

FUNGI ASSOCIATED WITH *AMMOPHILA ARENARIA* IN LITHUANIA AND TAXONOMICAL NOTES ON SOME SPECIES

Aušra TREIGIENĖ

Institute of Botany of Nature Research Centre, Laboratory of Mycology, Žaliojių Ežerų Str. 49,
LT-08406, Vilnius, Lithuania, e-mail ausra.treigiene@botanika.lt

Abstract

Treigienė A., 2011: Fungi associated with *Ammophila arenaria* in Lithuania and taxonomical notes on some species. [Grybai, susiję su pajūrine smiltlendre (*Ammophila arenaria*) Lietuvoje, ir taksonominės pastabos apie kelias jų rūšis]. – Bot. Lith., 17(1): 47–53.

Seventeen species of parasitic and saprotrophic fungi were identified on *Ammophila arenaria* (*Poaceae*). Two species were ascribed to the *Basidiomycota* (*Uredinales*), seven – to *Ascomycota* and eight – to anamorphic fungi. The plant is reported as a new host for *Phaeoseptoria airae* and *Septoriella juncei*. Five species were new for Lithuania: *Amarenomyces ammophilae*, *Mycosphaerella lineolata*, *M. psammae*, *Phaeosphaeria marram*, *P. vagans*. These fungi are described, illustrated and briefly discussed. Taxonomical notes for some species are provided.

Keywords: *Uredinales*, ascomycetes, anamorphic fungi, distribution.

INTRODUCTION

Relationships between different host plants and fungi inhabiting them are specific and depend upon many factors. Environmental conditions, physiological characteristics of both fungus and the host plant determine fungus manifestation, frequency and distribution. Biotrophic fungi are confined to their host scope, whereas saprobes are plurivorous, not so closely associated with their hosts, and their distribution ranges are wide.

Graminicolous fungi occur on various members of *Poaceae*, and many of them are specific to this plant group, but the knowledge of them is fragmentary. The data on occurrence of fungi on wild grasses in Lithuania are scarce and scattered in various papers (BRUNDA, 1961; DAPKEVIČIUS & STRUKČINSKAS, 1985 – on *Claviceps*; MINKEVIČIUS & IGNATAVIČIŪTĖ, 1991, 1993 – on *Uredinales*; IGNATAVIČIŪTĖ, 2001 – on

Ustilaginales; MARKEVIČIUS & TREIGIENĖ, 2003 – on *Septoria*; TREIGIENĖ, 2009 – on other *Sphaeropsidales*).

The purpose of this study was to investigate the diversity of fungi associated with *Ammophila arenaria* (L.) Link. in Lithuania and their distribution in the country. The host plant is an important element of dune and hillock vegetation. Only four fungi – *Claviceps purpurea* Tul., *Puccinia ammophilae* (Syd.) Guyot, *P. graminis* Pers. and *Septoria ammophilae* Syd., were known previously on this plant in Lithuania (STRUKČINSKAS & RADAITIENĖ, 1977; MINKEVIČIUS & IGNATAVIČIŪTĖ, 1993). Very few mycologists have studied mycobiota of *Ammophila* worldwide (JÄRVA & PARMASO, 1980; FARR et al., 1989; ERIKSSON, 1992; ELLIS & ELLIS, 1997). In total about 50 species of fungi belonging to various taxonomic groups are reported to inhabit this plant genus. Among them 30 species belong to *Ascomycetes*. Some species are found in Lithuania on grasses other than *Ammophila arenaria*.

MATERIALS AND METHODS

The specimens of dead leaves and culms of *Ammophila arenaria* were collected from dunes of the Baltic coast during the autumn field trips in 1994 and during the summers of 2003 and 2005. The specimens were identified following routine mycological methods. For the species or specimens collected and published by other mycologists, reference sources are cited.

The specimens are deposited in the collection of fungi of the Herbarium of Nature Research Centre, Institute of Botany (BILAS) in Lithuania.

RESULTS AND DISCUSSION

Seventeen species of parasitic and saprotrophic fungi were identified on *Ammophila arenaria*. Two species were ascribed to *Uredinales*, seven – to *Ascomycota* and eight – to anamorphic fungi. Five species (*Amarenomyces ammophilae*, *Mycosphaerella lineolata*, *M. psammae*, *Phaeosphaeria marram* and *P. vagans*) are new for Lithuania.

