



Fenestellaceae

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Abstract

Fenestellaceae is a poorly known family which comprises the genera *Fenestella*, *Lojkania* and *Pleurostromella*. There is limited molecular data or modern taxonomic descriptions for taxa of these genera. We therefore loaned the type and other specimens of *Fenestella princeps* and *Lojkania hungarica* from herbaria worldwide to clarify the morphological characters of *Fenestella* and *Lojkania*. A circumscription of the type species, *Fenestella princeps* and *Lojkania hungarica* is provided. *Fenestella faberi* and *F. fenestrata* have also been studied and are described and discussed. *Lojkania* is excluded from *Fenestellaceae* based on morphology and tentatively placed in *Testudinaceae*. In the study, we maintain the family *Fenestellaceae* until the type species is recollected and molecular phylogeny is used to confirm its natural placement.

Keywords – Asexual morph – *Fenestella* – *Fenestellaceae* – *Lojkania* – *Pleurostromella*

Introduction

Fenestellaceae is a poorly known family which comprises the genera *Fenestella*, *Lojkania* and asexual genus *Pleurostromella* with an estimated 78 species (Index Fungorum 2015). Species of *Fenestellaceae* have been reported as saprobic, hemibiotrophic or biotrophic on various woody plants (Barr 1987; Farr and Rossman 2015; Hyde et al. 2013). The family was introduced by Barr (1979) and typified by *Fenestella* with *F. princeps* Tul. & C. Tul. as the type species. Barr (1979, 1987) regarded the family as characterized by uni- to multi-loculate ascostromata, immersed to erumpent through the host periderm, trabeculate pseudoparaphyses and bicelled or muriform ascospores.

Barr (1979) initially included five genera in this family viz. *Crotonocarpia*, *Curcubidothis*, *Fenestella*, *Melanopsamma* and *Othtiella*. However, Barr (1987, 1990) modified her concept of *Fenestellaceae* and accepted only four genera; *Delitschia*, *Fenestella*, *Lojkania* and *Ohleriella*. Barr (2000) excluded *Ohleriella* and *Delitschia* from the family and accommodated these genera in *Delitschiaceae* due to their habit on dung. *Ohleriella* and *Delitschia* are hypersaprotrophic on old dung or aged exposed wood, whereas taxa of *Fenestellaceae* are saprotrophic or hemibiotrophic on woody or herbaceous plants. Kirk et al. (2008), Zhang et al. (2012), Hyde et al. (2013) and Wijayawardene et al. (2014) accommodated *Fenestella*, *Lojkania* and the asexual genus *Pleurostromella* in *Fenestellaceae*.

The placement of *Fenestellaceae* has also been debatable. Barr (1987, 1990) placed *Fenestellaceae* in *Melanommatales* based on the centrum type with trabeculate pseudoparaphyses (Hyde et al. 2013; Zhang et al. 2012). Liew et al. (2000), however, had shown that pseudoparaphyses versus trabeculae appeared to have little taxonomic significance at the higher level. Hyde et al. (2013) therefore treated the family in Dothideomycetes, *families incertae sedis* and this was followed by Wijayawardene et al. (2014). Taxa of *Fenestellaceae* have limited molecular data with sequence data available for only 16 strains of three species in GenBank. However, those sequences are not from the type species or type strains. Thus, the current familial placement of *Fenestellaceae* is still unclear.

The aim of this study was to revisit the genera in *Fenestellaceae* based on the morphological examination of available generic types in order to better understand the family. By illustrating the types of *Fenestella faberi* and *Lojkania hungarica* (*Pleosporales*) and the authentic specimens, *F. princeps* and *F. fenestrata*, we expect to stimulate recollection of these taxa. These new collections can be isolated, sequenced and epitypified (Ariyawansa et al. 2014) and used to stabilize the application of the names and provide a more natural classification of the class Dothideomycetes.

