



Surface Morphology of Entolomataceae Spores

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Abstract

Entolomataceae is a family of basidiomycetes which consists of several genera and species. *Entoloma* is a common genus in Texas and most recorded Entolomataceae in the Big Thicket National Preserve. This experiment consists of twenty-four Entolomataceae specimens collected from David Lewis' herbarium. The specimens were examined using a Scanning Electron Microscope to study surface morphology. Specimens were placed in three groups based on average spore size. *Entoloma* spores are similar in shape and size, therefore, further research is needed for classification purposes.

Introduction

The Entolomataceae family is found in the order Agaricales and is most difficult to identify (1). *Entoloma*, *Leptonia*, *Clitopilus*, and *Rhodocybe* are genera of Entolomataceae, while *Leptista* is a member of the Tricholomataceae (2, 3). *Entoloma* is the most common genus in Texas and the most recorded in the Big Thicket National Preserve.

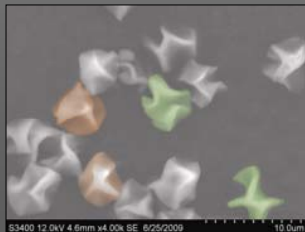
Spores of Entolomataceae play a vital role in reproduction. The cell wall of a spore is usually smooth but some genera of Entolomataceae produce wrinkled, warted, and angular spores.

The purpose of this experiment is to compare Entolomataceae spores of twenty-four specimens from five different genera to determine similarities and differences in spore morphology using a Hitachi S-3400N Scanning Electron Microscope (SEM).

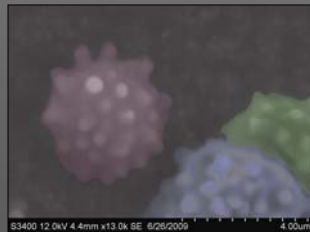
Methods

In the field, mushrooms were cut at their base using a pocket knife and placed in a wax lined paper bag. At the Big Thicket National Preserve Research Station, the mushrooms were placed in a dehydrator for eight hours and then stored in plastic bags for preservation. Twenty-four specimens of Entolomataceae were selected from the David Lewis' collection for spore examination.

Specimens were individually removed from their respective bags and placed on a dissecting tray under a dissecting microscope. The gills were cut with a razor blade, removed from the cap, and then placed on carbon sticky paper on a SEM stub using forceps. The gill was peeled off leaving spores attached to carbon sticky paper. Stubs were placed inside the chamber of the SEM and the spores were examined. Once specimens were focused, micrographs were taken of spores and saved to a database. To find the average spore size, five measurements were taken of each specimen using the Quartz PCI program.



Group 1: *Entoloma species 3* (4)



Group 1: *Rhodocybe species* (3)

DPL#	Genus	Species	Spore Description	SEM Spore Size	Literature Spore Size
1747	ENTOLOMA	NITIDUM*	Angular, 5-6 sided, with oil droplets	8.38 X 6.54 µm	None Found
7648	ENTOLOMA	SINUATUM	Angular, Roundish, Several oil droplets	6.78 X 5.34 µm	7.10 X 7.9 µm
1664	ENTOLOMA	SPECIES 1	Angular, 6-8 sided, Ridges	6.72 X 5.42 µm	None Found
1665	ENTOLOMA	SPECIES 2	Angular, 6-8 sided, Ridges	6.82 X 5.24 µm	None Found
7650	ENTOLOMA	SPECIES 3	Angular, 5-6 sided, Ridges	5.34 X 4.72 µm	None Found
1662	ENTOLOMA	SPECIES 4	Angular, 6-8 sided, Ridges	6.89 X 5.92 µm	None Found
1748	ENTOLOMA	SPECIES 5	Angular, 5-6 sided, Ridges	6.88 X 5.96 µm	None Found
176	LEPTONIA	SERRULATA	Angular, 6-8 sided, Ridges	8.14 X 6.44 µm	None Found
7961	ENTOLOMA	STRICTUS	Elliptical, Angular, 5-6 sided	8.56 X 6.36 µm	10.13 X 7.5-9 µm
8111	ENTOLOMA	SPECIES 6	Angular, 6-8 sided, Ridges	6.26 X 5.76 µm	None Found
8112	LEPTONIA	SERRULATA	Angular, Oval, 5-7 sided	6.98 X 5.56 µm	None Found
8113	CLITOPILUS	SPECIES 7	Angular, 6-8 sided, Ridges	7.25 X 6.08 µm	None Found
8117	RHOODOCYBE	SPECIES 8	Round, Warted	4.67 X 4.06 µm	None Found
8386	ENTOLOMA	LIVIDUM	Angular, 6-8 sided, Ridges, Oval	8.53 X 6.94 µm	None Found
8391	ENTOLOMA	SPECIES 9	Angular, Round, 4-6 sided, Oil Droplets	7.98 X 7.06 µm	None Found
8392	ENTOLOMA	SPECIES 10	Angular, 1-2 Spines, Oil Droplets	8.14 X 5.92 µm	None Found
8521	UNKNOWN	ASCO	Square, Square, Angular, Ridges	7.53 X 6.44 µm	None Found
8691	ENTOLOMA	STRICTUS	Elliptical, Angular, 5-6 sided	8.18 X 5.86 µm	10.13 X 7.5-9 µm
8717	ENTOLOMA	SINUATUM	Round, Angular, Several Oil Droplets	7.76 X 6.95 µm	7.10 X 7.9 µm
8962	CLITOPILUS	PRUNULUS	Elliptical, Smooth, Angular at End	4.22 X 3.00 µm	10.12 X 5.7 µm
8963	LEPISTA	SPECIES 11	Oval, Small Ridges	4.26 X 3.16 µm	None Found
8964	ENTOLOMA	MURRAI	Square, Four sided, Angular and Smooth	6.42 X 5.30 µm	9.12 X 8.10 µm
8965	ENTOLOMA	MEGACYSTIDIOSUM	Angular, 6-7 sided, Ridges	9.03 X 7.96 µm	10.14 X 7.8 µm
9101	ENTOLOMA	MEGACYSTIDIOSUM	Angular, 6-7 Sides, Ridges	8.78 X 6.58 µm	10.14 X 7.8 µm