Fungi specializing on the marram-grass hosts are *Amarenomyces ammophilae* with anamorph *Amarenographium metableticum*, *Phaeosphaeria marram*, *Puccinia ammophilae*, *Septoria ammophilae* and *Tiarospora perforans*. Biotrophic species – *Puccinia ammophilae* and *Septoria ammophilae* – are not common in Lithuania, while *Claviceps purpurea* and *Puccinia graminis* are rare on *Ammophila*, but very common on various other grasses worldwide. Other fungi are saprotrophs on leaves and culms.

Phaeoseptoria airae and *Septoriella juncki* were recorded on *Ammophila arenaria* for the first time.

LIST OF SPECIES

New for Lithuania species are marked with an asterisk (*), new or rare species are fully described.

Alternaria alternata (Fr.) Keissl – on dead leaves in the Curonian spit. It is a very common fungus inhabiting various plants in Lithuania (BRUNDZA, 1961; STANEVIČIENĖ et al., 1996; etc.).

**Amarenomyces ammophilae* (Lasch) O. E. Erikss., Op. Bot., 60: 124, 1981. – *Sphaeria ammophilae* Lasch, Flora, Jena: 282, 1850. – *Leptosphaeria sabuletorum* (Berk. et Broome) Höhn., Hedwigia, 60: 141, 1918. – *Phaeosphaeria ammophilae* (Lasch) Kohlm. et E. Kohlm., Icones Fungorum Maris, 3: tab. 55, 1965 (for other 5 synonyms see SHOEMAKER & BABCOCK, 1988). – Fig. 1.

Pseudothecia scattered, immersed, subepidermal, flask-shaped to globose, 160–500 µm diam., glabrous, dark brown to black, peridium about 20 µm thick, composed of 3 layers of *textura angularis* cells. Papilla short, only dark ostioles visible on pseudothecium surface. Asci bitunicate, 8-spores, irregularly 2–3-seriate, 150–235 × 27–30 µm; endotunica thick, multi-layered. Ascospores fusiform, straight, 40–50 × 13–15.5 µm, usually 6-celled (5–7), somewhat constricted at the septa, yellowish, guttulate, thick-walled and with gelatinous sheath.

Examined material: on dead leaves and culms, **Klaipėda district:** Nemirseta, September 14, 1994, BILAS 35806; September 16, 1994, BILAS 35547; **Neringa:** Nida, June 7, 2003, BILAS 33876; Preila, June 9, 2003, BILAS 35794, 35798, June 10, 2005, BILAS 33911; Juodkrantė, June 9, 2005, BILAS 33874, June 11, 2005, BILAS 33874.

Notes: The fungus is known in other European countries: Denmark, Estonia, Finland, Germany, Latvia, Netherlands, Sweden (MUNK, 1957; JÄRVA & PARMASO, 1980; ERIKSSON, 1982; SHOEMAKER & BABCOCK, 1988).

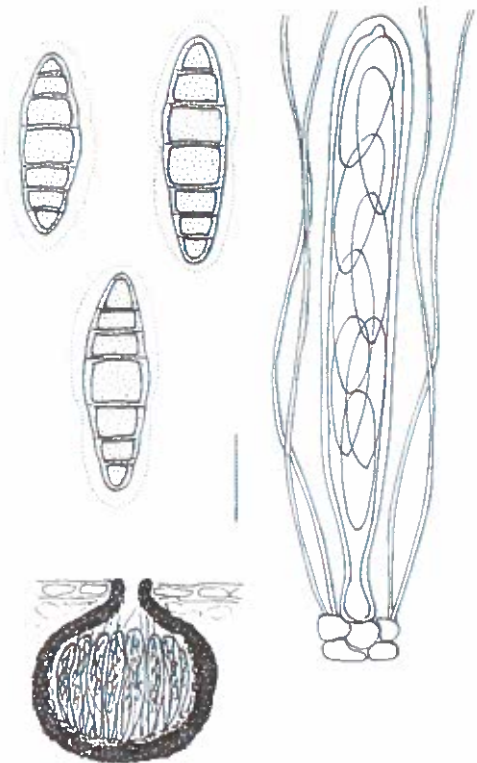


Fig. 1. *Amarenomyces ammophilae*: a – ascospores (bar = 20 µm), b – asci (bar = 30 µm), c – ascomata (bar = 200 µm)

