

## Documents

Zakaria, S.M.<sup>a</sup>, Amri, C.N.A.C.<sup>a</sup>, Talip, N.<sup>b</sup>, Juhari, A.A.A.<sup>c</sup>, Rahman, M.R.A.<sup>b</sup>, Zohari, A.F.<sup>b</sup>, Ghazalli, M.N.<sup>d</sup>, Siam, N.A.<sup>e</sup>, Shahari, R.<sup>a</sup>

**Comparative Leaf Anatomy and Micromorphology of *Thunbergia erecta* (Benth.) T. Anderson and *Thunbergia laurifolia* Lindl. in Peninsular Malaysia**

(2022) *Tropical Life Sciences Research*, 33 (1), pp. 105-119. Cited 1 time.

DOI: 10.21315/tlsr2022.33.1.7

<sup>a</sup> Department of Plant Science, Kulliyah of Science, International Islamic University Malaysia, Jalan Sultan Ahmad Shah, Pahang, Kuantan, 25200, Malaysia

<sup>b</sup> School of Environment and Natural Resource Sciences, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, Selangor, Bangi, 43600, Malaysia

<sup>c</sup> Department of Environment, Faculty of Forestry and Environment, Universiti Putra Malaysia UPM, Selangor, Serdang, 43400, Malaysia

<sup>d</sup> Programme of Resource, Utilisation and Agrobiodiversity Conservation, Agrobiodiversity and Environment Research Centre MARDI, Selangor, Serdang, 43400, Malaysia

<sup>e</sup> Forest Product, Forest Research Institute Malaysia, Selangor, Kepong, 52109, Malaysia

**Abstract**

Comparative leaf anatomy and micromorphology study was carried out on two selected species from the genus *Thunbergia* Retz. of Acanthaceae subfamily Thunbergioideae. These two investigated species were *T. erecta* and *T. laurifolia* from Peninsular Malaysia. The leaf anatomical study involve several methods such as cross-section using sliding microtome on the petioles, midribs, lamina and marginal, leaf epidermal peeling, leaf clearing and observation under a light microscope. The leaf micromorphology method involve the observation under a scanning electron microscope (SEM). This study aimed to investigate the taxonomic value of leaf anatomy and micromorphology characteristics of genus *Thunbergia*. The results have shown that there were five common characteristics present in both species studied and several variable characters that might be useful for species differentiation of *T. erecta* and *T. laurifolia*. The five common characteristics recorded were the presence of raphide, sinuous anticlinal walls, diacytic stomata, majority opened and minority closed venation in lamina and the presence of peltate glandular (unicellular terminal) trichome. The variable characteristics included were petiole, and marginal outlines, types of vascular bundles, the presence of druse, marginal venation, stomata occurrence, types of wax, cuticular sculpturing and types of trichomes. In conclusion, findings in this study showed that leaf anatomical and micromorphological characteristics possessed taxonomic value that can be used in the species identification for the genus *Thunbergia* specifically for *T. erecta* and *T. laurifolia*. © Penerbit Universiti Sains Malaysia, 2022.

**Author Keywords**

Leaf Anatomy; Leaf Micromorphology; Taxonomic Significance; *Thunbergia*

**Index Keywords**

anatomy, cross section, leaf, morphology, observational method, scanning electron microscopy, taxonomy, vine; Malaysia, West Malaysia

**References**

- Agbagwa, I O, Ndukwa, B C.  
**The value of morpho-anatomical features in the systematic of *Cucurbita* L. (*Cucurbitaceae*) species in Nigeria**  
(2004) *African Journal of Biotechnology*, 3 (10), pp. 541-546.
- Ahmad, K J.  
**Cuticular studies in some of *Mendoncia* and *Thunbergia* (*Acanthaceae*)**  
(1974) *Botanical Journal of the Linnean Society*, 69, pp. 53-63.
- Amirul-Aiman, A J, Noraini, T, Nurul-Aini, C A C.  
**Trichomes morphology on petals of some *Acanthaceae* species**  
(2014) *A Journal on Taxonomic Botany, Plant Sociology and Ecology*, 14 (1), pp. 79-83.
- Aritajat, S, Wutteerapol, S, Saenphet, K.  
**Anti-diabetic effect of *Thunbergia laurifolia* Linn. aqueous extract**  
(2004) *Southeast Asian Journal Tropical Medicine and Public Health*, 35, pp. 53-58.

