Alternate Morphological Characteristics of the Bryophytes of the Big Thicket National Preserve

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Abstract

Bryophyte taxa are constantly changing due new technologies. This preliminary study focused on three alternative characteristics for the identification of *Amblystegium riparium (Hedw.) Schimp.* (synonym of *Leptodictyum riparium (Hedw.) Warnst.*), *Atrichum angustatum*, *Ditrichum pallidum*, *Entodon macropodus (Hedw.) Müll. Hal.*, *Entodon seductrix (Hedw.) Müll. Hal.*, and *Thelia hirtella (Hedw.) Sull.* using the Hitachi TM-1000 and Hitachi S-3400 scanning electron microscopes (SEM). Spore characterization was divided into two categories for identification. It was found that possible morphological characteristics may be identified in the leaves and stalks in terms of the presence and absence of vascularity, and that better samples were needed to identify the surface structures of spores.

Introduction

Bryophytes are a little known group of colony-thriving plants within the kingdom Plantae that inhabit the same areas as other photosynthetic plants [1]. The Bryophyte samples used in this study were taken from The Big Thicket National Preserve because the difference in habitats allowed for the variety of samples needed for this preliminary study. Although traditionally considered to be non-vascular and monophyletic (single phylum), modern genetic information has redefined Bryophytes as paraphyletic (multi phylum) and non-tracheophytic [1], since many Bryophytes have hydroids (which function as the xylem) and leptoids (which function as the phloem) but lack tracheids and vessels [1]. The accessibility of new technologies is becoming an innovative force in redefining the morphology and taxonomy of Bryophytes [2]. The purpose of this preliminary study was to observe alternative morphology characteristics of the specimens *Amblystegium riparium (Hedw.) Schimp.* (synonym of *Leptodictyum riparium (Hedw.) Warnst.*), *Atrichum angustatum*, *Ditrichum pallidum*, *Entodon macropodus (Hedw.) Müll. Hal.*, *Entodon seductrix (Hedw.) Müll. Hal.*, and *Thelia hirtella (Hedw.) Sull.* using variable pressure scanning electron microscopy (SEM) to determine supplemental means of morphological identification.

Methods

The samples were collected, examined, keyed, labeled, pressed, and dried before small lab samples were taken for laboratory analysis. The remaining samples were sent to be preserved in the Texas A&M University herbarium for future reference. After the initial morphology characteristics were determined using dissecting and light microscopes, the samples were prepared for SEM observation. Some images were taken using a Hitachi TM-1000 in the charge-up reduction mode. Others were taken using a Hitachi S-3400n on the VP SEM setting and set to a vacuum of 30 Pa, a probe current range of 30 to 70, an accelerating voltage of 12 to 15 keV, and a working distance of 13 to 8 mm. Optimum magnification for stems, stalks, and leaves ranging from 300x to 800x and optimum magnification for spores ranged between 1000x and 5000x.

Results

Substrate

D. pallidum, A. riparium, and *E. seductri* were located on damp or wet substrates, and *A. angustatum*, *E. macropodus*, and *T. hirtella* were located on dry substrates.

Vascularity

With regard to the leaf structure, *D. pallidum* showed to be stratos (multi-layered) and *A. angustatum*, *T. hirtella*, *A. riparium*, *E. macropodus*, *and E. seductrix* showed to be non-stratos (single layered) [Figure 1a and 1b]. In terms of stalk, *E. macropodus*, *T. hirtella*, *A. riparium*, and *A. angustatum* showed to have a vascular stalk and *D. pallidum* and *E. seductrix* showed to have a non-vascular stalk [Figure 1c and 1d].

Spores

It seems that this experiment produced insufficient results with respect to the spores. Of the spores that were found, many were either too dry or too immature for conclusive results.

Discussion

Of three the samples collected from dry substrates, two were vascular and one was unknown. Although further studies are needed, it may be logical to assume that Bryophytes may have been a precursor to land plants, with riparian Bryophytes having been the most primitive of the group. The testing of multiple samples within the same genus may produce more conclusive results. Given the results in vascularity, it seems that a Bryophyte with a more complex water conducting system in the stalk or stem would have a less complex conducting system in its leaves. One explanation may be the need for circulation. With a more efficient centralized water conduction system, a plant may need to circulate water and food to and from the root at a faster rate. Further testing may validate or debunk this conclusion as well as provide additional information that may be useful when redefining Bryophyte taxa. It seems that this experiment produced insufficient results with respect to the spores. Of the spores that were found, many were either too dry or too immature for conclusive results. For this reason, better samples and further testing may be needed. Overall, this preliminary study was able to identify at least one possible alternative morphological characteristic. However, further testing with a focus on individual genera and multiple samples within each genera may produce more conclusive results.

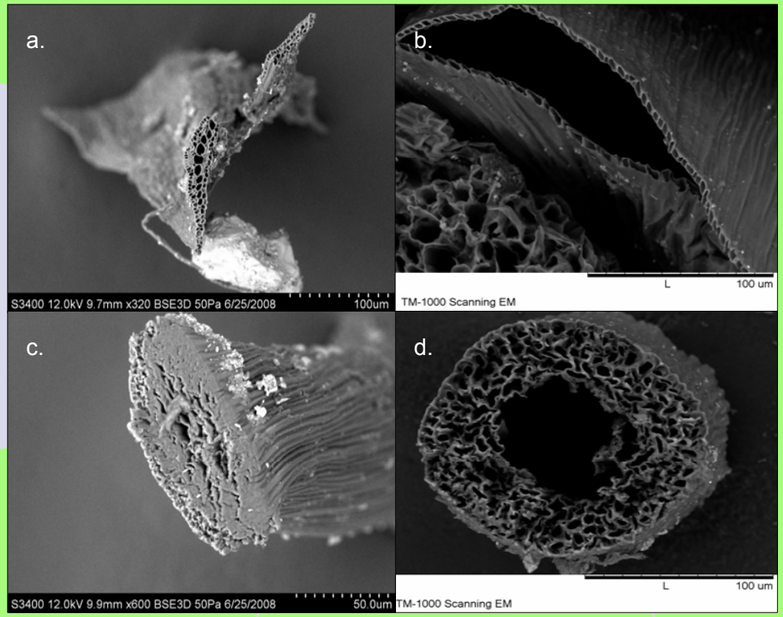

Figure 1: a.) D. pallidium leaf, b.) E. marcopodus leaf, c.) D. pallidium stalk, d.) A. angustatum stalk.

Literature Cited

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