Amarenographium metableticum (Trail) O. E. Erikss., Mycotaxon, 15: 199, 1982. – *Camarosporium metableticum* Trail, Scott. Natural., 8: 267, 1886. – *Camarographium metableticum* (Trail) Grove, British stem- and leaf-fungi, 2: 108, 1937. – Fig. 2.

Conidiomata pycnidial, scattered, immersed, globose or ovate, 250–500 µm diam., brown to black, with about 100 µm length neck, only the dark ostioles visible in surface. Ostiole circular, 25–40 µm diam. Conidiophores absent or often reduced to conidiogenous cells, rare with 1–2 septa, hyaline. Conidiogenous cells holoblastic, ampulliform, 6–15 × 4.5–8.5 µm, hyaline, with 1–3 proliferations. Macroconidia broadly fusiform or ellipsoid, with 3–7 transverse and 2–5 longitudinal septa, or/and oblique septa, often constricted at the septa, 25–36.5 × 11.5–15 µm [31.5 × 12.5 µm], pale brown to dark brown, paler toward the ends, guttulate, with irregular or cap-like gelatinous appendage of type H (for classification of conidial appendages in *Coelomyces* see NAG RAJ, 1993). Microconidia unicellular, ovoid to ellipsoidal with a broad rounded apex and a

narrow truncate base, 3–6 × 2.5–3 µm, colourless.

Examined material: on dead leaves and culms, **Klaipėda district**, Nemirseta: September 14, 1994, BILAS 35806, September 16, 1994, BILAS 35547; **Neringa**: Nida, June 7, 2003, BILAS 33876; Preila, June 9, 2003, BILAS 35794, June 10, 2005, BILAS 33911; Juodkrantė, June 9, 2005, BILAS 35798, June 11, 2005, BILAS 33874, 33903.

Notes: ERIKSSON (1982) wrote: 'The irregularly branched conidiophores are at least up to 55 µm long × 4 µm wide', but NAG RAJ (1993) stated that conidiophores are reduced. I have never observed such long conidiophores as mentioned by Eriksson, as well.

This species is known in other European countries: UK, Finland, Germany and Sweden, and also in North America: USA (GROVE, 1937; ELLIS & ELLIS, 1985; NAG RAJ, 1993).

Amarenographium metableticum is an anamorph of *Amarenomyces ammophilae* (NAG RAJ, 1993; TREIGIENĖ, 2009; *Index Fungorum*, 2008). Both morphs were collected together virtually in all samples.

Cladosporium herbarum (Pers.) Link – on dead leaves in Neringa. This species is also known on various plants (BRUNDZA, 1961; STRUKČINSKAS, 1970, etc.).

Claviceps purpurea Tul. – on spikes of *Ammophila arenaria* in Palanga and Neringa. It is a very common species recorded on various grasses in Lithuania (BRUNDZA, 1961; STRUKČINSKAS & RADAITIENĖ, 1977; DAPKEVIČIUS & STRUKČINSKAS, 1985; CHLEBICKI & TREIGIENĖ, 1995; STANEVIČIENĖ et al., 1996, etc.).

**Mycosphaerella lineolata* (Roberge ex Desm.) J. Schröt., in Cohn, Krypt.-Fl. Schlesien (Breslau) 3.2(3): 339, 1894[1908]. – *Sphaeria lineolata* Roberge ex Desm., 1843. – Fig. 3.

Ascomata immersed, linearly, globose to subglobose, 65–100 µm wide × 60–95 µm high, papillate, black, ostiole about 15 µm across. Asci bitunicate, 8-spored, cylindrical, 45–58.5 × 10–12.5 µm, thick-walled, short-stalked. Ascospores narrowly fusiform, obovoid to clavate, two-celled, constricted or not constricted at septum, (13.5)15–18.5 × 3–4 µm, hyaline.

