Leaf blade anatomy of some aquatic plants found in Chiang Mai University

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Abstract

This study aims to investigate leaf blade anatomy of 17 species of aquatic plants found in Chiang Mai University, including *Echinodorus cordifolius* (L.) Griseb., *Colocasia esculenta* (L.) Schott, *Lasia spinosa* (L.) Thwaites, *Pistia stratiotes* L., *Canna indica* L., *Cyperus alternifolius* L., *Hydrilla verticillata* (L. f.) Royle, *Thalia geniculata* L., *Eichhornia crassipes* (Mart.) Solms, *Hydrocotyle umbellate* L., *Ipomoea aquatica* Forsk., *Nelumbo nucifera* Gaertn., *Nymphaea capensis* Thunb., *Bacopa caroliniana* (Walter) B.L.Rob., *Marsilea crenata* C.Presl, *Salvinia cucullata* Roxb.ex Bory and *Salvinia molesta* D.S. Mitchell. Leaves were collected, cross-sectioned by hand, and stained with 0.05% Safranin O. After that, leaf internal structure was examined under a compound microscope. The study found that the emerged plants mostly had stomata on both leaf sides and cuticle present. The mesophyll presented air space except *Thalia geniculata, Ipomoea aquatica* and *Bacopa caroliniana*. The leaf thickness was between 0.2–0.4 mm, with *Nelumbo nucifera* having the highest thickness (0.4±0.03 mm). The submerged plants had very thin leaves with a thickness of 0.04±0.001 mm. They lacked stomata and cuticle. The free-floating plants found stomata on both leaf sides, except *Salvinia cucullata* and *Salvinia molesta* were presented only adaxial surface. Unicellular trichome and multicellular trichome were found. The mesophyll presented air space. The leaf thickness was between 0.2–0.4 mm, with *Eichhornia crassipes* having the highest thickness (0.4±0.03 mm). The floating-leaf plants had stomata only on the adaxial surface and cuticle was found. But unicellular trichome presented only on the abaxial surface. The mesophyll presented air space. The leaf thickness was 0.3±0.01 mm.

Introduction

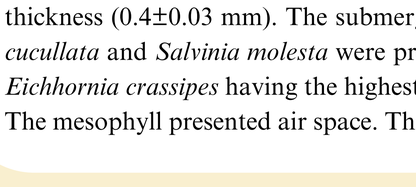
Aquatic plants refer to plants that grow in water or spend a part of their life cycle growing in water. The entire plant may be submerged underwater, or some parts of the plant may emerge above the water's surface. Aquatic plants can be classified into four groups based on their growth and habitat characteristics: emerged plants, submerged plants, free-floating plants and floating-leaf plants [1]. An examination of the leaf blade anatomy of aquatic plants can offer valuable insights into how the internal structural adaptations of each plant group contribute to their survival.

Objective

To investigate leaf internal structure of aquatic plants.

