cca. 290 m.s.m. Leg.: Sinigla, M., 14.05.2015 (HNHM-BMCRY 002125). – Comit. Veszprém, in valle “Evetes-völgy” prope pag. Balatonszőlős, in *Quercetum petraeae-Carpinetum*, ad corticem *Qu. petraea*, (x-y): 182547-557967, alt. cca. 264 m.s.m. Leg.: Sinigla, M., 02.06.2015 (HNHM-BMCRY 002126). – Comit. Veszprém, in valle “Evetes-völgy”, prope pag. Balatonszőlős, prope rivuli, in *Quercetum cerris pubescentis*, ad corticem *Qu. cerris*, (x-y): 182426-557999, alt. cca. 253 m.s.m. Leg.: Sinigla, M., 02.06.2015 (HNHM-BMCRY 002127). – Comit. Veszprém, in valle “Evetes-völgy”, prope pag. Balatonszőlős, in *Quercetum cerris pubescentis*, ad corticem *Qu. cerris*, (x-y): 182222-558080, alt. cca. 258 m.s.m. Leg.: Sinigla, M., 02.06.2015 (HNHM-BMCRY 002128). – Comit. Veszprém, in loci “Halomi-erdő”, prope pag. Mencshely, in *Quercetum cerris pubescentis*, ad corticem *Qu. cerris*, (x-y): 177766-548355, alt. cca. 267 m.s.m. Leg.: Sinigla, M., 04.06.2015 (HNHM-BMCRY 002129). – Comit. Veszprém, in loci “Koloska-felső”, prope opp. Balatonfüred, in *Quercetum petraeae-cerris*, ad corticem *Qu. cerris*, (x-y): 185045-560985, alt. cca. 297 m.s.m. Leg.: Sinigla, M., 05.06.2015 (HNHM-BMCRY 002130). – Comit. Veszprém, in loci “Paloznaki-erdő”, prope pag. Paloznak, in *Quercetum petraeae-cerridis*, ad corticem *Quercus cerris*, (x-y): 185439-564553, alt. cca. 267 m.s.m. Leg.: Sinigla, M., 08.06.2015 (HNHM-BMCRY 002131). – Comit. Veszprém, in monte “Paloznaki-hegy”, prope pag. Paloznak, in cacumine montis *Quercetum pubescentis*, ad corticem *Qu. pubescens*, (x-y): 183868-565434, alt. cca. 256 m.s.m. Leg.: Sinigla, M., 05.06.2015 (HNHM-BMCRY 002132). – Comit. Veszprém, in loci “Hideg-kúti-séd”, prope pag. Balatonszőlős, in *Quercetum cerris pubescentis*, ad corticem *Qu. cerris*, (x-y): 183565-557958, alt. cca. 292 m.s.m. Leg.: Sinigla, M., 25.06.2015 (HNHM-BMCRY 002133). – Comit. Veszprém, in loci “Ragonya”, prope pag. Vöröstó, in *Quercetum petraeae*, ad corticem *Qu. pubescens*, (x-y): 180236-549959, alt. cca. 366 m.s.m. Leg.: Sinigla, M., 01.07.2015 (HNHM-BMCRY 002134). – Comit. Veszprém, supra rivuli, in valle “Malom-völgy”, prope locum “Kopasz-tető” prope pag. Felsőörs, in saxa Tiliaceum, ad corticem *Qu. cerris*, (x-y): 186547-565721, alt. cca. 240 m.s.m. Leg.: Sinigla, M., 06.07.2015 (HNHM-BMCRY 002135). – Comit. Veszprém, in valle “Malom-völgy”, prope locum “Kopasz-tető” prope pag. Felsőörs, in saxa Tiliaceum, ad corticem *Tilia platyphyllos*, (x-y): 186762-565376, alt. cca. 239 m.s.m. Leg.: Sinigla, M., 06.07.2015 (HNHM-BMCRY 002136). – Comit. Veszprém, in valle “Malom-völgy”, prope pag. Felsőörs, in saxa Tiliaceum, ad corticem *Qu. cerris*, (x-y): 186785-565370,