Examined material: on dead leaves and culms, **Neringa**: Preila, June 9, 2003, BILAS 35794, 35798.

Notes: This species is known on various grasses in other European countries: Austria, Denmark, France, Great Britain, Germany, Italy, Russia, Switzerland, Ukraine; Asia: Turkmenistan and North America (TOMILIN, 1979; APTROOT, 2006).

**Mycosphaerella psammae* (O. Rostr.) Lind, Danish fungi as represented in the herbarium of E. Rostrup: 205, 1913. – *Sphaerella psammae* O. Rostr., 1899. – Fig. 4.

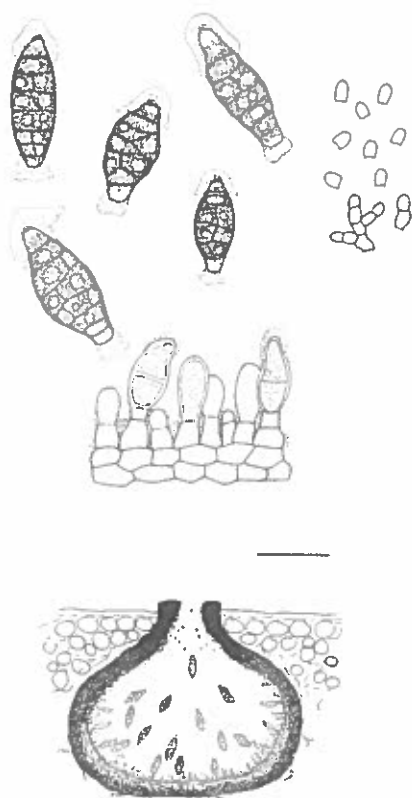


Fig. 2. *Amarenographium metableticum*: a – macroconidia and conidiogenous cells, b – microconidia and conidiogenous cells (bar = 20 µm), c – conidiomata (bar = 100 µm)

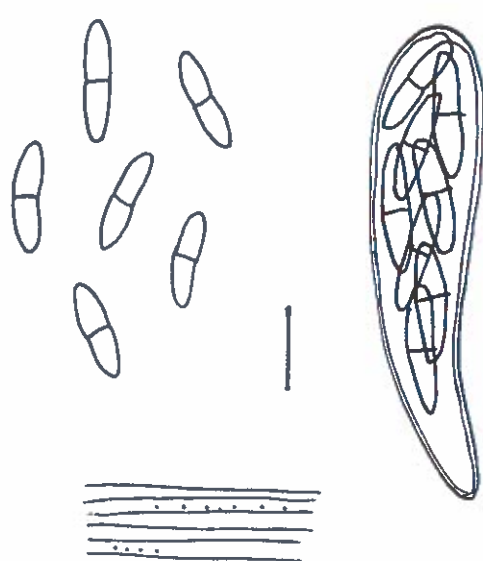


Fig. 3. *Mycosphaerella lineolata*: a – ascospores, b – asci (bar = 10 μ m), c – ascomata on leaf fragment

Ascomata immersed, dispersed, more or less globose, 85–100 μ m wide \times 65–95 μ m high, papillate, black, ostiole about 15 μ m across. Asci bitunicate, 8-spored, pyriform, 35.5–40.5 \times 9–10 μ m, thick-walled, short-stalked. Ascospores fusiform, ellipsoid, two-celled, slightly or not constricted at septum, 10–12.5 \times 2.5–3 μ m, hyaline.

Examined material: on dead leaves and culms, **Klaipėda district**: Nemirseta, September 13, 1994, BILAS 35547, 48760.

Notes: This species was known in only one European country – Denmark (MUNK, 1957; TOMILIN, 1979; APTROOT, 2006).

Phaeoseptoria airae (Grove) Sprague – on dead leaves in **Klaipėda district**: Nemirseta. This rare fungus is also known on *Phalaroides* plants in Lithuania (TREIGIENĖ, 2009). It is reported here on a new host plant – *Ammophila arenaria*.

