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Leaf anatomical investigation in some Acanthaceae

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Abstract
Foliar anatomical observations are extended for 12 species belonging to 10 genera of the Acanthaceae. Leaves are generally bifacial. The diversity with respect to vascular tissue, occurrence and development of collenchyma, sclerenchyma, palisade and spongy tissues, cell inclusions, etc. are studied in detail. The leaves are although basically similar, they vary species to species and hence appear useful taxonomically significant at specific levels.

Keywords: foliar anatomy, Acanthaceae

Introduction
Leaves are important since they conduct principal activity of photosynthesis. They face different environmental factors and hence generally show different endomorphic features (Metcalfe and Chalk, 1950) [2]. The present authors investigated foliar anatomy of Acanthaceae, a part of it is being presented in this communication. It focuses foliar anatomical diversity in detail.

Materials and Methods
Species studied were gathered from various places like Tropical Botanic Garden and Research Institute, Palode, Thiruvanthapuram District (Kerala), Lalbag Garden, Bangalore (Karnataka), Munnar, District Idukki (Kerala), Forest Research Institute, Peechi (Kerala), Govt. Botanical Garden, Ooty (Tamilnadu) and adjacent areas. Leaves were fixed in F. A. A. and preserved in 70% alcohol. Free hand transaction were stained in safranin (1%) and fast green (1%) and mounted in DPX after dehydration. Middle parts of lamina were selected for sectioning. Camera lucida drawings were drawn and inked. The anatomical features revealed are tabulated in the Table – 1.

Table 1: Anatomical observations of Leaves

Fig. No.	Plant species studied	Amphi/ Hypostomatic	No. of palisade layers	Palisade layers extends in midrib	Shape of spongy cells	Shape of central vascular arc	No. of additional vascular bundles	Vascular tissue capped by sclerenchyma	Shape of cells of conjunctive tissue	Sphaeraphides present/ absent	Cystoliths present/ absent	Wings present/ absent
1.	*Fittonia gigantea* Linden ex Andre.	Hypostomatic	01-layers	Absent	Rounded	Lunar	02	--	Rounded	Absent	Absent	Present
2.	*Goldfussia anysophylla* (G. Lodd) Nees	Hypostomatic	01-layers	Present	Rounded	Lunar	--	--	Rounded	Absent	Absent	Present
3.	*Graptophylum pictum* (L.) Griffith	Hypostomatic	02-layers	Absent	Rounded	Horse shoe	04	02 – layers	Rounded	Present	Present	Present
4.	*Hygrophila schulli* (Buch - Ham) M.R. Almeida and S.M. Almeida	Amphistomatic	01-layer	Absent	Rounded	Lunar	02	--	Rounded	Absent	Absent	Present
5.	*Hypoestes sanguinolenta* Hook.	Hypostomatic	01-layer	Present	Rounded	Lunar	02	02 – layers	Rounded	Absent	Present	Present
6.	*Justicia carnea* Edword F.Gilman	Hypostomatic	01-layers	Absent	Rounded	Lunar	02	02 – layers	Rounded	Absent	Absent	Deeply channeled
7.	*Justicia trinervia* Vahl	Amphistomatic	01-layer	Present	Rounded	Lunar	02	--	Rounded	Absent	Absent	Present
8.	*Justicia wynaddensis* (Nees) Heyne ex T. Ander.	Hypostomatic	01-layer	Present	Rounded	Lunar	02	--	Rounded	Absent	Absent	Present
9.	*Libonia floribunda* K. Koch	Hypostomatic	01-layer	Present	Rectangular	Lunar	02	02 – layers	Polygonal	Absent	Present	Present
10.	*Mackenzia intergrifolia* (Dalz.) Bremek.	Hypostomatic	01-layer	Present	Rounded	Lunar	--	--	Rounded	Absent	Present	Deeply channeled
11.	*Micranthes*	Amphistomat	01-	Absent	Rounded	Lunar	--	--	Rounded	Absent	Absent	Present

	oppositifolius Wendl.	ic	layers									
12.	*Neuracanthus sphaerostaschys* (Nees) Dalz.	Hypostomatic	01-layers	Absent	Rounded	Lunar	02	--	Rounded	Present	Present	Present