Table 1: SEM Data and Literature Comparison; (*) Refers to spore description from literature (1, 3).

Group 1		Group 2		Group 3	
Specimen	Spore Range	Specimen	Spore Range	Specimen	Spore Range
E. Species 3	5.34 X 4.72 µm	E. Sinuatum	6.78 X 5.34 µm	E. Nitidum	8.38 X 6.54 µm
R. Species 1	4.67 X 4.06 µm	E. Species 1	6.72 X 5.42 µm	E. Serrulata	8.14 X 6.44 µm
C. Prunulus	4.22 X 3.00 µm	E. Species 2	6.82 X 5.24 µm	E. Strictus	8.56 X 6.36 µm
L. Species	4.26 X 3.16 µm	E. Species 4	6.89 X 5.92 µm	E. Lividum	8.53 X 5.94 µm
		E. Species 5	6.88 X 5.96 µm	E. Species 8	8.14 X 5.92 µm
		E. Species 6	6.26 X 5.76 µm	E. Strictus	8.18 X 5.86 µm
				E. Megacys.	8.78 X 6.58 µm

Table 2: Specimens Grouped By Size. Specimens 8123, 8124, 8397, 8521, 8965, 8966 were not grouped because of no size comparison. (*) Refers to numbers added to species.

Results

Table 1 compares the data collected from the SEM to the data of other published works. *Entoloma sinuatum*, *Entoloma strictus*, *Entoloma strictus*, *Entoloma sinuatum*, *Clitopilus prunulus*, *Entoloma murrayi*, and *Entoloma megacystidiosum* were the only specimens identified in literature; other specimens are listed as "None Found" in Table 1. The spores were described using two methods. The first method utilized established terms found in scientific literature and the second method utilized SEM micrographs.

Table 2 separated the specimens into three groups by spore size comparison. Group 1 contains *Entoloma(E) species 3*, *Rhodocybe species*, *Clitopilus(C) prunulus*, and *Lepista species* with sizes ranging from 4.22-5.34 µm in length and 3.00-4.72 µm in width. Group 2 contains *E. sinuatum*, *Entoloma species 1*, *E. species 2*, *E. species 4*, *E. species 5*, and *E. species 6* with sizes ranging from 6.26-6.89 µm in length and 5.24-5.96 µm in width. Group 3 contains *E. nitidum*, *E. serrulata*, *E. strictus*, *E. lividum*, *E. species 8*, *E. strictus*, and *E. megacystidiosum* ranges from 8.14-8.78 µm in length to 5.86-6.58 µm in width. Specimens *Leptonia serrulata*, *C. species*, *E. species 7*, *Unknown*, and *E. murrayi* were not grouped because of no comparison between spore sizes

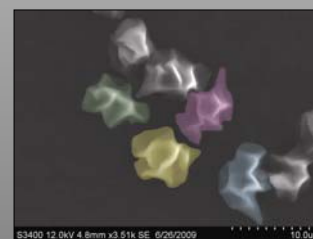
Discussion

Twelve of the twenty-four specimens were completely identified and the other twelve were classified only by genus. Using micrographs, the nine of the twelve unclassified species were grouped based on spore size to possibly identify the species. In Table 1 the average spore size matched only three of the eight specimen sizes found in literature. The specimens in Table 2, group 2, could be identified as *E. sinuatum* because the size and shape have similar features. In group 3, *E. species 8* could be identified as *E. strictus* because the spore size and structure features are alike. In table 2, group 1, *E. species 3* could possibly be *E. sinuatum* because of the similar angular spore but just not as mature.

Since the species of *Entoloma* all resemble angular spores, it is difficult to classify without further research on spore structure. The literature on Entolomataceae is rare causing problems in making an exact comparison of each specimen collected.



Group 2: *Entoloma sinuatum* (4)



Group 3: *Entoloma lividum* (4)

Acknowledgments

Thanks to Dr. Carl Knight, David Lewis, Jessica Silva, and Eastfield College Project Pathways Summer Institute that is supported by the National Science Foundation Science Talent Expansion Program Grant # DUE-0525536, the Dallas County Community College District, the National Park Service, and the Big Thicket Association.

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4. Micrographs were colored using Photoshop.