**Phaeosphaeria marram* (Cooke) O. E. Erikss., Ark. Bot., 6: 425, 1967. – *Sphaeria marram* Cooke, 1877. – Fig. 5.

Ascomata immersed, globose, 200–400 μ m diam., with about 30 μ m length neck and about 20 μ m diam. ostiole; wall 10–12 μ m thick, of 2 or 3 layers of pseudoparenchyma cells. Asci 8-spores, cylindrical, 65–80 \times 7.5–9 μ m, short-stalked. Pseudoparaphyses numerous, anastomosed, 2–3 μ m wide. Ascospores fusiform, straight, 3-septate, 25–35 \times 6.5–9 μ m, yellow, with guttules and a conspicuous sharply delimited sheath, 4–5 μ m wide.

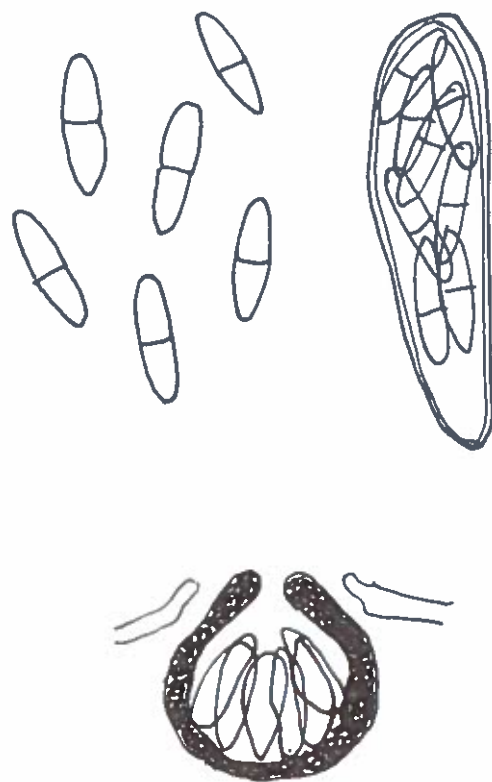


Fig. 4. *Mycosphaerella psammae*: a – ascospores, b – asci (bar = 10 μ m), c – ascomata (bar = 50 μ m)

Examined material: on dead leaves and culms, **Neringa**: Preila, June 9, 2003, BILAS 35794.

Notes: This species is known in other European countries: England, Sweden, and North America: Canada (SHOEMAKER & BABCOCK, 1988).

**Phaeosphaeria vagans* (Niessl) O. E. Erikss., Ark. Bot., 6: 430, 1967. – *Pleospora vagans* Niessl, 1876. – Fig. 6.

Ascomata immersed, broadly ellipsoidal to globose, about 200–300 μ m diam., brown, glabrous with more or less extensive brown mycelium in the host tissue, with central about 25 μ m length neck; wall about 15 μ m thick. Asci 8-spores, cylindrical, 80–120 \times 15–20.5 μ m, short-stalked. Ascospores narrowly fusiform, straight or slightly curved, 5-septate, 23–30 \times 8–10 μ m, yellowish brown, with a conspicuous sharply delimited sheath, 2–8.5 μ m wide.

Examined material: on dead leaves and culms, **Klaipėda district**: Nemirseta, September 13, 1994, BILAS 35547, 35796; **Neringa**: Preila, June 9, 2003, BILAS 35796; Juodkrantė, June 9, 2005, BILAS 48762.

Notes: This fungus is also known on other plants of *Poaceae* and *Cyperaceae*. It is registered in other

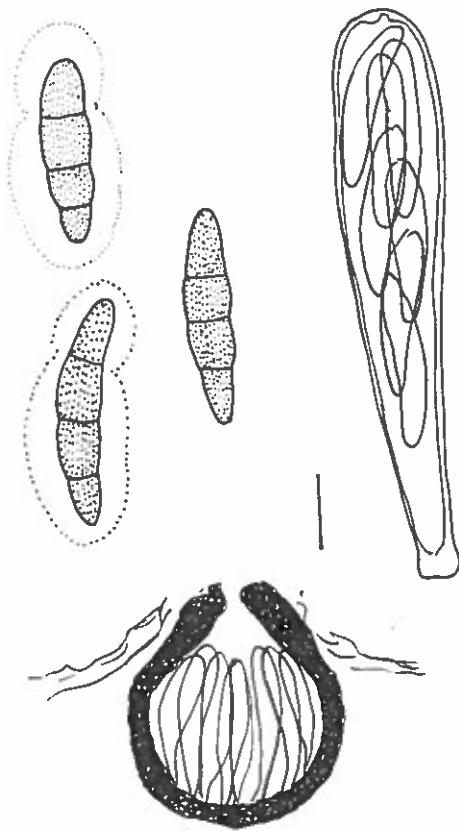


Fig. 5. *Phaeosphaeria marram*: a – ascospores, b – asci (bar = 10 µm), c – ascomata (bar = 100 µm)