alt. cca. 240 m.s.m. Leg.: Sinigla, M., 06.07.2015 (HNHM-BMCRY 002137). – Comit. Győr-Moson-Sopron, in loci “ösfenyves”, prope pag. Fenyőfő, in *Pineti*, ad corticem *Qu. cerris*, (x-y): 554107-224660, alt. cca. 272 m.s.m. Leg.: Sinigla, M., 06.07.2015 (HNHM-BMCRY 003624). – Comit. Zala, in valle “Vári-völgy”, prope pag. Vállus, in siccis graminosis, ad corticem *Qu. cerris*, (x-y): 514536-166459, alt. cca. 229 m.s.m. Leg.: Sinigla, M., 16.08.2022 (HNHM-BMCRY 003587). – Comit. Veszprém, in cacumine “Nagy-vár-tető”, prope pag. Vászoly, in *Quercetum cerris pubescentis*, ad corticem *Qu. cerris*, (x-y): 177219-553190, alt. cca. 298 m.s.m. Leg.: Sinigla, M., 08.07.2015 (BTM 002138). – Comit. Veszprém, in loci “fás legelő, Alsó-erdő”, prope pag. Veszprémfajsz, ad corticem *Qu. cerris*, (x-y): 562665-187757, alt. cca. 320 m.s.m. Leg.: Sinigla, M., 28.12.2019 (HNHM-BMCRY 003858). – Comit. Zala, in loci “Tátika”, prope pag. Zalaszántó, in *Quercetum cerris pubescentis*, ad corticem *Qu. cerris*, (x-y): 513499-174375, alt. cca. 321 m.s.m. Leg.: Sinigla, M., 17.08.2022 (HNHM-BMCRY 003588). – Comit. Veszprém, in loci “Balázs-tető”, prope pag. Dörgicse, in *Quercetum petraeae-cerris*, ad corticem *Qu. cerris*, (x-y): 175248-547248, alt. cca. 296 m.s.m. Leg.: Sinigla, M., 26.06.2015 (HNHM-BMCRY 002139). – Comit. Veszprém, in loci “Megye-hegy”, prope opp. Balatonalmádi, in *Carpinetis Quercetum vallis*, ad corticem *Qu. cerris*, (x-y): 192255-571272, alt. cca. 200 m.s.m. Leg.: Sinigla, M., 21.07.2015 (HNHM-BMCRY 002140). – Comit. Veszprém, in valle “Füredi Malom-völgy”, prope pag. Balatonszőlős, in *Quercetum petraeae-cerris*, ad corticem *Qu. cerris*, (x-y): 179967-557899, alt. cca. 172 m.s.m. Leg.: Sinigla, M., 07.08.2015 (HNHM-BMCRY 002141). – Comit. Veszprém, in valle “Malom-völgy”, prope opp. Balatonfüred, prope rivuli *Carpinetis*, ad corticem *Qu. cerris*, (x-y): 558089-179869, alt. cca. 188 m.s.m. Leg.: Sinigla, M., 07.08.2015 (HNHM-BMCRY 002142). – Comit. Veszprém, in loci “Istvándi-erdő”, prope pag. Uzsa, in alnetis, ad corticem *Alnus glutinosa*, (x-y): 518559-175887, alt. cca. 200 m.s.m. Leg.: Sinigla, M., 16.08.2022 (HNHM-BMCRY 003331). – Comit. Veszprém, in loci “fás legelő”, prope pag. Veszprémfajsz, ad corticem *Qu. cerris*, (x-y): 562116-186739, alt. cca. 188 m.s.m. Leg.: Sinigla, M., 20.01.2024 (HNHM-BMCRY 003820). – Comit. Veszprém, in loci “fás legelő”, prope pag. Veszprémfajsz, ad corticem *Qu. cerris*, (x-y): 563414-185772, alt. cca. 300 m.s.m. Leg.: Sinigla, M., 20.01.2024 (HNHM-BMCRY 003821).

Chaenotheca ferruginea

(Figs 3–4)

The 28 specimens of *Chaenotheca ferruginea* have been found mainly on *Quercus cerris* (16), *Qu. petraea* (5) and *Pinus sylvestris* (6) trunks typically at heights of

100–120 cm mainly in eastern (E) exposure (13 specimens), as well as in south-southeastern (SSE) exposure (9 specimens).



Fig. 3. Dull greenish-yellowish orange thalli of *Chaenotheca ferruginea*.

Comit. Veszprém, in *Quercetum*, prope pag. Bakonyszentkirály, ad corticem *Quercus cerris*, (x-y): 562627-227209, alt. cca. 260 m.s.m. Leg.: Sinigla, M., 10.05.2020 (HNHM-BMCRY 003750). – Comit. Győr-Moson-Sopron, in loci “Alsó-Cuha-szurdok”, “Kenyeri-hegy”, prope pag. Bakonyszentlászló, in *Quercetum cerris pubescentis*, ad corticem *Qu. cerris*, (x-y): 226085-558092, alt. cca. 260 m.s.m. Leg.: Sinigla, M., 12.03.2016 (HNHM-BMCRY 002335). – Comit. Veszprém, in monte “Megye-hegy”, prope opp. Balatonalmádi, in *Carpinetis Quercetum*, ad corticem *Qu. cerris*, (x-y): 192255-571272, alt. cca. 200 m.s.m. Leg.: Sinigla, M., 21.07.2015 (HNHM-BMCRY 002158). – Comit. Veszprém, in monte “Péter-hegy”, prope opp. Balatonfüred, in *Carpinetis fossis*, ad corticem *Pinus sylvestris*, (x-y): 182420-562028, alt. cca. 201 m.s.m. Leg.: Sinigla, M., 22.04.2015 (HNHM-BMCRY 002143). – Comit. Veszprém, in valle “Füredi Malom-völgy”, prope pag. Balatonszőlős, in *Quercetum petraeae-cerris*, ad corticem *Qu. cerris*, (x-y): 179967-557899, alt. cca. 172 m.s.m. Leg.: Sinigla, M., 07.08.2015 (HNHM-BMCRY 002161). – Comit. Veszprém, in valle “Evetes-völgy” prope pag. Balatonszőlős, in *Carpinetis-Quercetum petraea*, ad corticem *Qu. petraea*, (x-y): 182547-557967, alt. cca. 264 m.s.m. Leg.: Sinigla, M., 02.06.2015 (HNHM-BMCRY 002153). – Comit. Veszprém, in loci “Hideg-kúti-séd”, prope pag. Balatonszőlős, prope rivuli, in *Carpinetis*, ad corticem *Qu. cerris*, (x-y): 183463-558035, alt. cca. 284 m.s.m. Leg.: Sinigla, M., 04.08.2015

(HNHM-BMCRY 002160). – Comit. Veszprém, in loci “Káptalani-erdő”, prope pag. Csopak, in *Carpinetis Quercetum cerris*, ad corticem *Quercus petraea*, (x-y): 185121-562708, alt. cca. 264 m.s.m. Leg.: Sinigla, M., 14.06.2015 (HNHM-BMCRY 002151). – Comit. Veszprém, in cacumine “Balázs-tető”, prope pag.



Fig. 4. Proportions of exposures of *Chaenotheca ferruginea* occurrences.

