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Abstract
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Keywords
aquatic ascomycetes, fungi, Lake Itasca, Minnesota, freshwater mycoflora

Disciplines
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AQUATIC ASCOMYCETES FROM LAKE ITASCA, MINNESOTA

A. R. CAVALIERE*

ABSTRACT — A preliminary report of the aquatic Ascomycetes of Lake Itasca, Minnesota. Included is an introduction, methods of harvesting and studying, a key, descriptions, and illustrations of 19 common ascomycetous fungi inhabiting the study area.

Other than the unpublished account of aquatic fungi of the Lake Itasca region (Johnson and Wagner, 1967), the freshwater mycoflora of this region is unknown. The aquatic Ascomycetes in this area are saprophytes or weak parasites infesting moribund species of aquatic phanerogams. The two most common hosts are bulrushes and cattails, Scirpus aquaticus Muhl. and Typha latifolia L. Other species of Scirpus and Typha harbor Ascomycetes as well (S. validus Vahl., S. subterminis Torr., S. torreyi Olney, T. angustifolia L., et al.).

The aquatic fungi at Itasca display a seasonal variation. Spring and summer mycoflora differ markedly in kind and stages of development than do those occurring in fall.

Harvesting and examining fungal collections follow methods outlined in detail elsewhere (Cavalierie, 1973). Bulrushes and cattails afloat at the edge of the lake were gathered either from the shore or by rowboat; those still rooted to the lake bottom were collected by severing the culms with a probe.

With a dissecting scope, clusters of ascocarps were located and subsequently removed with a spearhead dissecting needle. Occasionally, culms heavily infested with algae had to be scraped before the underlying perithecia were exposed. Asccarps were mounted in lactophenol, crushed and examined.

Although these fungi are not difficult to find, identifying them is often tedious and uncertain. With Ascomycetes there is presently much disagreement as to the taxonomic position of many species. Because this is a preliminary account of these fungi, no attempt is being made, beyond an occasional comment to discuss taxonomic positions of any of the organisms. Keys, descriptions and spore illustrations of the Ascomycete flora are reported as a means by which these organisms may be tentatively identified.

Facilities of the Lake Itasca Biology Station of the University of Minnesota were used and are here acknowledged.

KEY TO SPECIES OF OPHIOBOLUS

| Spores under 200μ in length, | O. typhae |
| Spores larger than 200μ in length, | Ophiobolus sp. |

Ophiobolus typhae Feltgen (Figure 1)

Asccarps scattered or gregarious, globose to pyriform or flattened, dark brown or black, concolorous, carbonaceous or subcarbonaceous, innate, 100-250μ in diameter, neck, if present, short, eccentric to lateral. Asci numerous, cylindrical, thick apical wall, unitunicate, 8-spored, hyaline, to 180μ long, 14-20μ in diameter. Ascospores saccate, especially 8 spore forms, parallel, cylindrical, hyaline, not constricted at septa, to 162 x 7-8μ.

Ophiobolus typhae Feltgen is the only species of Ophiobolus described on Typha. Neither the spore characteristics nor the features of the perithecia in our material resemble very closely the description of this organism. The Itasca material more clearly resembles O. trichosporus or O. fuscus.

On floating and submerged culms of various species of Typha and Scirpus.

Ophiobolus sp. (Figure 2)

Asccarps scattered or gregarious, innate, black, subcarbonaceous or submembranous, subglobose to pyriform, occasionally flattened, to 300μ in diameter, neck, if present, papiliform or long, centric to slightly eccentric. Asci 8-spored, numerous, cylindrical, more or less curved, apices thick, unitunicate, hyaline, 190-270 x 14-36μ. Ascospores saccate, straight or curved, occasionally S-shaped, more or less parallel, cylindrical, ends rounded, usually 12 septations, not constricted, 165-290 x 3.5-5.0μ.

The extremely long asci and spores prevents adequate assignment of this collection to any described species of Ophiobolus at this time. Dimensions of asci and length of...
spores are close to O. volkarei Müller (Muller, 1952) and O. stictosporus C & E (Ellis & Everhart, 1892). A literature survey of several members of the genus Ophiobolus suggests that many of these organisms are being separated solely on the basis of spore length. This criteria may prove to be as untenable with members of this genus as was found with members of the genus Lutispora (Cavalliere & Johnson, 1966).

On submerged culms of various species of Typha and Scirpus.