Material and Methods

Herbarium specimens were requested from PC and S. They were examined and re-described as in Hyde et al. (2013). Ascomata on herbarium material were cut from main specimens as small pieces and initially rehydrated by water or adding 3–5 % KOH for 5–10 minutes. The ascomata and peridium structures are illustrated from free hand sections and preparation of squash mounts for determination of micro-morphological characters were observed under compound microscope (Phookamsak et al. 2014).

Macro-morphological characters were captured using a Sony DSC-T110 digital camera under an Olympus SZH10 stereomicroscope, while micro-morphological characters were captured under Nikon ECLIPSE 80i compound microscope with DIC microscopy using a Cannon 550D digital camera. Photographic plates were edited and combined using Adobe Photoshop version CS5 (Adobe Systems Inc., The United States). Morphological measurements were carried out using a Tarosoft (R) Image Frame Work version 0.9.7 and slide made permanent by adding lactoglycerol and sealing with clear nail polish (Phookamsak et al. 2014).

Results and discussion

Fenestellaceae is a poorly known family which includes the genera *Fenestella*, *Lojkania* and asexual genus *Pleurostromella*. These genera lack modern descriptions and have limited molecular data in GenBank (Barr 1987, 1990; Hyde et al. 2013). The generic type, *Fenestella* has been shown to have morphological characters similar to the genera in *Cucurbitariaceae* (Doilom et al. 2013). This includes ascostromata on woody plants, narrow cellular pseudoparaphyses and muriform ascospores (Doilom et al. 2013; Hyde et al. 2013). The distinguishing feature between *Fenestella* and genera of *Cucurbitariaceae* is the arrangement of the locules in ascostromata and the peridium structure (Doilom et al. 2013). In *Fenestella* the locules form in a valsoid configuration in the ascostromata, while the peridium is composed of thin-walled, pseudoparenchymatous cells. Various types of ascostromata are found in genera of *Cucurbitariaceae* and the peridium mostly comprises thick-walled, scleroplectenchymatous cells (Doilom et al. 2013; Hyde et al. 2013). These characters may be significant in distinguishing *Fenestella* species from other genera in *Cucurbitariaceae*, but it is not clear if they warrant familial status. The type species of *Fenestella*, *F. princeps* lacks a modern morphological treatment. Molecular data in GenBank is from a putative strain (*Fenestella fenestrata*, CBS 114122) and thus it is unclear whether the current familial status should be maintained. In this study, we maintain the family *Fenestellaceae* until the taxon is recollected and molecular phylogeny is used to confirm its natural placement.

The type species of *Lojkania*, *L. hungarica* Rehm was previously classified as a genus in *Fenestellaceae* because of its trabeculate pseudoparaphyses (Barr 1979, 1987; Hyde et al. 2013; Zhang et al. 2012). In this study we observed that *Lojkania* differs from *Fenestella* in its habitat, arrangement of ascostromata, peridium structure, pseudoparaphyses and ascospore type. *Lojkania* is saprotrophic on decorticated, submerged wood, forming gregarious ascostromata, the peridium is composed of small, thick-walled, pseudoparenchymatous cells, pseudoparaphyses frequently anastomose and are trabeculate and ascospores are didymosporous. Thus, the genus *Lojkania* is excluded from *Fenestellaceae* and tentatively placed in *Testudinaceae* based on its morphology. Descriptions of the generic type of *Fenestella* and *Lojkania* are provided below. Additionally, we have studied *Fenestella faberi* J. Kunze and *F. fenestrata* (Berk. & Broome) J. Schröt. and their descriptions are also provided. A key to the sexual and asexual genera in *Fenestellaceae* is provided; *Lojkania* is included in the key for convenience.

