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Investigation of the Morpho-Anatomical and Epidermal Properties of *Commelina erecta* L.

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ABSTRACT: In traditional medicine, *Commelina erecta* L. has been used as antiviral, for the treatment of hemorrhages, skin rashes and sores, and for the treatment of infections. It is also used as a wild edible plant in salads, preserves or decorating the dishes. Hence, the objective of this paper was to investigate the morpho-anatomical and epidermal properties of *Commelina erecta* L of Commelinaceae using appropriate standard methods. Results revealed *C. erecta* as a Broadleaf and vivacious branching up to 20 to 55 cm in length as it trails and roots at nodes, having leaves which are elliptical, oval to lanceolate and sub sessile about 2.5 ± 0.5 cm long and 1.5 ± 0.5 cm wide; the leaf sheath is closed and united at base. The stomata are anomocytic, tetracytic and paracytic stomata with pentagonal to heptagonal epidermal cells and trichomes (piloses) including glandular trichomes which are amphistomatic. Anatomical sections showcased root pith, vascular bundles scattered and concentrated towards the ground tissues. These information would assist for further delimitation of the species.

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Commelinaceae R. Brown belongs to the monocots, commonly known as the Spiderwort family made up of mostly perennial herbs remarked with swollen node and contains about 42 genera with 650 species (Cabezas *et al*., 2009). The family Commelinaceae has been divided into two subfamilies- Commelinoideae and Cartonematoidea (Faden, 2000). They are common throughout the Caribbean, North and Latin America, Africa, Asia, the Middle East and parts of Oceania (Faden, 1993; Holm *et al*., 1997; Standish, 2001). Recent data indicate that the Commelinaceae family contains 23 genera and at least 225 species native to or naturalized in the New World and 23 genera and about 200 species in the Neotropics, Hong *et al*. (2000), there are also website reports of 50 genera and 700 species, Isaac and Brathwaite (2007). They also have wide distributed all through the tropical, sub-tropical regions and warm temperate zones, particularly in Africa and Asia (Hutchinson and Dalziel, 1954; Mohsin *et al*., 1987; Faden, 1998). For the phylogenetic analyses and related treatments on Commelinaceae, see Faden (1998), Evans *et al*. (2000), and Pellegrini (2017a). There are about 170 species of *Commelina* in the warmer regions of the world and 50 species of Murdannia occurring in the tropics and warm temperate regions worldwide with Tropical Asia having the greatest diversity, Fish (2000). The genus *Commelina* are classified C-3 plants, Kennedy (1980). They are both annuals and perennials and dominate fallow vegetation due to their growth and regeneration characteristics (Van 2000;

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Hutchinson and Dalziel, 1954; Akobundu and Agyakwa 1998).

The use of foliar anatomical properties in Commelinaceae is not new; Tomlinson (1966 and 1969) made use of the anatomical characters in separating the genera *Aneilema* and *Murdannia* that were initially taxonomically confuse; similarly, Faden and Hunt (1991) separated taxa that were wrongly grouped together using anatomical characters. Also Ekeke and Agobua (2018) gave comparative anatomy of *C. erecta* and *C. diffusa*.

Commelina species are used in the treatment of several diseases (Hillocks, 1998) such as diabetes, skin diseases and atherosclerosis (Ujowundu *et al*., 2008), leprosy and leucoderma (Mukerjee, 2006). Nine species of Commelinaceae are found in US and only three of them are native (Faden, 1993; 2000). *Commelina erecta* L. is the most widespread of the native species (Faden, 1993). The flowers have been thoroughly described for its taxonomic relevance as having two different types of petals (two large ones usually blue and one clawed often observed smaller and colorless) and two different sizes of sepals (Radford *et al*., 1968).

Thus, along with the leaves and spathes, which enclose the inflorescences, there are six different laminar organs in *C. erecta*. The floral organs represent modified leaves (Weberling, 1989). There are also other works on the anatomy of *Commelina* (Paula *et al.*, 2010; Oladipo and Ayo-Ayinde, 2014) and their morphological characteristics (Rahman *et al*., 2015; Jyoti and Krishna, 2009).