**KEY TO SPECIES OF METAESPHAERIA**

- Spores smaller than 50μ in length ............. *M. junicella*
- Spores larger than 50μ in length ............. *Metaesphaeria sp.*

**METAESPHAERIA**

Metaesphaeria junicella Mout. (Figure 3)

Ascomycetes scattered, clustered or cespitose, innate, occasionally slightly erumpent, globose to subglobose or pyriform, black, concolorous, subcarbonaceous to membranous, 100-125μ in diameter, neck papilliform, centric, ostiole usually visible. Asci 8-spored, thin-walled, broadly cylindrical to clavate, pedicellate, 116-180 x 11-20μ. Ascospores hyaline, broadly cylindrical to ellipsoidal, if cylindrical, widest at the center, straight or slightly curved, 4-celled, occasionally a 4th septum may form at tip, slightly constricted, irregularly uniseriate, 25-40 x 5-7μ.

All collections of this fungus at Itasca have larger asci than reported for the same organism elsewhere. In addition, with the material collected in this area, spore range is larger, 25-40μ in length as compared to 32-40μ in length, reported elsewhere (Wehmeyer, 1946).

On submerged culms of various species of Scirpus.

**METAESPHAERIA**

Metaesphaeria sp. (Figure 4)

Ascomycetes scattered or gregarious, but never cespitose, innate, globose to subglobose, subcarbonaceous to membranous, black, concolorous, or black above, brown to hyaline below substrate, 150-250μ in diameter, neck papilliform, rising to surface of substrate. Asci 8-spored, bitunicate, thick-walled, broadly cylindrical or clavate cylindrical, short pedicellate, intercalary threads abundant, 150-200 x 30-40μ. Spores ellipsoidal to broad-ellipsoidal, occasionally slightly curved, bisected, hyaline, 4-5 celled, primarily 4-celled, sheathed in cytoplasm for a short time after leaving ascus, not, or only slightly constricted at septa, 54-70 x 14.5-20μ.

The *Metaesphaeria*-like character or these collections coupled with the large spore size makes the placing of this organism into any recognized species questionable.

On submerged culms of various species of Scirpus.

**MYCOSPHAERELLA**

*Mycoesphaera* typhae (Lasch) Lindau (Figure 5)

Ascomycetes small, scattered to densely cespitose, innate or occasionally slightly erumpent, membranous to subcarbonaceous when old, brown or black, 50-75μ in diameter, neck, if present, papilliform. Asci 8-spored, oblong or broadly fusiform, occasionally narrow clavate, short pedicellate, 30-40 x 8-12μ. Ascospores clavate or attenuated, rounded at both ends, obliquely biseriate, 2-celled, hyaline or slightly yellowed with age, not constricted at septa, 10-14 x 4-5μ.

On submerged culms of Typha and Scirpus.

**HYPODERMA**

*Hypoderma scirpinum* D.C. ex. Merat (Figure 6)

Ascomycetes hyaline, uniformly scattered along substrate, developing beneath epidermis and raising it into a black blister up to 0.5mm high and 2mm long, dimidiate or subdimidiate, opening by a longitudinal slit along apex. Asci abundant, clavate, cylindrical or fusoid, 8-spored, pedicellate, 110-123(140) x (10)15-18μ. Ascospores oblong, fusiform cylindrical or fusoid-bacillate, straight or curved, hyaline and single-celled at first, becoming yellowish and septate at maturity, 30-40 x 6(5)μ.

On culms of Scirpus.

**DIDYMOSPHAERIA**

Didymosphaeria typhae Peck (Figure 7)

Ascomycetes small, scattered, deeply innate, membranous, globose to subglobose or oval, 40-75μ in diameter, neck present, short, centric or eccentric. Asci 8-spored, cylindrical to fusiform, 50-70 x 7-8μ. Ascospores oblong or ellipsoidal, obliquely uniseriate, 2-celled, brown at maturity, not, or only slightly constricted at septa, 8-15 x 4-7μ.

On leaves and submerged culms of various species of Typha.

**KEY TO SPECIES OF LEPTOSPHAERIA**

1. Spores with 2-3 septations ....................... 2
2. Spores with 4-10 septations ....................... 5
3. Spores longer than 30μ ......................... *L. junicola*
4. Spores shorter than 30μ ......................... *L. typhae*
5. Spores not more than twice as long as broad .................. *L. acuta*
6. Spores ellipsoidal, usually with 5 septations .................. *L. scirpinum*
7. Spores subcylindrical, 5-6 septations, antepenultimate cell enlarged .................. *L. sowerbyi*

Leptosphaeria junicola Rehm apud Winter (Figure 8)

Ascomycetes gregarious to scattered, innate, subglobose to oval, subcarbonaceous to membranous, black or brown, concolorous, 100-250μ in diameter, neck absent. Asci 8-spored, clavate-cylindrical or broadly clavate, thick-walled, slightly pedicellate, 60-90 x 10-20μ. Ascospores fusoid to broadly fusoid, straight or curved, hyaline when young, yellow to brown when mature, 4-celled, with constrictions at septa, varying slightly enlarged penultimate cell, 32-48 (50) x 4-6 (10)μ.