Key to genera of Fenestellaceae

1. Sexual morph 2
 1. Asexual morph with oblong, hyaline, aseptate conidia *Pleurostromella*
 2. Ascumata forming in valsoid configuration with muriform ascospores
 *Fenestella*
 2. Ascumata frequently scattered, gregarious in clypeus with didymosporous ascospores
 *Lojkania*
 3.2. Taxonomy

Fenestellaceae M.E. Barr, Mycologia 71(5): 952 (1979)

Facesoffungi number: FoF00575

Saprotrophic or *hemibiotrophic* on woody plants. **Sexual morph:** *Ascostromata* uni- to multi-loculate, locules in a valsoid configuration, clustered, gregarious, immersed to erumpent, multi-loculate, ovoid or obpyriform, glabrous, brown to dark brown or black, with blunt or acute apex, covered by hyphae or protruding cells surrounding locules, ostioles individual, central. *Peridium* thin to thick, composed of brown to dark brown, pseudoparenchymatous cells. *Hamathecium* composed of dense, narrow cellular pseudoparaphyses, anastomosing between asci, embedded in a mucilaginous matrix. *Asci* 8-spored, bitunicate, fissitunicate, cylindrical to cylindrical-clavate, short to long pedicellate, apically rounded with an ocular chamber. *Ascospores* uni- to bi-seriate, muriform, ellipsoidal to fusiform, brown to dark brown or reddish brown, slightly constricted at median septa, wall rough. **Asexual morph:** reported as coelomycetous. *Pycnidia* solitary or gregarious, pseudoparenchymatous or felty, composed of densely interwoven dark coloured hyphae, some hyphae protruding, with or without an ostiole. *Pycnidial walls* composed of large parenchymatous cells, coriaceous to carbonaceous. *Conidiophores* long, stout, branched, septate. *Conidia* small, oblong, hyaline, aseptate, laterally supporting transverse septa (from Petrak, 1922).

Type: **Fenestella** Tul. & C. Tul.

Fenestella Tul. & C. Tul., Select. fung. carpol. (Paris) 2: 207 (1863)

Facesoffungi number: FoF00576

Saprotrophic, *biotrophic* or *hemibiotrophic* on angiosperms. **Sexual morph:** *Ascostromata* solitary to gregarious, immersed to erumpent through host periderm, visible on the host surface as raised, circular areas with a central sunken area, with blackened ostiolar dots. *Locules* clustered or gregarious, multiloculate, arranged in a valsoid configuration, ovoid to obpyriform, or ampulliform, glabrous, covered by vegetative hyphae between locules and host tissue, ostioles individual, central. *Peridium* thick-walled, of unequal thickness, slightly thicker at the apex, composed of hyaline to brown, pseudoparenchymatous cells, arranged in a *textura angularis*. *Hamathecium* composed of numerous, narrow, cellular pseudoparaphyses, anastomosing between asci, embedded in gelatinous matrix. *Asci* 8-spored, bitunicate, fissitunicate, cylindrical to cylindrical-clavate, with long pedicel,

apically rounded, with an indistinct ocular chamber. *Ascospores* overlapping uni-seriate, muriform, ellipsoidal to broadly fusiform, pale yellowish to dark brown, or reddish brown, paler at both extreme ends, constricted at the median septa, wall rough. **Asexual morph:** reported as *Pleurostromella* Petr. (Brefeld 1891; Huhndorf and Glawe 1990; Hyde et al. 2013)

Notes: *Fenestella* was introduced by Tulasne and Tulasne (1863) to accommodate a Dothideomycete species that form valsoid groups on woody plants and is typified by *Fenestella princeps*. Tulasne and Tulasne (1863) initially included three species in this genus; *F. princeps* Tul. & C. Tul., *F. media* Tul. and *F. minor* Tul. & C. Tul. from *Alnus* spp. (Barr 1990; Hyde et al. 2013). However, Tulasne and Tulasne (1863) did not illustrate the morphological detail of these species, but used the length to width ratios of ascospores to distinguish between the species (Barr 1990; Hyde et al. 2013). Thus, the species and genus concepts are confused.

Barr (1987) mentioned that the asexual morph of *Fenestella* was poorly known, while Kendrick and DiCosmo (1979) reported the asexual morph of *Fenestella* as similar to *Phoma* species which formed micro-conidial conidiomata (Hyde et al. 2013). Brefeld (1891) circumscribed the asexual morph characters of *Fenestella* from the sexual morph. Huhndorf and Glawe (1990) confirmed Brefeld's report as they did the experiments of the anatomical changes exhibited in germinating ascospores of *Fenestella princeps*. Therefore, *Pleurostromella* was treated as the asexual morph of *Fenestella* in Kirk et al. (2008) and Wijayawardene et al. (2012).