- Barthlott, W, Neinhuis, C, Cutler, D.  
**Classification and terminology of plant epicuticular waxes**  
(1998) *Botanical Journal of the Linnean Society*, 126 (3), pp. 237-260.
- Beck, C B.  
(2010) *An introduction to plant structure and development plant anatomy for the twenty-first century*,  
2nd ed. New York: Cambridge University Press
- Bieras, A C, Sajo, M G.  
**Leaf structure of the Cerrado (Brazilian Savanna) woody plants**  
(2009) *Trees*, 23, pp. 451-471.
- Borg, J A, McDade, A L, Schönenberger, J.  
**Molecular phylogenetics and morphological evolution of Thunbergioideae (Acanthaceae)**  
(2008) *Taxon*, 57 (3), pp. 811-822.
- Candolle, C D E.  
**Anatomie compare des feuilles chez quelques familles de Dicotyledones**  
(1879) *Mémoires de la Société de Physique et d'Histoire Naturelle de Genève*, 26, pp. 427-480.
- Carlquist, S.  
**Wood anatomy of Acanthaceae: A survey**  
(1988) *Journal of Systematic and Evolutionary Botany*, 12 (1), pp. 201-227.
- Chan, E W C, Eng, S Y, Tan, Y P.  
**Phytochemistry and pharmacological properties of Thunbergia laurifolia: A review**  
(2011) *Pharmacognosy Journal*, 3 (24), pp. 1-6.
- Chia-Chi, H, Yunfei, D, Wood, J R I.  
(2011) *Flora of China: Acanthaceae*,  
United States of America: Missouri Botanical Garden Press
- Cutler, D F.  
(1978) *Applied plant anatomy*,  
London: Longman Group Limited
- Dunn, D B, Sharma, G K, Campel, C C.  
**Stomatal patterns of dicotyledons and monocotyledons**  
(1965) *American Midland Naturalist*, 74, pp. 185-195.
- Fahn, A.  
(1967) *Plant anatomy*,  
Israel: Hakibutz Hameuhad Publishing House Ltd
- Franceschi, V R, Nakata, P A.  
**Calcium oxalate in plants: Formation and function**  
(2005) *Annual Review of Plant Biology*, 56, pp. 41-71.
- Hare, C L.  
**On the taxonomic value of the anatomical structure of the vegetative organs of the dicotyledons: The anatomy of the petiole and its taxonomic value**  
(1942) *Proceedings of the Linnean Society of London*, 555 (3), pp. 223-229.
- Heywood, V H, Brummitt, R K, Culham, A.  
(2007) *Flowering plants families of the world*,  
Canada: Firefly Books