On culms of Scirpus species.

Leptosphaeria typhae (Karst.) Saccardo (Figure 9)

Ascomycetes gregarious, innate, globose to subglobose, more or less carbonaceous, black concolorous, 150-160μ in diameter, neck absent, Asci 8-spored, clavate to cylindrical, thin-walled, short pedicellate, 50-100 x 15-20μ. Ascospores fusiform, but more commonly narrowly clavate, slightly curved, 4-celled, brown or yellowish at maturity, not or only
slightly constricted at septa, penultimate cell broadest, 15-24 x 3.5-5.0 (5.5) μ.

This species is very close to both *L. typharum* and *L. eustoma*. It differs from the latter only by having extremely narrow spores, never exceeding width of 5.5μ.

*Leptosphaeria typhae* may be, in fact, merely a variant of *L. eustoma*.

On submerged culms of various *Scirpus* and *Typha* species.

*Leptosphaeria eustoma* (Fk.) Saccardo (Figure 10)

Ascomycetes clustered or cespitose, deeply innate, innate or occasionally erumpent, globose to subglobose or pyriform, carbonaceous or subcarbonaceous, brown or black, 100-200μ in diameter, neck, if present, papilliform. Asci 8-spored, cylindrical to clavate-cylindrical, thin-walled, 75-105 (120) x 15-20μ. Ascospores ellipsoidal or slightly clavate, slightly curved, ends rounded, obliquely uniseriate, hyaline when young, brown at maturity, 4-celled, slightly constricted at septa, penultimate cell slightly enlarged, (13)18-33 x 4.5-10.5μ.

This species is very close to *L. typharum*, but differs in having slightly narrower spores with constricted septa.

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**Figure I.**


**Figure II.**


On submerged culms of various *Scirpus* and *Typha*

*Leptosphaeria typharum* (Desm.) Karsten (Figure 11)

Ascomycetes scattered, globose to subglobose or oval to oblong, deeply innate, carbonaceous to submembranous, brown or black, concolorous, to 150μ long, 200μ broad, many collections predominantly 150μ in diameter, neck absent. Asci 8-spored, clavate-cylindrical or oblong, short pedicellate, 60-100 x 16-25μ. Ascospores broadly ellipsoidal or oblong, slightly curved, usually irregularly arranged in ascu, hyaline and 2-celled when young, 4-celled, yellowish brown at maturity, scarcely or not at all constricted at septa, penultimate cell broadest, 20-30 (35) x 9-15μ.

On submerged culms of *Typha*.

*Leptosphaeria acuta* (Fries) Karsten (Figure 12)

Ascomycetes scattered or clustered, erumpent or commonly superficial, globose to subglobose, black, subcarbonaceous to membranous, 150-200μ in diameter, neck, if present, papilliform. Asci 8-spored, clavate to cylindrical, short pedicellate, thick-walled, 100-190 x 10-30μ. Ascospores fusiform, straight or curved, hyaline when young, becoming yellow or brown-
ish when mature, 8-10 celled, not or only slightly constricted at septa, 36-50(58) x 5-7μ.

On species of Scirpus.

Leptosphaeria scirpina Winter (Figure 13)

Ascorpores scattered, sparse, deeply innate, globose to subglobose, carboxarum to subcarbonaceous, black, 125-250μ in diameter, neck absent. Ascii 8-spored, clavate to cylindrical, thin-walled, pedicellate, base of pedicel bulbous, 100-125(150) x 15-29μ. Ascomspores fusoid to subfusoid or ellipsoidal, straight or slightly curved, obliquely uniseriate or overlapping, hyaline when young, yellow to brown at maturity, 5-6 celled, primarily 6-celled, not constricted at septa, (25)30-36 x (6)10-14μ.

On submerged culms of Scirpus species.

Leptosphaeria sowerbyi (Fkl.) Saccardo (Figure 14)

Ascorpores gregarious or occasionally clumped, innate, globose to pyriform, subcarbonaceous to membranous, black or brown, 75-100μ in diameter, neck, if present, papilliform. Ascii 8-spored, cylindrical, short pedicellate, thin-walled, 60-75 x 16-20μ. Ascomspores ellipsoidal to subcylindrical, yellowish to brown, 7-celled, not constricted at septa, ante-nuctmillar, cells slightly enlarged, 42-50 x 5-6μ.