Dörgicse, in *Quercetumpetraeae-cerris*, ad corticem *Qu. petraea*, (x-y): 175103-547516, alt. cca. 321 m.s.m. Leg.: Sinigla, M., 04.06.2015 (HNHM-BMCRY 002154). – Comit. Veszprém, in valle “Horog-völgy”, prope pag. Dörgicse, in *Pineti*, ad corticem *Pinus sylvestris*, (x-y): 174127-552019, alt. cca. 266 m.s.m. Leg.: Sinigla, M., 02.07.2015 (HNHM-BMCRY 002156). – Comit. Veszprém, in valle “Malom-völgy”, prope pag. Felsőörs, in *Quercetum cerris*, ad corticem *Pinus sylvestris*, (x-y 186930-565259, alt. cca. 226 m.s.m. Leg.: Sinigla, M., 07.05.2015 (HNHM-BMCRY 002145). – Comit. Veszprém, in valle “Malom-völgy”, prope pag. Felsőörs, in *Quercetum cerris pubescentis*, ad corticem *Pinus sylvestris*, (x-y 186930-565259, alt. cca. 226 m.s.m. Leg.: Sinigla, M., 07.05.2015 (HNHM-BMCRY 002146). – Comit. Veszprém, in valle “Malom-völgy”, prope pag. Felsőörs, in *Quercetum cerris Pinetum*, ad corticem *Pinus sylvestris*, (x-y 565259-186930, alt. cca. 226 m.s.m. Leg.: Sinigla, M., 07.05.2015 (HNHM-BMCRY 002147). – Comit. Veszprém, in valle “Malom-völgy”, prope pag. Felsőörs, in *Pinetum*, ad corticem *Qu. cerris*, (x-y 187140-565096, alt. cca. 234 m.s.m. Leg.: Sinigla, M., 07.05.2015 (HNHM-BMCRY 002979). – Comit. Veszprém, in “Malom-völgy”, prope pag. Felsőörs, in *Quercetum cerris pubescentis*, ad corticem *Pinus sylvestris*, (x-y 565294-186872, alt. cca. 255 m.s.m. Leg.: Sinigla, M., 06.07.2015 (HNHM-BMCRY 002157). – Comit. Győr-Moson-Sopron, in loci “ösfenyves”, prope pag. Fenyőfő, in *Pineti*, ad corticem *Qu. cerris*, (x-y 553771-225226)

alt. cca. 261 m.s.m. Leg.: Sinigla, M., 07.05.2015 (HNHM-BMCRY 003625). – Comit. Veszprém, in loci “Zádor-vár”, prope pag. Pécsely, prope murus arcis, ad corticem *Qu. cerris*, (x-y 181783-552960, alt. cca. 328 m.s.m. Leg.: Sinigla, M., 07.05.2015 (HNHM-BMCRY 001559). – Comit. Veszprém, in loci “Zádor-vár”, prope pag. Pécsely, prope murus arcis, ad corticem *Qu. petraea*, (x-y: 181783-552960, alt. cca. 328 m.s.m. Leg.: Sinigla, M., 05.05.2015 (HNHM-BMCRY 002144). – Comit. Veszprém, in loci “Zádor-vár”, prope pag. Pécsely, in valle *Faginetis*, ad corticem *Qu. cerris*, (x-y 181864-552944) alt. cca. 286 m.s.m. Leg.: Sinigla, M., 22.07.2015 (HNHM-BMCRY 002159). – Comit. Veszprém, in monte “Sátorma-hegy”, prope pag. Szentbékállá, in *Quercetum petraeae-cerridis*, ad corticem *Qu. petraea*, (x-y): 173875-535346, alt. cca. 321 m.s.m. Leg.: Sinigla, M., 17.05.2016 (HNHM-BMCRY 002573). – Comit. Veszprém, in loci “Öreg-Futóné”, prope pag. Tés, in saxis Tiliaceum, ad cortex *Tilia*, (x-y): 574216-209350, alt. cca. 482 m.s.m. Leg.: Sinigla, M., 13.03.2021 (HNHM-BMCRY 003388). – Comit. Veszprém, in cacumine “Nagy-vár-tető”, prope pag. Vászoly, in *Quercetum cerris pubescentis*, ad corticem *Qu. cerris*, (x-y): 177245-553054) alt. cca. 283 m.s.m. Leg.: Sinigla, M., 07.05.2015 (HNHM-BMCRY 001560). – Comit. Veszprém, in cacumine “Nagy-vár-tető”, prope pag. Vászoly, in *Quercetum cerris pubescentis*, ad corticem *Qu. cerris*, (x-y): 177245-553054) alt. cca. 283 m.s.m. Leg.: Sinigla, M., 07.05.2015 (HNHM-BMCRY 002148). – Comit. Veszprém, in *Quercetum cerris pubescentis*, loci “Nagy-vár-tető”, prope pag. Vászoly, ad corticem *Qu. cerris*, (x-y): 177203-553068 alt. cca. 286 m.s.m. Leg.: Sinigla, M., 07.05.2015 (HNHM-BMCRY 002149). – Comit. Veszprém, in loci “Fajszí-fás-legelő”, prope pag. Veszprémfajsz, in *Quercetum cerris pubescentis*, ad corticem *Qu. cerris*, (x-y): 185702-562092) alt. cca. 287 m.s.m. Leg.: Sinigla, M., 14.05.2015 (HNHM-BMCRY 002152). – Comit. Veszprém, in loci “Fajszí-fás-legelő”, prope pag. Veszprémfajsz, in *Quercetum cerris pubescentis*, ad corticem *Qu. cerris*, (x-y): 186276-561848) alt. cca. 298 m.s.m. Leg.: Sinigla, M., 07.05.2015 (HNHM-BMCRY 002155). – Comit. Veszprém, in loci “Nagy-vár-tető”, prope pag. Vászoly, in *Quercetum cerris pubescentis*, ad corticem *Qu. cerris*, (x-y): 562116-186739, alt. cca. 286 m.s.m. Leg.: Sinigla, M., 20.01.2024 (HNHM-BMCRY 003822). – Comit. Veszprém, in loci “Vöröstói fás legelő”, prope pag. Vöröstó, in *Quercetum cerris pubescentis*, ad corticem *Qu. cerris*, (x-y): 181072-556122) alt. cca. 344 m.s.m. Leg.: Sinigla, M., 12.05.2015 (HNHM-BMCRY 002150).