Fenestella was treated in *Pleosporaceae* by von Arx and Müller (1975). Later, Barr (1979) established a new family *Fenestellaceae* and designated *Fenestella* as a generic type. However, the genus is poorly known and represented by 63 epithets in Index Fungorum (2015). Two sequences of a putative strain, *Fenestella fenestrata* (CBS 114122) are available in GenBank. The phylogenetic analysis of LSU nrDNA gene shows that this strain clusters with *Cucurbitariaceae* (data not shown). *Fenestella* is however, not represented by its type species. Epitypification and molecular data are needed to resolve the natural placement of *Fenestella*.

The type specimens of *Fenestella princeps* could not be located from any herbaria worldwide. However, we examined a specimen given to PC by L.R. Tulasne in 1873 named as *Valsa macrospora* which it is probably representative of the species which was described by Tulasne and Tulasne (1863). Tulasne and Tulasne (1863) identified *Fenestella* species by using the length to width ratios of ascospores and described *Fenestella princeps* as large ascospores with acute ends ($57\text{--}65 \times 16\text{--}20 \mu\text{m}$) which Fuckel (1871) often identified as *F. macrospora* (Barr 1990; Hyde et al. 2013). A comparison of the authentic specimen with the type protologue has similar morphology with the protologue. A description and illustrations is provided below.

Type species: *Fenestella princeps* Tul. & C. Tul.

Phylogenetic study: None.

Fenestella princeps Tul. & C. Tul., Select. fung. carpol. (Paris) 2: 207 (1863)

Fig.1

Faces of Fungi number: FoF00577

Saprotrophic or *biotrophic* on woody plants. **Sexual morph:** *Ascostromata* solitary, immersed to erumpent through host periderm, visible as raised, circular areas with a central sunken area, with blackened ostiolar dots, with numerous locules arranged in a valsoid configuration. *Locules* $580\text{--}950 \mu\text{m}$ high, $490\text{--}950 \mu\text{m}$ diam, clustered or gregarious, immersed in valsoid groups beneath periderm of host, multiloculate, ovoid to obpyriform, glabrous, covered by vegetative hyphae, brown to dark brown, ostioles individual, central with rounded plane apex. *Peridium* $15\text{--}30 \mu\text{m}$ wide, thick-walled, of unequal thickness, slightly thicker at the apex, composed of 4–5 layers of brown to dark brown, pseudoparenchymatous cells, arranged in a *textura angularis*. *Hamathecium* composed of numerous, $2\text{--}3 \mu\text{m}$ wide, narrow, cellular pseudoparaphyses, anastomosing at above the asci, embedded in a gelatinous matrix. *Asci* $(300\text{--})340\text{--}400(\text{--}440) \times (23\text{--})25\text{--}28 \mu\text{m}$ ($\bar{x} = 367.3 \times 24.9 \mu\text{m}$, $n = 25$), 8-spored, bitunicate, fissitunicate, cylindrical to cylindrical-clavate, with long pedicel ($30\text{--}90 \mu\text{m}$ long), apically rounded, with indistinct ocular chamber. *Ascospores* $(50\text{--})53\text{--}58(\text{--}62) \times (16\text{--})17\text{--}20(\text{--}23) \mu\text{m}$ ($\bar{x} = 54.7 \times 19 \mu\text{m}$, $n = 30$), overlapping uni-seriate, muriform, ellipsoidal to broadly fusiform, hyaline to pale brown when young, becoming dark brown at



Fig. 1 – *Fenestella princeps* (PC0084496, authentic specimen). a. Herbarium label and herbarium specimens. b. Ascostromata in valsoid configuration. c. Section through ascostroma. d. Section through peridium stained with lactoglycerol. e. Ocular chamber of ascus. f. Immature ascospores. g-h. Ascospores. i. Asci with narrow cellular pseudoparaphyses. j-k. Asci. Scale bars: c = 200 μ m, i-k = 50 μ m, L-P = 50 μ m, d, e, f, g, h = 20 μ m.

maturity, or reddish brown when stained in lactoglycerol, paler at the extreme ends, with 3–6 primary transverse septa and mainly one longitudinal septa, usually constricted at the central septum, wall rough. **Asexual morph:** see notes.