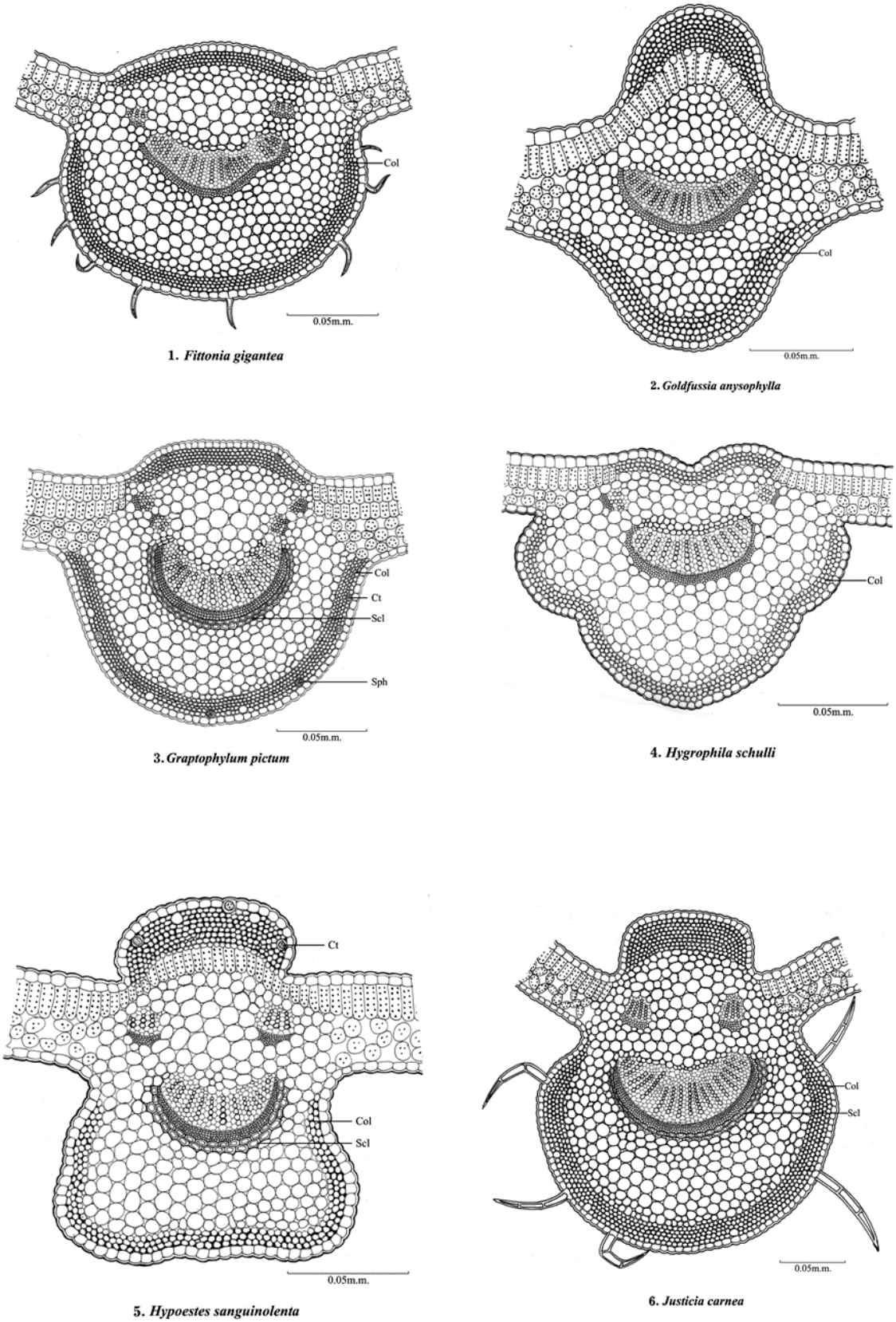
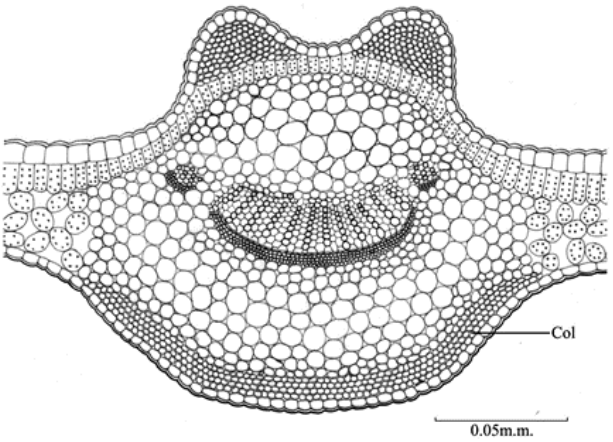
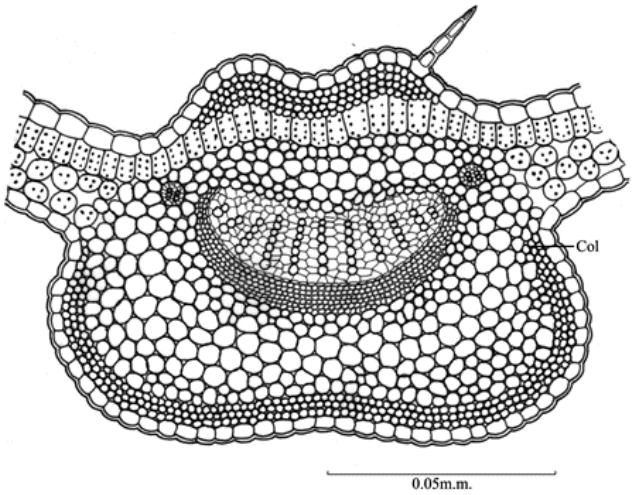