Chaenotheca furfuracea
(Figs 5–6)

Only three occurrences have been detected on rather old *Pinus sylvestris* and *Tilia platyphyllos* trunks at eastern (E) and northeastern (NE) exposures at the base of the trunks, as well as on the soil.



Fig. 5. Dull greenish-yellowish thalli of *Chaenotheca furfuracea*.

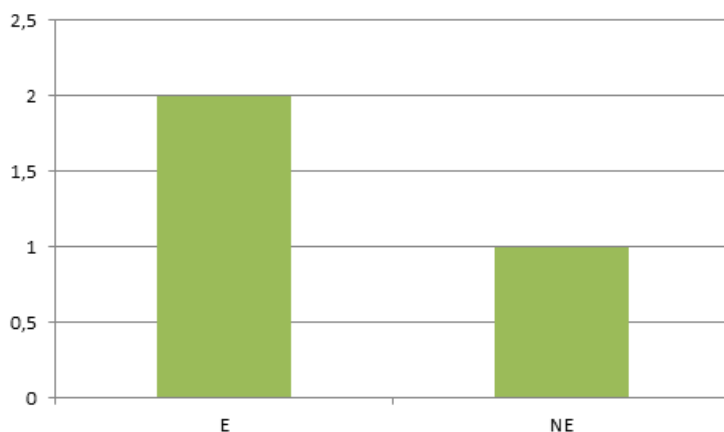


Fig. 6. Proportions of exposures of *Chaenotheca furfuracea* occurrences.

Comit. Veszprém, supra Bittva, prope pag. Farkasgyepű, in *Faginetis*, ad terram, (x-y): 206282-540902, alt. cca. 315 m.s.m. Leg.: Sinigla, M., 05.10.2018 (HNHM-BMCRY 002922). – Comit. Veszprém, in cacumine “Kopasz-tető”, prope pag. Felsőörs, in saxa Tiliaceum, ad corticem *Tilia platyphyllos*, (x-y): 565778-186537, alt. cca. 232 m.s.m. Leg.: Sinigla, M., 06.07.2015 (HNHM-BMCRY 002167). – Comit. Győr-Moson-Sopron, in loci “Hangos-Fenyves”, prope pag. Fenyőfő, in arenosis sylvestris, ad corticem *Pinus sylvestris*,

(x-y): 225199-553923, alt. cca. 271 m.s.m. Leg.: Sinigla, M., 26.07.2016 (HNHM-BMCRY 003033).

Chaenotheca phaeocephala
(Figs 7–8)

Altogether 16 occurrences have been recorded from *Pyrus pyraister* (2), *Quercus cerris* (5), *Qu. petraea* (5), and *Qu. pubescens* (4) trunks up to a height of 180 cm. Most of the specimens (10) have been located in E exposure, while 4 specimens were in SE exposure (mainly on *Quercus petraea* trunks).

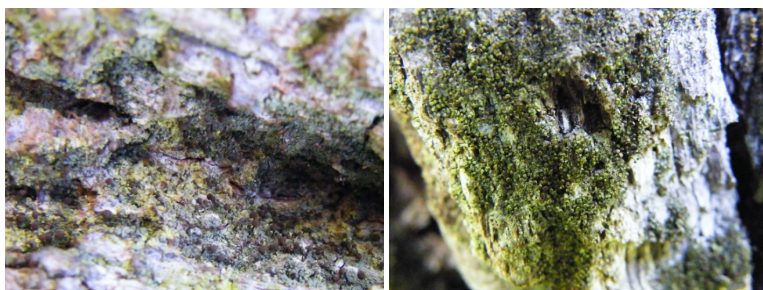


Fig. 7. Inconspicuous thalli of *Chaenotheca phaeocephala*.



Fig. 8. Proportions of exposures of *Chaenotheca phaeocephala* occurrences.

Comit. Veszprém, in loci “Káptalani-erdő”, prope pag. Csopak, in *Quercetum cerris-Pinetum*, ad corticem *Quercus cerris*, (x-y): 185135-562716, alt. cca. 269 m.s.m. Leg.: Sinigla, M., 14.05.2015 (HNHM-BMCRY 002173). – Comit. Veszprém, in monte “Bádi-hegy”, prope pag. Óbudavár, ad margines viam, in *Quercetum cerris pubescentis*, ad corticem *Qu. cerris*, (x-y): 177522-546625,