Material examined: SWITZERLAND, on dead branch [*Alnus* sp., Otth, autumn 1861, Delectum Otthianum Fungorum Thunensium], 1873, L.R. Tulasne no. 33 (PC0084496, as *Valsa macrospora*; authentic specimen); USA, New York, Alcove, on dead branch of *Alnus incana* (L.) Moench, 1894, C.L. Shear (S-F11273; as *Fenestella princeps* var. *gigaspora*).

Fenestella faberi J. Kunze, Fung. sel. exs., cent. 3: no. 263 (1879), IF 246975

Fig. 2

Faces of Fungi number: FoF00578

Saprotrophic on *Rosa canina* L. Sexual morph: Ascostromata 250–360 μ m high, 580–830 μ m diam, scattered, gregarious, immersed to erumpent through periderm, visible as raised, circular areas, central sunken area, with blackened ostiolar dots, with 1–4 locules in a valsoid configuration. **Locules** 165–280 μ m high, 250–440 μ m diam, clustered, immersed in a valsoid configuration, becoming erumpent, uni- to multi-loculate, ovoid to obpyriform, or ampulliform, rarely conical,



Fig. 2 – *Fenestella faberi* (GZU 365656, isotype) a. Herbarium label and specimens. b. Ascostromata on host surface. c. Horizontal section through ascostromata illustrating the multilocules at the upper layers. d. Vertical section through ascostroma. e. Section through peridium. f. Pseudoparaphyses stained by cotton blue reagent. g-j. Asci. k-o. Ascospores. Scale bars: d = 100 µm, e = 50 µm, f, g, h, i, j = 20 µm, k, l, m, n, o = 10 µm.

protruding vegetative hyphae surrounding the locules, dark brown to black, ostioles individual, central, apapillate, with plane apex. *Peridium* 15–60 µm wide, thick-walled, of unequal thickness, slightly thicker at the apex, composed of several layers of brown to dark brown, pseudoparenchymatous cells, arranged in a *textura angularis*. *Hamathecium* composed of numerous, 1.5–3 µm wide, narrow, cellular pseudoparaphyses, anastomosing between asci, embedded in mucilaginous sheath. *Asci* (130–)150–170(–180) × (16.5–)18–22(–23.5) µm (\bar{x} = 159.9 × 20.3 µm, n = 25), 8-spored, bitunicate, fissitunicate, cylindrical, with a short to long pedicel, apically rounded, with indistinct ocular chamber. *Ascospores* (25.5–)26–28(–30) × 10–12(–13) µm (\bar{x} = 27.7 × 11.7 µm, n = 30), overlapping uni-seriate, muriform, ellipsoidal to broadly fusiform, brown to dark brown, paler at extreme ends, with three main transverse septate, usually constricted at the central septum, wall smooth. *Asexual morph*: Undetermined.

Table 1 Synopsis of *Fenestella* species examined in this study.