On submerged culms of various species of Scirpus.

PLEOSPOROS

Pleospora pulchra Kirschst. (Figure 15)

Ascorpores gregarious, innate, globose to spherical, carboxarum, black, concolorous, neck absent, 150-200μ in diameter. Ascii 8-spored, broadly clavate, thick-walled, short pedicellate, 130-150 x 25-35μ. Ascomspores obliquely biserate, broadly fusoid, to oblong ellipsoidal, tapered, constricted inequilateral, brown, muriform, 8-12 transverse septations, 1 or 2 longitudinal septations in any or all cells, usually one or both terminal cells without longitudinal septa, 35-45 x 12-18μ.

On submerged culms of various species of Scirpus and Typha.

KEY TO SPECIES OF PLATYSPORA

Spores with 3 transverse septa ................. P. typhaeola
Spores with 4-5 transverse septa ................. P. scirpi

Platyospora permunda (Cke.) Wehmeyer (Figure 16)

Ascorpores scattered or gregarious, innate, globose to spherical or slightly flattened, subcarbonaceous, dark brown or black, concolorous, neck absent, 150-200μ in diameter. Ascii 8-spored, stout, clavate, thick-walled, base clavate, 50-65 x 16-24μ. Ascomspores ellipsoid or clavate-ellipsoid, pigmented, usually straight, occasionally inequilateral, symmetric or tapered below, muriform, 3 transverse septations with a single longitudinal septum in each of the central cells, but none in the end cells, slightly flattened in edge view, 18-22 x 8-10μ.

On submerged and floating culms of various species of Scirpus and Typha.

Platyospora planispora (Ell.) Wehmeyer (Figure 17)

Ascorpores gregarious or scattered beneath host epidermis, globose, subspherical or pyriform, carboxarum to subcarbonaceous, black, 100-200μ in diameter, neck, if present, papilliform. Ascii 8-spored, stout, clavate, thick-walled, short pedicellate 250-290 x 54-65μ. Ascomspores broad, fusoid or fusoid-ellipsoid, hyaline when young, becoming pigmented with maturity, muriform, 5 transverse septations, usually

equal, only 1 longitudinal septation per cell, none in end cells, slightly constricted at septa, straight or slightly curved, flattened in one plane, 40-58 x 21-25μ.

In Wehmeyer's (1961) treatment of Pleospora and its segregates, Platyospora planispora is reported to have asci and spores much smaller than those in the Itasc material (asci 75-125 x 17-25μ; spores 23-41 x 11-17μ). The present collection is being retained as P. planispora on the basis of spore shape and septation number.

On submerged and floating culms of various species of Scirpus and Typha.

KEY TO SPECIES OF PYRENOPHORA

Spores with 3-4 transverse septa ................. P. typhaeola
Spores with 4-5 transverse septa ................. P. scirpi

Pyrenophora typhaeola (Cke.) Müll. (Figure 18)

Ascorpores scattered or gregarious, innate or slightly erumpent, globose, spherical or occasionally oval, carboxarum to subcarbonaceous, black or brown, concolorous, 250-350μ in diameter, neck, if present, papilliform, centric. Ascii 8-spored, clavate, thick-walled, short pedicellate, 120-150 x 20-30μ. Ascomspores obleng-ellipsoidal to broadly ellipsoidal, slightly depressed, pigmented, usually 3, but occasionally 4 transverse septa, inequilateral, longitudinal septations in any or all cells, but usually only 2, constricted at all or only mid-septum, rounded at both ends, irregularly biseriate, 25-50 x 12-16μ.

On submerged culms of various species of Typha.

Pyrenophora scirp (Lamb.) Wehmeyer (Figure 19)

Ascorpores scattered or clustered, more or less globose, innate or occasionally slightly erumpent, subcarbonaceous to membranous, black, concolorous, 250-300μ in diameter, minutely ostiolate. Ascii 8-spored, broadly cylindrical or clavate, thick-walled, provided with a short, claw-like base, 100-180 x 35-45μ. Ascomspores irregularly biseriate, broadly fusoid or more commonly ellipsoidal, brown muriform, 4-5 transverse septa, one longitudinal septum in any or all cells, guttulate or not, straight or slightly curved, slightly narrower in edge view, (36)40-54 x 15-22(25)μ.

On submerged culms of various species of Scirpus.

References


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