alt. cca. 266 m.s.m. Leg.: Sinigla, M., 26.06.2015 (HNHM-BMCRY 002175). – Comit. Veszprém, in monte “Bádi-hegy”, prope pag. Óbudavár, ad margines viam, in *Quercetum cerris pubescentis*, ad corticem *Qu. cerris*, (x-y): 177522-546625, alt. cca. 266 m.s.m. Leg.: Sinigla, M., 26.06.2015 (HNHM-BMCRY 002176). – Comit. Veszprém, in monte “Csengő-hegy”, prope pag. Olaszfalu-Alsópere, in saxis *Quercetum*, ad corticem *Qu.s cerris*, (x-y): 568791-211617, alt. cca. 470 m.s.m. Leg.: Sinigla, M., 07.11.2021 (HNHM-BMCRY 003389). – Comit. Veszprém, in monte “Csengő-hegy”, prope pag. Olaszfalu-Alsópere, in *Quercetum*, ad corticem *Qu. petraea*, (x-y): 569740-210580, alt. cca. 409 m.s.m. Leg.: Sinigla, M., 07.01.2023 (HNHM-BMCRY 003645). – Comit. Veszprém, in “Örvényesi-fás-legelő”, prope pag. Örvényes, in fruticetis, ad corticem *Qu. pubescens*, (x-y): 555094-176225, alt. cca. 166 m.s.m. Leg.: Sinigla, M., 30.06.2015 (HNHM-BMCRY 002177). – Comit. Zala, in loci “Rezi-vár”, prope pag. Rezi, in *Quercetum pubescentis*, ad corticem *Qu. pubescens*, (x-y): 512299-170552, alt. cca. 422 m.s.m. Leg.: Sinigla, M., 30.06.2015 (HNHM-BMCRY 003213). – Comit. Zala, in loci “Büdös-kút”, prope pag. Vállus, in pascuis, ad corticem *Pyrus pyraeaster*, (x-y): 518504-164464, alt. cca. 348 m.s.m. Leg.: Sinigla, M., 07.06.2022 (HNHM-BMCRY 003423). – Comit. Zala, in loci “Büdöskút”, prope pag. Vállus, in *Quercetum cerris pubescentis*, ad corticem *Pyrus pyraeaster*, (x-y): 518545-164408, alt. cca. 348 m.s.m. Leg.: Sinigla, M., 16.08.2022 (HNHM-BMCRY 003589). – Comit. Veszprém, in loci “Fajszi-erdő”, prope pag. Veszprémfajsz, ad margines viam, in *Quercetum cerris pubescentis*, ad corticem *Qu. pubescens*, (x-y): 185755-562497, alt. cca. 287 m.s.m. Leg.: Sinigla, M., 14.04.2015 (HNHM-BMCRY 002168). – Comit. Veszprém, in loci “Fajszi-erdő” prope pag. Veszprémfajsz, ad viam antiquus pascuis *Quercetum cerris*, ad corticem *Qu.s pubescens*, (x-y): 185755-562501, alt. cca. 283 m.s.m. Leg.: Sinigla, M., 14.05.2015 (HNHM-BMCRY 002174). – Comit. Veszprém, in loci “Vöröstói fás legelő (Lapály-dűlő)”, prope pag. Vöröstó, in *Quercetum cerris pubescentis*, ad corticem *Qu.s petraea*, (x-y): 181072-550160, alt. cca. 349 m.s.m. Leg.: Sinigla, M., 12.05.2015 (HNHM-BMCRY 002169). – Comit. Veszprém, in loci “Vöröstói fás legelő (Lapály-dűlő)”, prope pag. Vöröstó, in *Quercetum cerris pubescentis*, ad corticem *Qu. petraea*, (x-y): 181072-550160, alt. cca. 349 m.s.m. Leg.: Sinigla, M., 12.05.2015 (HNHM-BMCRY 002170). – Comit. Veszprém, in loci “Vöröstói fás legelő”, prope pag. Vöröstó, in *Quercetum petraeae-cerridis*, ad corticem *Qu. petraea*, (x-y): 550160-181072, alt. cca. 349 m.s.m. Leg.: Sinigla, M., 12.05.2015 (HNHM-BMCRY 002171). – Comit. Veszprém, in loci “Vöröstói fás legelő”, prope pag. Vöröstó, in *Quercetum petraeae-cerris*, ad corticem *Qu. petraea*, (x-y): 550160-181072, alt. cca. 349 m.s.m. Leg.: Sinigla, M., 12.05.2015 (HNHM-BMCRY 002172). – Comit. Veszprém, in loci “Vöröstói fás legelő (Lapály-dűlő)”, prope pag. Vöröstó, in *Aceretum*, ad

corticem *Qu. cerris*, (x-y): 181111-550141, alt. cca. 348 m.s.m. Leg.: Sinigla, M., 01.07.2015 (HNHM-BMCRY 002178).

Chaenotheca stemonea
(Figs 9–10)

The 14 specimens have been found on nine host tree species (*Pinus sylvestris*, *Pyrus pyraister*, *Quercus cerris*, *Qu. petraea*, *Qu. pubescens*, *Robinia pseudoacacia*, *Salix alba*, *S. fragilis*, and *Tilia cordata*), occasionally also on decaying wood. The specimens have been collected in eastern (E), northern (N), and northeastern (NE) exposures of the tree trunks at height of around 180 cm.

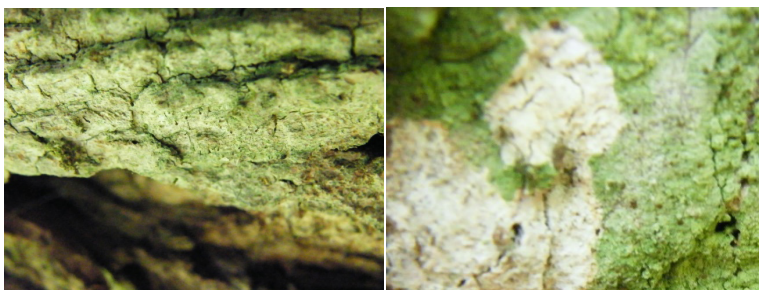


Fig. 9. Greenish leprarioid thalli of *Chaenotheca stemonea*.