- Hickey, L J.  
**Classification of the architecture of dicotyledonous leaves**  
(1973) *American Journal of Botany*, 60, pp. 1-33.
- Johansen, D A.  
(1940) *Plant microtechnique*,  
New York: McGraw-Hill
- Kar, A, Goswami, N K, Saharia, D.  
**Distribution and traditional uses of Thunbergia Retzius (Acanthaceae) in Assam, India**  
(2013) *Pleione*, 7 (2), pp. 325-332.
- Khatijah, H, Ruzi, M A R.  
(2006) *Anatomical atlas of Malaysian medicinal plants*,  
Bangi: UKM Press
- Kim, H J, Seo, E Y, Kim, J H.  
**Morphological classification of trichomes associated with possible biotic stress resistance in the genus Capsicum**  
(2012) *The Plant Pathology Journal*, 28 (1), pp. 107-113.
- Korn, R W.  
**Concerning the sinuous shape of leaf epidermal cells**  
(1976) *New Phytologist*, 77, pp. 153-161.
- Metcalfe, J D, Chalk, L.  
(1950) *Anatomy of the dicotyledons, Vol. 1 and 2*,  
Oxford: Clarendon Press.. (1965). *Anatomy of the dicotyledons*. Oxford: Clarendon Press..  
(1985). *Anatomy of dicotyledons: Wood structure and conclusion of the general introduction*. Oxford: Clarendon Press
- Mill, R R, Schilling, D M S.  
**Cuticle micromorphology of Saxegothea (Podocarpaceae)**  
(2009) *Botanical Journal of the Linnean Society*, 159, pp. 58-67.
- Moraes, T M, Barros, C F, Silva-Neto, S J.  
**Leaf blade anatomy and ultrastructure of six Simira species (Rubiaceae) from the Atlantic Rain Forest, Brazil**  
(2009) *Biocell*, 33 (3), pp. 155-165.
- Moraes, T M, Rabelo, G R, Alexandrino, C R.  
**Comparative leaf anatomy and micromorphology of Psychotria species (Rubiaceae) from the Atlantic rainforest**  
(2011) *Acta Botanica Brasilica*, 25 (1), pp. 178-190.
- Nath, M, Dutta-Choudhury, M.  
**Ethno-medico botanical aspects of Hmar tribe of Cachar district, Assam (Part I)**  
(2010) *Indian Journal Traditional Knowledge*, 9 (4), pp. 760-764.
- Navarro, T, El-Oualidi, J.  
**Trichome morphology in Teucrium L. (Labiatae). A taxonomic review**  
(2000) *Anales Jardin Botanico De Madrid*, 57 (2), pp. 277-297.
- Noraini, T, Cutler, D F.  
**Leaf anatomical and micromorphological characters of some Malaysian Parashorea (Dipterocarpaceae)**  
(2009) *Journal of Tropical Forest Science*, 21 (2), pp. 156-167.

- Noraini, T, Ruzi, A R, Amirul-Aiman, A J.  
(2019) *Anatomi dan mikroskopik tumbuhan*,  
Bangi: Universiti Kebangsaan Malaysia
- Nurhanim, M N, Noraini, T, Chung, R C K.  
**Nilai taksonomi ciri anatomi daun genus *Schoutenia* Korth. (Malvaceae subfam. Brownlowioideae)**  
(2014) *Sains Malaysiana*, 43 (3), pp. 331-338.
- Nurul-Aini, C A C, Noraini, T, Amirul-Aiman, AJ, Ruzi, A R.  
**Taxonomic value of leaf micromorphology in some selected *Acanthus* L. (Acanthaceae) species in Peninsular Malaysia**  
(2013) *Proceedings of 22nd Scientific Conference of Microscopy Society Malaysia (MSM2013)*, pp. 40-44.  
Primula Beach Hotel, Terengganu, 26–28 November
- Nurul-Aini, C A C, Noraini, T, Latiff, A.  
**Taxonomic significance of leaf micromorphology in some selected taxa of Acanthaceae (Peninsular Malaysia)**  
(2014) *The 2014 UKM FST POSTGRADUATE COLLOQUIUM: Proceedings of the Universiti Kebangsaan Malaysia, Faculty of Science and Technology 2014 Postgraduate Colloquium*, pp. 727-733.
- Nurul-Aini, C A C, Nur-Shuhada, T, Rozilawati, S.  
**Comparative leaf anatomy of selected medicinal plant in Acanthaceae**  
(2018) *IJUM Medical Journal Malaysia*, 17 (2), pp. 17-24.
- Nurul-Syahirah, M, Noraini, T, Latiff, A.  
**Characterization of midrib vascular bundles of selected medicinal species in Rubiaceae**  
(2016) *Proceedings of the Universiti Kebangsaan Malaysia, Faculty of Science and Technology 2016 Postgraduate Colloquium*,  
Selangor, Malaysia, 13–14 April 2016
- Rao, S R S, Ramayana, N.  
**Structure distribution and taxonomic importance of trichomes in the Indian species of *Malvastrum***  
(1977) *Phytomorphology*, 27, pp. 40-44.
- Retief, E, Reyneke, W F.  
**The genus *Thunbergia* in Southern Africa**  
(1984) *Bothalia*, 15, pp. 107-116.
- Robbrecht, E.  
(1988) *Tropical woody Rubiaceae. Characteristic features and progressions. Contributions to a new subfamilial classification*,  
Opera Botanica Belgica I. Meise: National Botanical Garden of Belgium
- Rojo, J P.  
**Petiole anatomy and infrageneric in interspecific relationship Philippines *Shorea* (Dipterocarpaceae)**  
(1987) *Proceedings of the Third Round Table Conference on Dipterocarps*,  
A J G H Kostermans (ed). Mulawarman University, Indonesia
- Ruzi, A R, Hussin, K, Noraini, T.  
**Systematic significance of the petiole vascular bundles types in *Dipterocarpus Gaertn. F. (Dipterocarpaceae)***  
(2009) *Malaysian Applied Biology*, 38 (2), pp. 11-16.