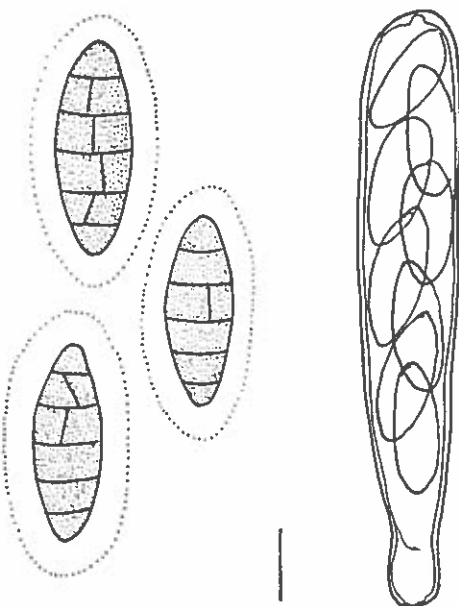


Fig. 6. *Phaeosphaeria vagans*: a – ascospores, b – asci (bar = 10 µm)

European countries: Denmark, France, Poland, Sweden, and North America: Canada, USA (SHOEMAKER & BABCOCK, 1988; CHLEBICKI, 2005).

Puccinia ammophilae A. L. Guyot – on living leaves in Palanga; state II (MINKEVIČIUS & IGNATAVIČIŪTĖ, 1993).

P. graminis Pers. – on living leaves in Palanga; states II, III. This fungus is common on various grasses (STRUKČINSKAS & RADAITIENĖ, 1977; MINKEVIČIUS & IGNATAVIČIŪTĖ, 1993).

Septoria ammophilae Syd. – on living leaves in Palanga (STRUKČINSKAS & RADAITIENĖ, 1977) and Neringa.

Septoriella junci (Desm.) B. Sutton – on dead leaves in Klaipėda district, Nemirseta. It is also known on *Juncus* and *Carex* in Lithuania (TREIGIENĖ, 2009). *Ammophila arenaria* is a new host plant.

Tiarospora perforans (Roberge ex Desm.) Höhn., Hedwigia, **60**: 141, 1918. – *Sphaeria perforans* Roberge, Ann. Sci. Nat. Bot., **19**: 357, 1843 (for other 6 synonyms see NAG RAJ, 1993). – Fig. 7.

Conidiomata pycnidial, scattered, immersed, subepidermal, separate, globose, about 300 µm diam., dark brown, with short neck, only the dark ostioles visible in surface; wall composed of an outer layer of thick-walled, *textura angularis*. Ostiole central, circular, about 25 µm diam. (NAG RAJ (1993) reports the ostiole reaching up to 40 µm diam.). Conidiophores absent. Conidiogenous cells holoblastic, sympodial, doliiiform, 9–15.5 × 6.5–9 µm, hyaline, smooth, with 1–3 proliferations. Conidia broadly ellipsoid, with 1 septa, continuous, 18.5–32.5 × 12.5–17.5 µm, hyaline, later very pale brown, with irregular or cap-like gelatinous appendage of type H at both ends (for classification of conidial appendages in *Coelomycetes* see NAG RAJ, 1993).

Examined material: on dead leaves and culms, Neringa: Preila, June 9, 2003, BILAS 35794, 35798.

Notes: This species is known in other European countries: Belgium, U. K., Sweden; North America (USA) and Australia (SUTTON, 1980; ELLIS & ELLIS, 1985; NAG RAJ, 1993).