C. erecta is a cosmopolitan weed used as medicine and food source, and cumbered with scarce information, therefore deserves proper description as related to morphology and anatomy. Hence, the objective of this paper was to investigate the morpho-anatomical and epidermal properties of *Commelina erecta* L. of Commelinaceae.

MATERIALS AND METHODS

Geographic Location: Plant sample was collected fresh within the University of Port Harcourt Campus, ($4^{0}53^{1}30.12^{11}$North, and $6^{0}55^{1}39.6^{11}$East).

Morphological Studies: The meter rule was used to ascertain morphological measurements of plant parts such as: plant height from the root-collar to the terminal bud, the leaf length from the leaf tip to the petiole base and the leaf width across the leaf lamina, from one margin to another at the widest region.

Epidermal Studies: Fresh foliar organs collected were peeled manually, and soaked in 90% alcohol solution for 5 to 10 minutes, thereafter stained with Safranin O, rinsed with distilled water and counter stained with Alcian blue for 5 minutes in each, rinsed again and mounted in aqueous glycerol solution placed on glass slide with coverslip following the method of Cutler (1978). Slides with good sections were placed on the stage, viewed and photo-micro graphed using Android Sony Camera on Monocular microscope.

Anatomical Study: Commelina erecta L. stems, leaves, petioles, flowers, fruits and roots harvested for the study, were fixed in FAA prepared in the ratio of 1:1:18 of 40 % formaldehyde, glacial acetic acid and 70 % alcohol for 2 to 48 hours following the methods of Johansen (1940) modified; Free hand sections were done as described by Wahua (2020). Slides with good sections were placed on the stage, viewed and photo-micro graphed using Leica WILD MPS 52 microscope camera on Leitz Dra plan microscope. See plates 1a, b, c, and d respectively.

RESULTS AND DISCUSSION

Morphological Study: Commelina erecta has a natural vivacious branching and growth form and the aerial stem trails and roots at node. It has glabrous simple leaves having alternate phyllotaxy usually sub sessile, with two small round auricles at the top of the ochrea, but whitish basal hairs are observed at the base of the margin and at the top of the ochrea. The flowers are pale blue to white, somewhat wrapped in a small triangular leaf in which the edges are welded at the back and their surfaces with dotted piloses. The fruit has three cells containing a total of 3 seeds. Plate 1a, b and table 1.

Plate 1 A: *Commelina erecta* L.; **1 B**: magnified flower portion of *C. erecta*

Table 1: Morphological properties of *Commelina erecta* L.

Characters	***C. erecta* L.**
Habitat	Terrestrial
Growth form and nature of branching	Broadleaf and vivacious branching up to 20 to 55 cm in length/height as it trails
Stem	Usually Greenish, pilosed, aerial and cylindrical amid intermingled brownish spots in older stems
Leaves shape	Elliptical, oval to lanceolate and sub sessile
Length of 1st leaves	2.5 ± 0.5 cm
Width of 1st leaves	1.5 ± 0.5 cm
Leaf sheath	Closed and united at basal region like those of grasses
Inflorescences	Made of 2 aerial flowers pubescent in triangular leaf spathes, the one behind being welded.
Flowers	3 light bluish aerial flowers with 2 of them in same spathe, about 3 to 4 cm in length and the 2 lateral being conspicuous (petals) and large while the centralized one is whitish and very much reduced
Sepals	3 membranous whitish sepals, the anterior 2 welded.
Stamens	3 long filet, multi lobed anthers alongside 3 sterile staminodes
Pistils	3 long styles suspending the stigma
Fruit	A capsule
Seed	3 per capsule

Epidermal Studies: The micro-morphological studies revealed presence of trichomes identified in *C. erecta*, mainly in the form of piloses. The stomata are anomocytic, tetracytic and paracytic stomata with pentagonal to heptagonal epidermal cells. See plates 2a and b.