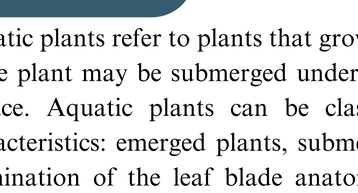
Materials & Methods

1



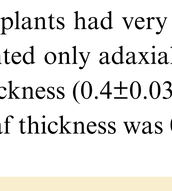
Chiang Mai University

2



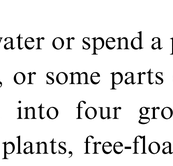
Plant collection

3



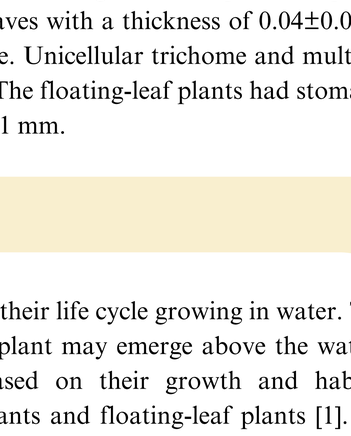
Wet mount preparation

4



Investigation under the light microscope

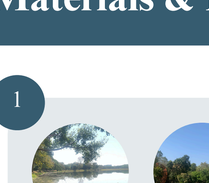
5



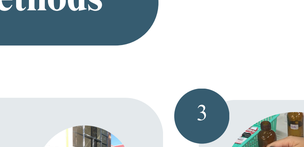
Data collection

Results & Discussion

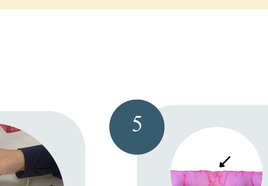
Emeraged Plants



Echinodorus cordifolius



Colocasia esculenta



Lasia spinosa

Canna indica

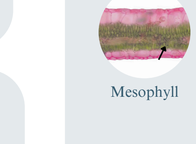
Cyperus alternifolius

Thalia geniculata

Hydrocotyle umbellata

Ipomoea aquatica

Nelumbo nucifera



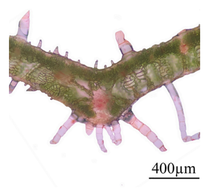
Bacopa caroliniana

Marsilea crenata

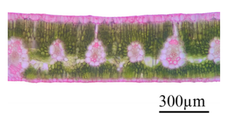
Submeraged Plants

Hydrilla verticillata

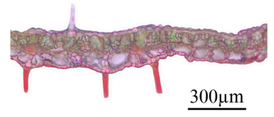
Free-floating Plants



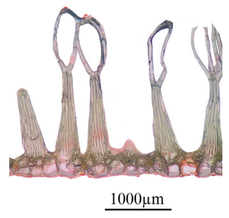
Pistia stratiotes



Eichhornia crassipes

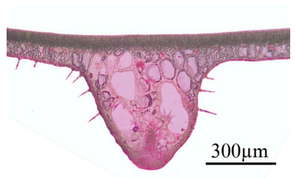


Salvinia cucullata



Salvinia molesta

Floating-leaves Plants



Nymphaea capensis

Scientific name	Common name	Stomata	Cuticle	Trichome	Mesophyll (separate 2 layers)	Aerenchyma	Sclereid	Leaf thickness (mm)
Echinodorus cordifolius	บัวอเมซอน	B	/	-	-	/	-	0.2±0.01
Colocasia esculenta	บอน	B	-	/	-	/	-	0.2±0.02
Lasia spinosa	ผักหนาม	B	/	/	-	/	-	0.2±0.01
Canna indica	พุทธรักษา	B	/	-	-	/	-	0.3±0.01
Cyperus alternifolius	กกรังกา	B	/	/	-	/	-	0.2±0.02
Thalia geniculata	คล้าน้ำข่อห้อย	B	/	-	-	-	-	0.2±0.01
Hydrocotyle umbellata	แว่นแก้ว	B	/	-	/	/	-	0.3±0.02
Ipomoea aquatica	ผักบุ้งไทย	B	/	-	/	-	-	0.3±0.02
Nelumbo nucifera	บัวหลวง	B	/	/	/	/	-	0.4±0.03
Bacopa caroliniana	ลานไพลิน	B	/	-	-	-	-	0.3±0.01
Marsilea crenata	ผักแว่น	B	/	-	/	/	-	0.2±0.01

Table 1 Leaf internal structure of emerged plants (B = both leaf surface)

Scientific name	Common name	Stomata	Cuticle	Trichome	Mesophyll	Aerenchyma	Sclereid	Leaf thickness (mm)
Hydrilla verticillata	สาหร่ายหางกระรอก	-	-	-	-	-	-	0.04±0.001

Table 2 Leaf internal structures of submerged plants

Scientific name	Common name	Stomata	Cuticle	Trichome	Mesophyll	Aerenchyma	Sclereid	Leaf thickness (mm)
Pistia stratiotes	จอก	B	-	/	-	/	-	0.4±0.02
Eichhornia crassipes	ผักตบชวา	B	/	-	-	/	-	0.4±0.03
Salvinia cucullata	จอกหูหนู	AD	/	/	/	/	-	0.2±0.01
Salvinia molesta	จอกหูหนูยักษ์	AD	/	/	/	/	-	0.2±0.03

Table 3 Leaf internal structures of free-floating plants (AD = adaxial surface, B = both leaf surface)

Scientific name	Common name	Stomata	Cuticle	Trichome	Mesophyll	Aerenchyma	Sclereid	Leaf thickness (mm)
Nymphaea capensis	บัวผัน	AD	/	/	/	/	Astrosclereid	0.3±0.01

Table 4 Leaf internal structures of floating-leaves plants (AD = adaxial surface)

Aquatic Plants	Stomata	Cuticle	Trichome	Aerenchyma	Sclereid	Leaf thickness (mm)
Emerged plants	B	/	-	/	-	0.2-0.4
Submerged plants	-	-	-	-	-	0.04
Free-floating plants	B	/	/	/	-	0.2-0.4
Floating-leaves plants	AB	/	/	/	/	0.3

Table 5 Compares the leaf Internal structures of aquatic plants (AD = adaxial surface, B = both leaf surface)

Conclusion

The internal structure of leaves in aquatic plants plays a crucial role in determining their survival.

Acknowledgement

I would like to express my sincere thanks

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References

[1] Kiprop, V. 2019. What Are The Different Types Of Aquatic Plants?. WorldAtlas [Online]. Available : https://www.worldatlas.com/articles/what-are-the-different-types-of-aquatic-plants.html [2025, Feb. 20]