Species name	Size (µm)		Septation (transverse × longitudinal)	Locules in valsoid stroma
	Asci	Ascospores		
<i>Fenestella bavarica</i>	200–225 × 15–18	26–33 × 11–14	7–9 × 3	15–25
<i>Fenestella bipapillata</i>	180–200 × 16–18	32–40 × 15–18	3 transverse septa, muriform	5–8
<i>Fenestella faberi</i> (isotype)	(130–)150–170(– 180) × (16.5–)18– 22(–23.5)	(25.5–)26–28(–30) × 10–12(–13)	3–6 × 1	1–4
<i>Fenestella fenestrata</i> (GZU 201)	(176–)230–300(– 330) × (24.5–)25– 28(–32)	(39–)43–50(–53) × (15–)17–20	(3–)7–8 × 1	2–5
<i>Fenestella hoehneliana</i>	180–250 × 16–18	25–34 × 12–16	6–8 × 2–3	2–10
<i>Fenestella leucostoma</i>	150–200	20–27 × 2–13	5–7	4–6
<i>Fenestella macrospora</i>	270 × 21	48 × 18	multi-septate	8–12
<i>Fenestella princeps</i>	–	57–65 × 16–20	6–7 transverse with multi longitudinal septa	–
<i>Fenestella princeps</i> (PC0084496)	(300–)340–400(– 440) × (23–)25–28	(50–)53–58(–62) × (16–)17–20(–23)	3–6 × 1	Multi-loculate

Material examined – GERMANY, Oberrissdorfer Thalpr. Islebiam (Sax. Bor.), in vine yards, on dead, still corticated twigs of *Rosa canina* L. (*Rosaceae*), September 1878, J. Kunze, no. 263, GZU 226 (DigiBota ID: 365656, **isotype**)

Notes – *Fenestella faberi* is similar to other species in *Fenestella*, but differs in ascostromata with four locules, and in the size of its ascostromata, asci and ascospores. *Fenestella faberi* shares the size of ascospores with various *Fenestella* species, such as *F. bavarica* Kirschst., *F. hoehneliana* Rehm. and *F. leucostoma* Ellis & Everh., but *F. faberi* differs from these species in having smaller asci and in the number of ascospore septa (Table 1). The species lacks molecular data, thus epitypification and molecular data are needed to establish a natural placement.

Fenestella fenestrata (Berk. & Broome) J. Schröt., in Cohn, Krypt.-Fl. Schlesien (Breslau) 3.2(4): 435 (1897) [1908], IF 121788 **Fig. 3**

≡ *Valsa fenestrata* Berk. & Broome, Ann. Mag. nat. Hist., Ser. 3 3: 366 (1859)

Faces of Fungi number: FoF00579

Saprotrophic or *hemibiotrophic* on various hosts (Farr and Rossman, 2015). **Sexual morph**: *Ascostromata* 550–680 µm high, 850–1530 µm diam, scattered, gregarious, immersed in periderm, visible as raised, circular areas with a central sunken area, with blackened ostiolar dots on host surface, with 2–5 locules in a valsoid configuration. *Locules* 350–600 µm high, 220–520 µm diam, clustered, immersed in valsoid configuration, becoming erumpent, uni- to multi-loculate, obpyriform, flask-shaped or irregular in shape, with protruding dense, vegetative hyphae surrounding the locules, dark brown to black, ostioles central, papillate, with round apex. *Peridium* 16.5–67 µm wide, thick-walled, of unequal thickness, slightly thicker at the apex, composed of several layers of brown to dark brown, pseudoparenchymatous cells, arranged in a *textura angularis*. *Hamathecium* composed of numerous, 1.5–3 µm wide, narrow cellular pseudoparaphyses, anastomosing above the asci, embedded in mucilaginous matrix. *Asci* (176–)230–300(–330) × (24.5–)25–28(–32) µm (\bar{x} = 265.1 × 26.8 µm, n = 25), 8-spored, bitunicate, fissitunicate, cylindrical, with a short to long pedicel, apically rounded, with indistinct ocular chamber. *Ascospores* (39–)43–50(–53) × (15–)17–20 µm (\bar{x} = 46.5 × 17.6 µm, n = 30), overlapping uni-seriate, muriform, ellipsoidal to broadly fusiform, brown to dark brown, paler at extreme ends, at first with 3-transverse septa, becoming 7–8-septate, usually constricted at the central septum, smooth-walled. **Asexual morph**: Undetermined.