- Saas, J E.  
(1958) *Botanical microtechnique*,  
3rd ed. Ames: Iowa State University
- Sarma, J.  
(2006) *Medicinal and aromatic plants of Assam with special reference to Karbi Anglong*,  
India: Silviculture Division, Department of Forest, Diphu
- Scotland, R W, Sweere, J A, Reeve, P A.  
**Higher level systematics of Acanthaceae determined by chloroplast DNA sequences**  
(1995) *American Journal of Botany*, 82 (2), pp. 266-275.
- Sehgal, L, Paliwal, G S.  
**Studies on the leaf anatomy of Euphorbia: II Venation Patterns**  
(2008) *Botanical Journal of Linnean Society*, 68 (3), pp. 173-208.
- Stevens, P F.  
(2016) *Angiosperm Phylogeny Website: Lamiales (Acanthaceae)*,  
(accessed on 3 October 2020)
- Sultana, K W, Chatterjee, S, Roy, A.  
**An overview on ethnopharmacological and phytochemical properties of Thunbergia sp**  
(2015) *Medicinal and Aromatic Plants*, 4 (5), pp. 1-6.
- Suwanphakdee, C, Vajrodaya, S.  
**Thunbergia impatienoides (Acanthaceae), a new species from Thailand**  
(2018) *Blumea*, 63, pp. 20-25.
- Takhtajan, A.  
(1997) *Diversity and classification of flowering plants*,  
New York: Columbia University Press
- Teron, R.  
**Bottle gourd: Part and parcel of Karbi culture**  
(2005) *Indian Journal Traditional Knowledge*, 4 (1), pp. 86-90.
- Ummu-Hani, B, Noraini, T, Abdul-Latiff, M.  
**Studies on leaf venation in selected taxa of the genus Ficus L. (Moraceae) in Peninsular Malaysia**  
(2014) *Tropical Life Sciences Research*, 25 (2), pp. 111-125.
- Vollesen, K.  
(2008) *Flora of Tropical East Africa: Acanthaceae*,  
Kew: Royal Botanic Gardens
- Wasshausen, D C, Wood, J R I.  
(2004) *Acanthaceae of Bolivia*,  
Washington: Department of Botany, National Museum of Natural History
- Werker, E.  
**Trichome diversity and development**  
(2000) *Advances in Botanical Research*, 31, pp. 1-35.

**Correspondence Address**

Amri C.N.A.C.; Department of Plant Science, Jalan Sultan Ahmad Shah, Pahang, Malaysia; email: chenurulainicheamri@iium.edu.my

**Publisher:** Penerbit Universiti Sains Malaysia

**ISSN:** 19853718

**Language of Original Document:** English

**Abbreviated Source Title:** Trop. Life Sci. Res.

2-s2.0-85129212143  
**Document Type:** Article  
**Publication Stage:** Final  
**Source:** Scopus

---

**ELSEVIER**

Copyright © 2022 Elsevier B.V. All rights reserved. Scopus® is a registered trademark of Elsevier B.V.

 **RELX** Group™