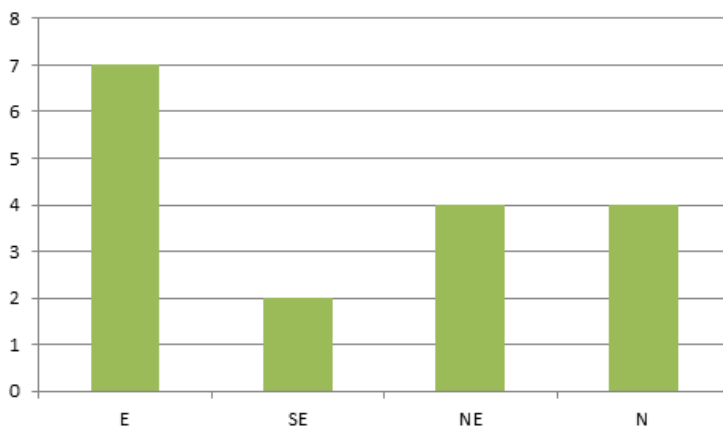


Fig. 10. Proportions of exposures of *Chaenotheca stemonea* occurrences.

Comit. Veszprém, supra “Koloska-forrás”, in cacumine “Koloska-tető”, prope opp. Balatonfüred, in saxa *Quercetum cerris*, ad corticem *Pinus sylvestris*,

(x-y): 183594-561606, alt. cca. 269 m.s.m. Leg.: Sinigla, M., 03.07.2015 (HNHM-BMCRY 002180). – Comit. Veszprém, supra vallem “Koloska-völgy”, in cacumine “Koloska-tető”, prope opp. Balatonfüred, ad saxa dolomit., in *Quercetum petraeae-cerridis*, ad corticem *Qu. pubescens*, (x-y): 183682-561468, alt. cca. 271 m.s.m. Leg.: Sinigla, M., 03.07.2015 (HNHM-BMCRY 002184). – Comit. Veszprém, supra vallem “Koloska-völgy”, in cacumine “Koloska-tető”, prope opp. Balatonfüred, ad saxa dolomit., in *Quercetum petraeae-cerridis*, ad corticem *Pinus sylvestris*, (x-y): 183594-561606, alt. cca. 269 m.s.m. Leg.: Sinigla, M., 03.07.2015 (HNHM-BMCRY 002185). – Comit. Veszprém, in loci “Hideg-Kúti-Séd”, prope pag. Balatonszőlős, in *Salicetum*, ad corticem *Salix alba*, (x-y): 183594-561606, alt. cca. 279 m.s.m. Leg.: Sinigla, M., 23.04.2015 (HNHM-BMCRY 002948). – Comit. Veszprém, in valle Evetes-völgy”. Balatonszőlős, in *Quercetum Carpinetis*, ad corticem *Robinia pseudoacacia*, (x-y): 182424-558012, alt. cca. 258 m.s.m. Leg.: Sinigla, M., 25.06.2015 (HNHM-BMCRY 002181). – Comit. Veszprém, in loci “Káptalani-erdő” prope pag. Csopak, in cacumine *Quercetum*, ad corticem *Qu. cerris*, (x-y): 185269-562618, alt. cca. 276 m.s.m. Leg.: Sinigla, M., 08.06.2015 (HNHM-BMCRY 002182). – Comit. Veszprém, in cacumine “Kopasz-tető”, prope pag. Felsőörs, in *Quercetum Carpinetis*, ad corticem *Qu. cerris*, (x-y): 186436-565950, alt. cca. 214 m.s.m. Leg.: Sinigla, M., 06.07.2015 (HNHM-BMCRY 002186). – Comit. Veszprém, in valle “Malom-völgy”, prope pag. Felsőörs, in saxa Tiliaceum, ad corticem lignum, (x-y): 186718-565406, alt. cca. 248 m.s.m. Leg.: Sinigla, M., 06.07.2015 (HNHM-BMCRY 002187). – Comit. Veszprém, in valle “Király-kúti-völgy”, prope pag. Lovas, in *Carpinetis vallis*, ad corticem *Quercus cerris*, (x-y): 186031-565280, alt. cca. 244 m.s.m. Leg.: Sinigla, M., 10.05.2015 (HNHM-BMCRY 002183). – Comit. Veszprém, ad viam lacum, prope “Séd”, prope pag. Márkó, ad corticem *Tilia cordata*, (x-y): 197056-557066, alt. cca. 262 m.s.m. Leg.: Sinigla, M., 25.09.2018 (HNHM-BMCRY 002828). – Comit. Zala, in loci “Büdöskút”, prope pag. Vállus, in *Quercetum cerris pubescentis*, ad corticem *Pyrus pyraster*, (x-y): 518545-164408, alt. cca. 348 m.s.m. Leg.: Sinigla, M., 16.08.2022 (HNHM-BMCRY 003590). – Comit. Veszprém, in cacumine “Nagy-vár-tető”, prope pag. Vászoly, in *Faginetis*, ad corticem *Salix fragilis*, (x-y): 177432-553149, alt. cca. 231 m.s.m. Leg.: Sinigla, M., 22.07.2015 (HNHM-BMCRY 002188). – Comit. Veszprém, in loci “Vöröstói fás legelő”, prope pag. Vöröstó, in *Quercetum petraeae-cerridis*, ad corticem *Qu. petraea*, (x-y): 550085-180994, alt. cca. 350 m.s.m. Leg.: Sinigla, M., 01.07.2015 (HNHM-BMCRY 002179). – Comit. Zala, in loci “Tátika”, prope pag. Zalaszántó, in saxis Tiliaceum, ad corticem *Tilia cordata*, (x-y): 513325-175342, alt. cca. 312 m.s.m. Leg.: Sinigla, M., 17.08.2022 (HNHM-BMCRY 003332).