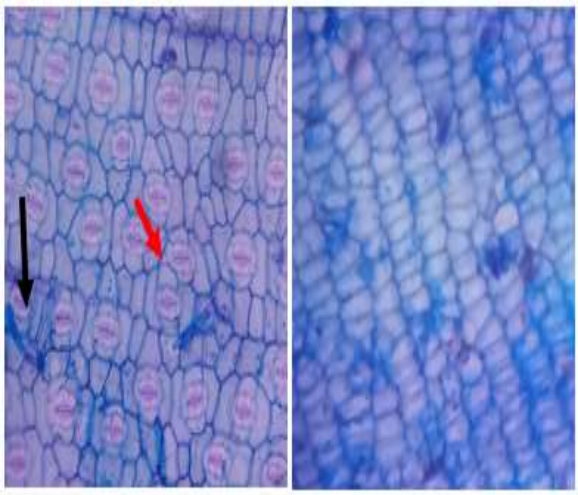

Plate 2 a: *Commelina erecta* L. Abaxial foliar epidermis; **2 b:** *C. erecta* L. Adaxial foliar epidermis. Red arrow revealed stoma and the black one showcased linear trichome compliment for the abaxial surface. No stoma identified in the adaxial surface but trichome piloses including glandular ones. Stomatal type is basically paracytic.

*Anatomical Study***:** It is observed that *Commelina erecta* is a monocot with irregular or scattered vascular arrangement, and the roots are not obliterated but there is presence of pith. Trichomes are generally present, See Plates 3 a, b, c and d and table 2.

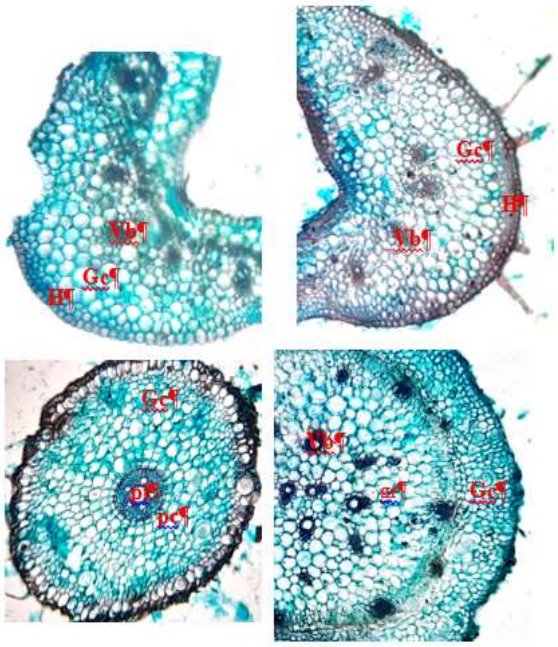

Plate 3 a: *Commelina erecta*, Mid-rib; **3 b:** Petiole; **3 c:** root and **3 d:** stem. All in transverse sections (T.S.). Vascular bundles more concentrated at ground tissues especially regions of stem. Presence of large pith in the root. Linear trichomes observed in the petiole. Gc.-General cortex; H – Hypodermis, pi – pith; Vb. – Vascular bundle; pc – pericycular region.

Table 2: Anatomical properties of *Commelina erecta* L.

Features	*C. erecta* L.
Hairy nature of stem	Piloses of hairs as observed in petioles
Epidermis of stem, petiole and stem	Single row of cells
Hypodermis	2 to 3 layers of cells of sclerenchyma
General cortex	5 to 7 rows of parenchyma and thick wall cells of sclerenchyma.
Pericycle of roots	4 to 6 layers of compact cells
Root pith	Visibly large

The *Commelina erecta* L. described here conforms to those given by Van (2000); Akobundu and Agyakwa (1971); Hutchinson and Dalziel (1953); Mahbubur Rahman *et al*., 2015 and Jyoti and Krishna, 2009. The anatomical description agreed to those given by Ekeke and Agogbua (2018). Trichomes have been identified with *C. erecta*, mainly in the form of piloses. The stomata are anomocytic, tetracytic and paracytic stomata with pentagonal to heptagonal epidermal cells in conformation to the work of Kaushik (1971) and Ekeke and Agogbua (2018) on *Commelina*, but no

stoma identified in the adaxial region of foliar surface. The general cortex is made of parenchyma and sclerenchyma of thick wall cells.

Conclusion: Commelina erecta L. has not so much work in anatomy especially as it has to do with nodal anatomy. A very clear background of epidermal studies and anatomical sections are contributory information made as added information to other existing knowledge on the plant. More research findings in the DNA barcode is recommended.

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