The genus *Tiarospora* was described by SACCARD & MARCHAL (1885) with *T. westendorpii* Sacc. et Marchal as type species. This genus was stated to be monotypic by HAWKSWORTH et al. (1995). HÖHNEL (1918) established that *Sphaeria perforans* Roberge ex Desm. belongs to *Tiarospora* and is identical with *T. westendorpii* and proposed a new combination *Tiarospora perforans* (Roberge ex Desm.) Höhn. He was also convinced that *Tiarospora perforans* is a conidial state of *Leptosphaeria sabuletorum* (Berk.

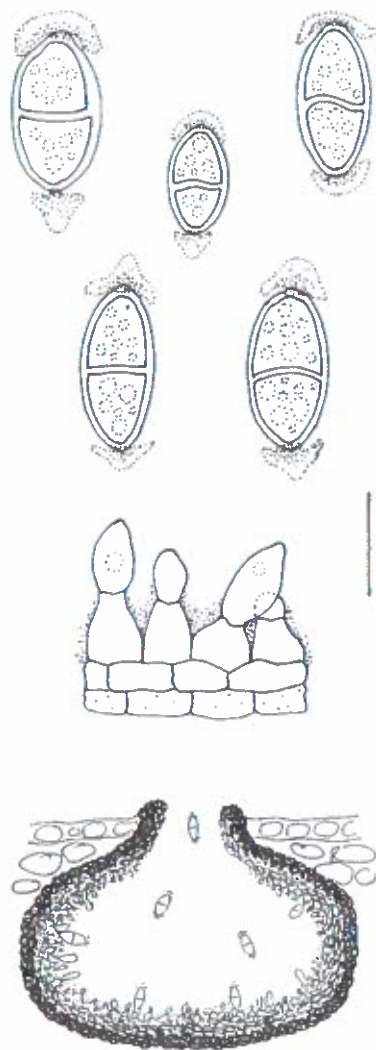


Fig. 7. *Tiarospora perforans*: a – conidia, b – conidiogenous cells (bar = 20 µm), c – conidiomata (bar = 100 µm)

et Broome) Höhn. ERIKSSON (1967, 1982), however, noted that this opinion was certainly wrong. NAG RAJ (1993) referred to *Phaeosphaeria ammophilae* (Lasch) Kohlm. et E. Kohlm. (= *Amarenomyces ammophilae*) as teleomorph of *Tiarospora perforans*, but there is no molecular evidence to substantiate these statements.

APTROOT (2006) transferred *Sphaeria perforans* Roberge ex Desm. to the genus *Montagnula*, and now, according to *Index Fungorum* (2008), the teleomorph name *Montagnula perforans* (Roberge ex Desm.) Aptroot is used for this fungus; *Tiarospora perforans* (Roberge ex Desm.) Höhn. is placed among its synonyms. I think that *Tiarospora perforans* is probably an anamorph of *Montagnula perforans*.

Ulocladium sp. – on dead leaves in Neringa.

ACKNOWLEDGEMENTS

I am grateful to Dr. Vadim A. Mel'nik and Dr. Svetlana Markovskaja for critical reading of the manuscript. Dr. Jurga Motiejūnaitė is thanked for linguistic help.