Chaenotheca trichialis

(Figs 11–12)

A total of 11 occurrences have been detected on six host tree species (*Quercus cerris*, *Qu. petraea*, *Robinia pseudoacacia*, *Tilia cordata*, *T. platyphyllos*, and *Ulmus laevigata*). Northeastern (NE) (5) and eastern (E) (4) exposures have been dominant, in most cases at heights between 100 and 160 cm.



Fig. 11. Inconspicuous greyish-greenish thalli of *Chaenotheca trichialis*.

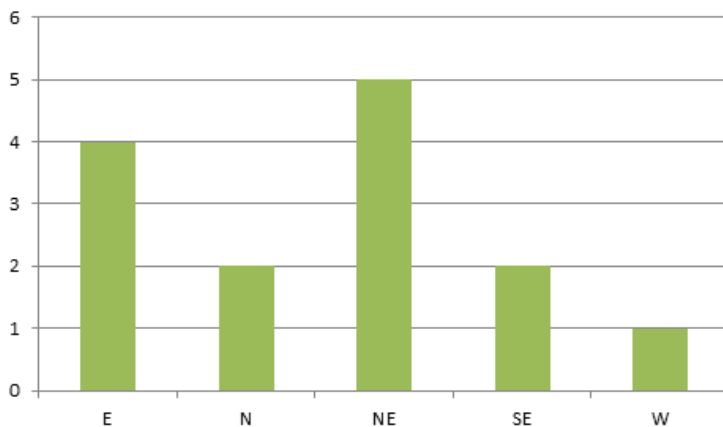


Fig. 12. Proportions of exposures of *Chaenotheca trichialis* occurrences.

- Comit. Veszprém, in loci “Káptalani-erdő”, prope opp. Csopak, in *Quercetum*, ad corticem *Quercus cerris*, (x-y): 185135-562716, alt. cca. 269 m.s.m. Leg.: Sinigla, M., 14.05.2015 (HNHM-BMCRY 002949).
 – Comit. Veszprém, in monte “Tobán-hegy”, prope pag. Eplény, in sax-
 is *Quercus pubescentis*, ad corticem *Tilia cordata*, (x-y): 566965-207008, alt.
 cca. 378 m.s.m. Leg.: Sinigla, M., 28.03.2016 (HNHM-BMCRY 003390).
 – Comit. Veszprém, in loci “Vöröstói fás legelő”, prope pag. Vöröstó,

in *Quercetum petraeae-cerridis*, ad corticem *Qu. petraea*, (x-y): 180950-550043, alt. cca. 340 m.s.m. Leg.: Sinigla, M., 12.05.2015 (HNHM-BMCRY 002162). – Comit. Veszprém, in loci “Hideg-kúti-séd”, prope pag. Balatonszőlős, prope rivuli, in *Aceretum*, ad corticem *Robinia pseudoacacia*, (x-y): 183482-558029, alt. cca. 286 m.s.m. Leg.: Sinigla, M., 25.06.2015 (HNHM-BMCRY 002163). – Comit. Veszprém, in cacumine “Kopasz-tető”, prope pag. Felsőörs, in *Quercetum pubescentis*, ad corticem *Tilia platyphyllos*, (x-y): 186537-565778, alt. cca. 232 m.s.m. Leg.: Sinigla, M., 06.07.2015 (HNHM-BMCRY 002164). – Comit. Veszprém, in valle “Malom-völgy”, prope locum “Kopasz-tető” prope pag. Felsőörs, in saxa Tiliaceum, supra rivuli, ad corticem *Tilia platyphyllos*, (x-y): 186507-565813, alt. cca. 231 m.s.m. Leg.: Sinigla, M., 06.07.2015 (HNHM-BMCRY 002165). – Comit. Veszprém, in valle “Malom-völgy”, prope pag. Felsőörs, in *Quercetum cerris pubescentis*, ad corticem *Qu. cerris*, (x-y): 186781-565380, alt. cca. 234 m.s.m. Leg.: Sinigla, M., 06.07.2015 (HNHM-BMCRY 002166). – Comit. Veszprém, prope “Séd”, prope pag. Márkó, ad viam lacum, ad corticem *Tilia cordata*, (x-y): 197056-557066, alt. cca. 262 m.s.m. Leg.: Sinigla, M., 25.09.2018 (HNHM-BMCRY 002829). – Comit. Veszprém, prope “Séd”, prope pag. Márkó, ad viam lacum, ad corticem *Ulmus laevigata*, (x-y): 97056-557066, alt. cca. 262 m.s.m. Leg.: Sinigla, M., 25.09.2018 (HNHM-BMCRY 002830). – Comit. Zala, in loci “Rezi-vár”, prope pag. Rezi, in saxa sylvis, ad corticem *Qu. petraea*, (x-y): 512299-170552, alt. cca. 422 m.s.m. Leg.: Sinigla, M., 17.08.2022 (HNHM-BMCRY 003492). – Comit. Veszprém, in monte “Sátorma-hegy”, prope pag. Szentbékállá, in *Quercetum petraeae-cerridis*, corticem *Q. petraea*, (x-y): 174010-535140, alt. cca. 274 m.s.m. Leg.: Sinigla, M., 17.05.2016 (HNHM-BMCRY 002567).