Fig. 3 – *Fenestella fenestrata* (GZU 210, 365612) a. Herbarium label and specimens of *Fenestella fenestrata*. b. Ascostromata on host surface. c. Horizontal section through ascostromata illustrating the multilocules at the upper layers. d. Vertical section through ascostromata e. Section through peridium. f. Pseudoparaphyses in congo red. g-k. Asci. l. Ascus with indistinct ocular chamber in congo red. m-p. Ascospores. Scale bars: d = 200 μ m, e = 50 μ m, f, g, h, i, j, k = 20 μ m, l, m, n, o, p = 10 μ m.

Material examined – LATVIA, Distr. Riga, Katlakalns, on branch of *Alnus glutinosa* (L.) Gaertn, April 1943, J. Smarods, GZU 210 (DigiBota ID: 365612); Czechoslovakia, Mährisch, Weißkirchen, Ludinabach, on branch of *Alnus glutinosa* (L.) Gaertn, November 1913, F. Petrak, GZU 261 (DigiBota ID: 365617).

Notes – *Fenestella fenestrata* was originally described by Berkeley and Broome (1859) as *Valsa fenestrata* and later, Schröter (1897) combined the species as *Fenestella fenestrata*. Berkeley and Broome (1859) collected *Fenestella fenestrata* from alder and dead twigs of oak and described the ascostromata as forming in small pustules with a narrow disk and ellipsoid-oblong, 1-septate ascospores with extremely small appendages and rough walls. Berkeley and Broome (1859) also provided a hand drawing of ascospores. We have examined herbarium material identified as *F. fenestrata* from GZU. Our illustration and description is provided and compared with the type protologue. Based on morphological comparable, these specimens have similar characters to the type protologue.

Fenestella fenestrata is similar to *F. bipapillata* (Tul. & C. Tul.) Sacc. and *F. macrospora* Fuckel and they share a similar size range of asci and ascospores. However, they differ in the number of locules in the valsoid configuration, and septation of ascospores. *Fenestella bipapillata* has 5–8 locules in a valsoid configuration, while *F. fenestrata* has 2–5 locules and *F. macrospora* 8–12 locules (Table 1). *Fenestella fenestrata* has ascospores with three primary transverse septa which is similar to *F. bipapillata*, but ascospores become 7–8 septate when mature in *F. fenestrata*. *Fenestella macrospora* has multi-septate ascospores (Table 1). Based on the phylogenetic analysis, *Fenestella fenestrata* clusters in *Cucurbitariaceae* (data not shown). However, the sequence data is not represented by a verified strain; thus we do not place the species in *Cucurbitariaceae* until a verified species has been sequenced to confirm its natural placement.

Lojkania Rehm, Növénýt. Közlem. 4: 2 (1905)

Faces of Fungi number: FoF00580

Saprotrophic on decorticated wood. **Sexual morph:** *Ascomata* gregarious, immersed to semi-immersed in pseudoclypeus, or superficial, visible as raised, black dots on host tissue, covered by dense hyphae, uniloculate, ovoid to obpyriform, glabrous, dark brown to black, ostiole central, with carbonaceous papilla. *Peridium* thick-walled, of unequal thickness, slightly thicker at the apex, composed of several layers of small, brown to dark brown cells, arranged in *textura angularis*. *Hamathecium* composed of dense, trabeculate pseudoparaphyses, anastomosing between asci, embedded in gelatinous matrix. *Asci* 8-spored, bitunicate, cylindrical, short to long pedicellate, apically rounded, with a distinct ocular chamber. *Ascospores* overlapping uni-seriate, ellipsoidal, pale brown to dark brown, or reddish brown, 2-celled, constricted at the central septum, walls rough. **Asexual morph:** Undetermined.

Notes – *Lojkania* was introduced by Rehm (1905) to accommodate a single species, *Lojkania melasperma* (Cooke) M.E. Barr (as *L. hungarica* Rehm). The genus was previously synonymized under *Herpotrichia* (Barr 1984; Sivanesan 1972, 1984; von Arx and Müller 1975; Yuan and Barr 1994) and later, Barr (1984) re-circumscribed *Lojkania* species from North America and distinguished the genus from *Herpotrichia*. Barr (1984) placed the genus *Lojkania* in *Fenestellaceae*, *Melanommatales* which was followed by Eriksson and Hawksworth (1991).