REFERENCES

- APTROOT A., 2006: *Mycosphaerella* and its anamorphs: 2. Conspectus of *Mycosphaerella*. – Utrecht.
- BRUNDZA K., 1961: Parazitnye gryby kul'tiviruemykh rastenij v Litovskoj SSR i nekotorye voprosy biologii parazitnykh gribov. – Vilnius.
- CHLEBICKI A., 2005: Some ascomycete fungi from primeval forests of north-eastern Poland. – *Acta Mycologica*, **40**(1): 71–94.
- CHLEBICKI A., TREIGIENĖ A., 1995: Notes on *Pyrenomyces* and *Coelomyces* from North Lithuania. – *Acta Mycologica*, **30**(1): 95–119.
- DAPKEVIČIUS Z., STRUKČINSKAS M., 1985: Porazaemye gribami roda *Claviceps* Tul. zlakovye rastenija v Litovskoj SSR. – Lietuvos TSR Mokslų Akademijos darbai. C serija, **4**(92): 3–11.
- ELLIS M. B., ELLIS J. P., 1997: Microfungi on land plants. – Slough.
- ERIKSSON O. E., 1967: On graminicolous pyrenomyces from Fennoscandia 2. Phragmosporous and scolecosporous species. – *Arkiv för Botanik, Ser. 2*, **6**(9): 381–440.
- ERIKSSON O. E., 1982: Notes on *Ascomycetes* and *Coelomyces* from NW Europe. – *Mycotaxon*, **15**: 189–202.
- ERIKSSON O. E., 1992: The non-lichenized pyrenomyces of Sweden. – Lund.
- GROVE W. B., 1937: British stem- and leaf-fungi (*Coelomyces*). – Cambridge.
- HAWKSWORTH D. L., KIRK P. M., SUTTON B. C., PEGLER D. N., 1995: Ainsworth & Bisby's Dictionary of the Fungi (8th ed.). – Wallingford.
- FARR F. D., BILLS G. F., CHAMURIS G. P., ROSSMAN A. Y., 1989: Fungi on plants and plant products in the United States. – St. Paul, Minnesota.
- INDEX FUNGORUM, 2008: <http://www.indexfungorum.org/Names/Names.asp>. [accessed 2011-02-10].
- JÄRVA L., PARMAS TO E., 1980: List of Estonian Fungi. – Tartu.
- MARKEVIČIUS V., TREIGIENĖ A., 2003: Lietuvos grybai [Mycota Lithuaniae]. Spuogagrybicčiai (*Sphaeropsidales*). *Genis Septoria*, **10**(3). – Vilnius.

- MINKEVIČIUS A., IGNATAVIČIŪTĖ M., 1993: Lietuvos grybai [Mycota Lithuaniae]. Rūdiečiai (*Uredinales*), 5(2). – Vilnius.
- MUNK A., 1957: Danish *Pyrenomycetes*. – Copenhagen.
- NAG RAJ T. N., 1993: Coelomycetous anamorphs with appendage-bearing conidia. – Ontario.
- SHOEMAKER R. A., BABCOCK C. E., 1988: *Phaeosphaeria*. – Canadian Journal of Botany, 67: 1500–1599.
- STANEVIČIENĖ S., TREIGIENĖ A., IGNATAVIČIŪTĖ M., 1996: Mycological and lichenological investigations in the former Soviet military forestries in Lithuania. Micromycetes: General review. – Botanica Lithuanica, 2(4): 395–405.
- STRUKČINSKAS M., RADAITIENĖ D., 1977: Parazitnaja mikoflora rastitel'nosti diun goroda Palangi. – In: Ekologičeskije osobennosti nizšikh rastenij sovetskij Pribaltiki (Mater. VIII simpoz. pribaltijskikh i belorusskikh mikologov i likhenologov 21–23 sentiabria 1977 g.): 236–237 – Vilnius.
- SUTTON B. C., 1980: The *Coelomycetes*. – Kew.
- TOMILIN B. A., 1979: Opredelitel' gribov roda *Mycosphaerella* Johans. – Leningrad.
- TREIGIENĖ A., 2009: Lietuvos grybai [Mycota Lithuaniae]. Spuogagrybiečiai (*Sphaerosidales*), 10(2). – Vilnius.

GRYBAI, SUSIJĘ SU SMILTYNINE SMILTLENDRE (*AMMOPHILA ARENARIA*) LIETUVOJE, IR TAKSONOMINĖS PASTABOS APIE KELIAS JŲ RŪŠIS

Aušra TREIGIENĖ

Santrauka

Straipsnyje pateikti duomenys apie Lietuvos pajūrio kopose ant *Ammophila arenaria* rastus 17 rūšių mikromicetus. Iš jų *Amarenomyces ammophilae*, *Mycosphaerella lineolata*, *M. psammae*, *Phaeosphaeria marram* ir *P. vagans* yra pirmą kartą aptikti mūsų šalyje. Jie rasti tuo pačiu metu greta ant nudžiūvusių

smiltyninės smiltlendrės lapų ir stiebelių. Be to, šis augalas nustatytas kaip naujas grybšių *Septoriella junci* ir *Phaeoseptoria airae* augalas šeimininkas. Straipsnyje pateikti naujų Lietuvoje ir retų grybų rūšių morfologijos aprašymai ir iliustracijos bei aptarti kai kurie jų taksonomijos klausimai.