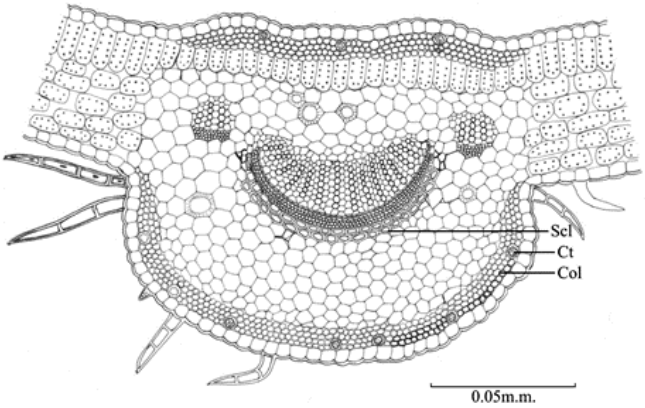
Fig 1



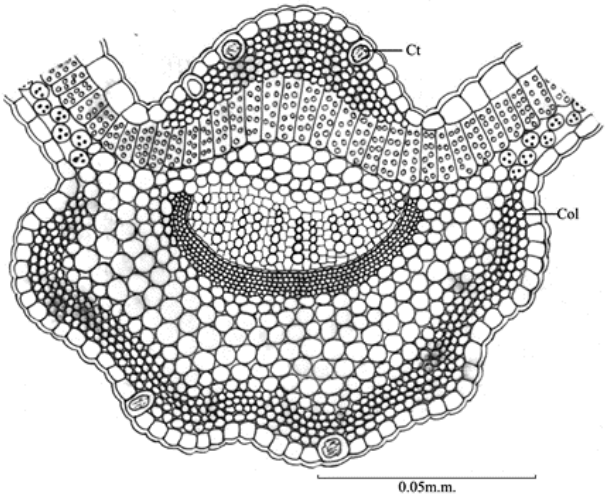
7. ***Justicia trinervia***



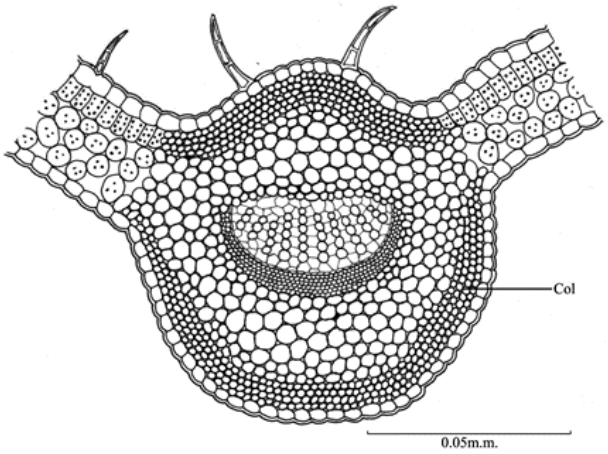
8. ***Justicia wynaddensis***



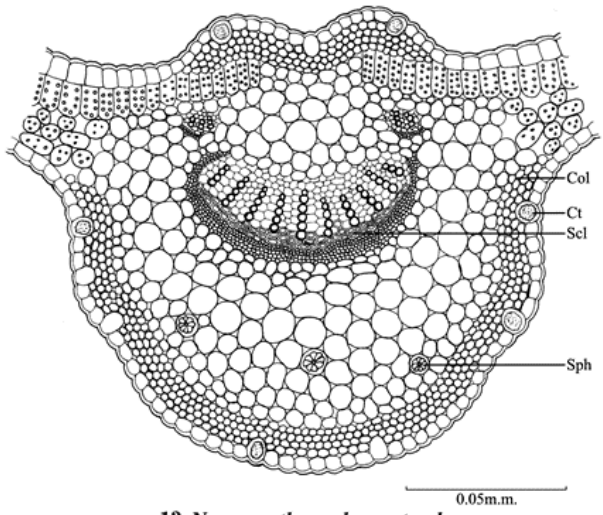
9. ***Libonia floribunda***



10. ***Mackenzia intergrifolia***



11. ***Micranthes oppositifolius***



12. ***Neuracanthus sphaerostaschys***

Fig 2

Results and Discussion

Total 12 species belonging 10 genera of the family Acanthaceae are investigated for the present account. Majority of taxa studied are hypostomatic, except *H. schulli, J. trinervia* and *M. oppositifolius.* The mesophyll is differentiated into palisade and spongy tissue. The former is either one layered or two layered. Most taxa have 1-layered palisade, whereas only *G. pictum* 2-layered. The palisade extends in some species in midrib region e.g. *G. anysophylla, H. sanguinolenta, J. trinervia, J. wynaddensis, L. floribunda* and *M. integrifolia*. The spongy tissue have generally rounded cells, except *L. floribunda*. The foliar vasculature is resolved differently. In majority of taxa, the central vascular arc is lunar-shaped, except *G. pictum.* The leaves sometimes receive additional 02 or 04 vascular traces. Vascular tissue is capped by sclerenchyma in few species. The cells of conjunctive tissue are generally rounded, except *L. floribunda*. The cells inclusions are of two types *viz.*, cystoliths and sphaeraphides. Presence of both types of cell inclusions are observed in some species *viz., G. pictum and N. sphaerostachys.* In others, either of them occur. The adaxial and abaxial epidermises are uniformly 1-layered with varied development of cuticle. They are interrupted at places by the stomatal openings. Thus there is fair diversity of anatomical features and cell contours and inclusions. These features have been thought taxonomically significant (Carlquist, 1961, Patil and Patil 2014) [1, 3].

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