Lojkania is a poorly known genus represented by 15 names in Index Fungorum (2015). Four taxa have been transferred to other genera based on molecular data. There are 14 sequences from two species available in GenBank. However, these species were transferred to other genera (*Lojkania enalia* belongs to *Verruculina*, *Testudinaceae* while *L. striatispora* clusters in *Herpotrichia*, *Pleosporales*) (Griffin et al. 2006; Hyde et al. 2013). The type species, *Lojkania hungarica* has not been sequenced and is morphologically poorly known. Hyde et al. (2013) mentioned that the genus is unrelated to *Fenestella*.

Lojkania differs from *Fenestella* in its *ascomata*, *peridium*, *pseudoparaphyses* and *ascospore* types (Hyde et al. 2013). *Lojkania* is similar to *Verruculina* as they are forming *ascomata* immersed in *pseudoclypeus*, with short to long *papilla*, *trabeculate pseudoparaphyses* and *didymosporous*, *brown ascospores* (Hyde et al. 2013; Zhang et al. 2012). However, *Lojkania* differs from *Verruculina* due to its habitat as *Lojkania* was found on submerged wood while *Verruculina* is obligate marine fungi. Based on the type examination, we agree with Hyde et al. (2013) and exclude the genus from *Fenestellaceae*. Based on morphological characters, *Lojkania* is best placed

in the family *Testudinaceae*.

Type species: Lojkania hungarica Rehm.

Phylogenetic study: Lumbsch and Lindemuth (2001), Griffin et al. (2006)

Lojkania hungarica Rehm., Növényt. Közlem. 4 (1905)

Fig.4

Faces of Fungi number: FoF00581

Saprotrophic on submerged wood, forming gregarious ascostroma in pseudoclypeus, semi-immersed beneath the host epidermis. **Sexual morph:** *Ascomata* 125–225 μm high, 130–210 μm diam, scattered or clustered, gregarious, immersed in pseudoclypeus or semi-immersed to superficial on host surface, visible as raised, black dots on host tissue, ovoid to obpyriform or globose, dark brown to black, central ostiole with carbonaceous papilla. *Peridium* 25–35 μm wide, thick-walled, of unequal thickness, slightly thick at the apex, composed of several layers, inner layers composed of hyaline to light brown, minute cells of *textura angularis*, outer layer composed of brown to dark brown cells of *textura angularis*. *Hamathecium* composed of numerous, 1–2 μm wide, trabeculate, pseudoparaphyses, anastomosing between asci, embedded in a gelatinous matrix. *Asci* (210–)220–250(–300) \times (14–)15–17(–19) μm (\bar{x} = 243.1 \times 16.8 μm , n = 20), 8-spored, bitunicate, cylindrical, long pedicellate, apically rounded, with a 1.4–2.7 μm wide ocular chamber. *Ascospores* (26–)28–31(–32) \times (11–)12–13(–15) μm (\bar{x} = 29.8 \times 12.7 μm , n = 30), uni-seriate, ellipsoidal or broadly fusiform, with rounded ends, initially pale brown, becoming brown to dark brown or reddish brown, 1-septate, constricted at the septum, wall rough. **Asexual morph:** Undetermined.

Material examined – HUNGARY, on the (wooden) boards of a swimming school in Szentgyörgy, on submerged dead wood, September 1903, Zahlbruckner (S-F7196, **type**).



Fig. 4 – *Lojkania hungarica* (S-F7196, type) a. Appearance of fungus on host surface. b. Section through ascostroma. c. Section through peridium. d. Trabeculate pseudoparaphyses. e. Ocular chamber of ascus. f-i. Ascospores. j-l. Asci. Scale bars: B = 100 μm , d, j, k, l = 50 μm , c = 20 μm , e, f, g, h, i = 10 μm .

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