DISCUSSION

In the last decades, habitats and the species composition have changed here significantly as a result of shading (shrub encroachment, afforestation). Generally, the number of species decreased with the shading of trees and shrubs growing around old oaks, which can be explained by moderate or weak wind movement and by competition with bryophytes. On the other hand, these changes favoured and enhanced the appearance of those species that prefer shady, moist, deep bark crevices and cooler microhabitats (SINIGLA and LÖKÖS 2015), like in the case of *Chaenotheca trichialis* and *C. stemonea*, also discussed by previous studies (RANIUS *et al.* 2008). Diaspores of these species are continuously washed away by rainwater in these deep bark crevices, favouring their spread also by ants marching primarily in deeper crevices (PALTTO *et al.* 2011).

A total of 107 occurrences of six *Chaenotheca* species (*Ch. chrysocephala*, *Ch. ferruginea*, *Ch. furfuracea*, *Ch. phaeocephala*, *Ch. stemonea*, and *Ch. trichialis*) registered around 28 settlements in the Bakony Mts and the Balaton Uplands (Fig. 13) in the past decade proved to be influenced mainly by exposure, host tree species, and collecting height on the trunks.

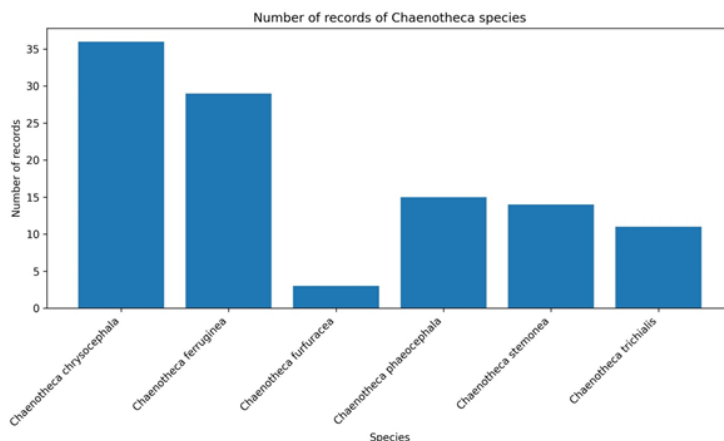


Fig. 13. Abundance of *Chaenotheca* species in the Bakony Mts and the Balaton Uplands.

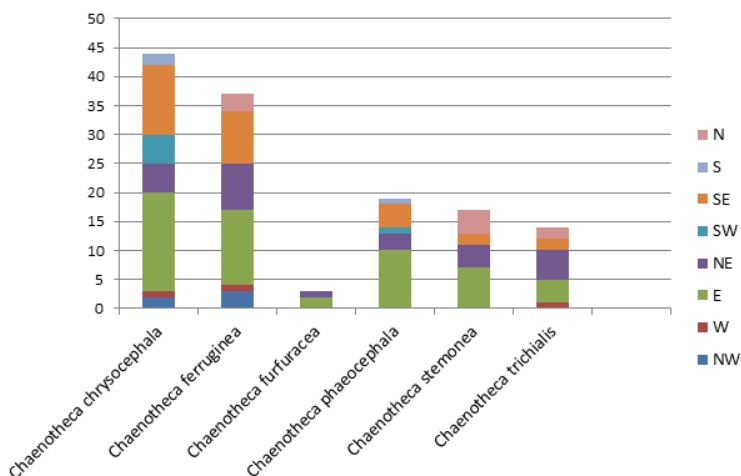


Fig. 14. Favoured exposures for the studied *Chaenotheca* species.

Chaenotheca chrysocephala (35 localities) and *Ch. ferruginea* (28 localities) have been the most frequent of the six species. In the studied area the eastern side of the trunks is clearly favourable for all species, however *Chaenotheca ferruginea*

and *Ch. phaeocephala* also prefer SW exposure, *Ch. stemonea* and *Ch. trichialis* N/NE exposures (Fig. 14).

Host tree biodiversity has been quite high, altogether 12 phorophytes (*Alnus glutinosa*, *Pinus sylvestris*, *Pyrus pyraeaster*, *Quercus cerris*, *Qu. petraea*, *Qu. pubescens*, *Robinia pseudoacacia*, *Salix alba*, *S. fragilis*, *Tilia cordata*, *T. platyphyllos*, and *Ulmus laevis*) have been identified. Old oak trees, with their microhabitats of adequate microclimatic conditions, served as the most suitable hosts for the *Chaenotheca* species, i.e. *Quercus cerris* (5 species), *Qu. petraea* (5 species), and *Qu. pubescens* (4 species). The highest number of phorophytes has been colonised by *Chaenotheca stemonea* (9 species) and *Ch. trichialis* (6 species).

Chaenotheca furfuracea is predominantly located at the lowest parts of the trunks (0–50 cm), *Ch. ferruginea* and *Ch. trichialis* at middle range (100–150 cm), while *Ch. chrysocephala*, *Ch. phaeocephala*, and *Ch. stemonea* can spread between 30 and 200 cm.

* * *

Összefoglaló: A *Chaenotheca* fajok előfordulását a Bakony hegységben és a Balaton-felvidéken elsősorban az égtáj, a fajaj és a fatörzseken elfoglalt vertikális pozíció befolyásolja. Az utóbbi évtizedben hat *Chaenotheca* faj (*Ch. chrysocephala*, *Ch. ferruginea*, *Ch. furfuracea*, *Ch. phaeocephala*, *Ch. stemonea*, and *Ch. trichialis*) adatait sikerült begyűjteni a tanulmányozott terület 28 településének környékéről. Ezek között a leggyakoribb faj a *Chaenotheca chrysocephala* volt. Mind a hat zuzmófaj az idős tölgyek, elsősorban *Quercus cerris* és *Qu. petraea*, keleti, északkeleti és délkeleti kitétettségű részeit preferálja, ahol az élőhely megfelelő mikroklímája biztosított.

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