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Studies on the Morphological, Anatomical and Phytochemical Properties of *Emilia sonchifolia* (L) DC, of the Family Asteraceae

Wahua C[1*] and Ukomadu J[1]

[1]Department of Plant Science and Biotechnology University of Port Harcourt, Choba, P.M.B. 5323, Nigeria

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***Corresponding author:** Wahua C

Abstract **Original Research Article**

Emilia sonchifolia (L.) DC. is a regular occurring annual weed of the tropical and semi tropical zones. This research investigation geared towards the morpho-anatomical properties of the plant. The stem is erect to prostrate, branched and sparingly pubescent which can attain up to 30cm in height. The sessile leaves are simple lanceolate with opposite phyllotaxy having margins that are deeply lobed, measuring up to 6.4±1.0 cm long and 3.5±0.8 cm wide with an acute apex. The inflorescence is bell-shaped capitulum consisting of disc florets surrounded by involucre of bracts. Florets are pale purple rarely white in color. Epidermal study revealed anomocytic stomata and amphistomatic in nature. Anatomical study showed a layer of epidermal cells. The hypodermis is made of 2 to 3 rolls of collenchyma, general cortex and pith dominated by parenchyma in the same mode of occurrence in mid-ribs, petioles, stems, nodes and roots except that the number of rolls of cells varied slightly and vasculation is open type. There are presence of crystals and tanniferous cells. The phytochemical studies revealed the presence of alkaloids, saponins, flavonoids, terpenoids, tannins, phlobatannins, phenol, steroids. The information generated here would further assist in the delimitation of the species.

Key words: Morphology, *Emilia*, weeds, flowers. Anatomy.

INTRODUCTION

Emilia sonchifolia (L.) DC belongs to Asteraceae. The occurrence has been observed in Nigeria and other West African countries [1-3]. Asteraceae is made of about 25,000 species belonging to about 1,500 genera [4]. *Emilia sonchifolia* is a weed occurring as regrowth in cleared forest and abandoned farmlands [2, 1] and grows well in drained and open habitats [5]. In the family Asteraceae, there are considerable anatomical differences brought about by ecological specialization and these features manifest in their occurrences in diverse habitats, such features as presence of secretory structures, secretory cells directly associated with the phloem and varying vascular bundles are of great taxonomical interest and their restricted distribution has an important diagnostic value [6-10] revealed differences in their mid-rib shape used to classify members of the family. The differentiation of trichomes is genetically controlled and their frequency affected by environmental factors, both abiotic and biotic components [11]. Sometimes when not flowering, *Emilia sonchifolia* could be mistaken for *Emilia coccinea* commonly called yellow tasselflower, and *Emilia* praetermissa respectively. This varied from one ecozone to another within the cardinal regions of Rivers State.

Thus the relevance is to add more information to existing knowledge of *Emilia sonchifolia* and the objectives focused on the morphological, anatomical and phytochemical properties of *Emilia sonchifolia* (L.) DC. of the family Asteraceae.

MATERIALS AND METHODS

Geographic Location

The location of the parent plant studied was Port Harcourt, Rivers, Nigeria.

Morphological Studies

The meter rule was used to confirm the plant height, leaf length and width etc.

Micro-morphological (Epidermal) Studies

Fresh leaves and young stem collected for this study were peeled and subjected to alcohol solutions in the ratio of 50%, 75% and absolute alcohol respectively. The cleared epidermal layers obtained were stained with safranin for 5 minutes washed and counter stained with Alcian blue for same time interval, washed and

temporarily mounted in aqueous glycerol solution. Photomicrographs were taken from good preparations. [12] Method was adopted is stomata and trichome mensuration. The stomatal index (S.I.) was obtained using the formula:

$$S.I. = \frac{S}{S+E} \times \frac{100}{1}$$

Where S and E are mean numbers of stomatal and epidermal cells respectively within the particular area under investigation. Likewise trichome Index (T.I) was obtained using:

$$T.I. = \frac{T}{T+E} \times \frac{100}{1}$$

Where T and E are trichomes and epidermal cells respectively within the study area

Anatomical Study

The plant was harvested from the wild for the secondary anatomy. The harvested stems, leaves, petioles, flowers, fruits and roots were dehydrated in alcohol solutions of 50%, 75%, absolute alcohol and thereafter subjected through alcohol chloroform series in the ratio of 3:1 of alcohol chloroform series, 1:1, 1:3 and pure chloroform respectively for five minutes in each. Then rehydrated following same procedure to 50% alcohol before staining with safranin for 2 to 5 minutes, counter stained with Alcian blue for same time interval. Free hand section was done using a systematic arrangement of 5 razor blades as described by [13] was also adopted. Microphotographs were taken from good preparations using Sony camera of 7.2 Mega pixels having 2.411 LCD monitor and High sensitivity ISO 1250.

Qualitative Phytochemical Study

Leaves of the plant specimen studied were sun dried for 72 hours (3 days) and weighed. Fifty grammes (50 g) of the dried leaves were macerated in 96 % ethanol using a pestle and a mortar. The extract was filtered and evaporated to dryness (constant weight) using a rotary evaporator set at 45^0 C. Residue yields were observed and a portion was used for the phytochemical screening.

Test for alkaloids

This was carried out using 0.5 g of the plant extract which was stirred with 5ml of 1% aqueous hydrochloric acid on a steam bath; 1ml of the filtrate was treated with a few drops of Mayer's reagent and a second 1ml portion was treated similarly with Dragendorff's reagent as was carried out by [14] and [15]. A modified form of the tin-layer chromatography (TLC) method as described by [16] was used.

Test for Saponins

Frothing tests was done following the method described by [17].

Test for tannins

Five grammes (5 g) of each portion of plant extract were stirred with 10 mls of distilled water, filtered, and 5 % ferric chloride reagent added to the filtrate. A blue-black, green, or blue-green precipitate was taken as evidence for the presence of tannins [18].

Test for phlobatannins

The deposition of a red precipitate when an aqueous extract of the plant part was boiled with 1% aqueous hydrochloric acid was taken as evidence for the presence of phlobatannins [15].

Test for flavonoids

Lead acetate test: 5 g of pulverized sample was boiled in 5 mls of distilled water for 5 minutes in water bath and filtered while hot. 2 mls of 10 % lead acetate was added to the filtrate and observed. Yellow precipitate indicated presence of flavonoids.

Shinoda reduction test**:** 5 g of the pulverized sample was boiled in 5 mls of distilled water for 5 minutes on water bath and filtered while hot. Magnesium (Mg) was added to the filtrate and few drops of conc.H_2SO_4 were carefully introduced into the mixture. The formation of orange, red, crimson or magenta was taken as evidence of preliminary presence of flavonoid.

Test for cardiac glycosides

Lieberman's test was used as described by [18].

Steroids and Terpenoids

Libermann-Burchard's Test: 2 g of plant sample was pulverized and macerated in 5mls of chloroform and filtered. 1 ml of acetic anhydride was added to the filtrate followed by 2 mls of conc.H_2SO_4 to form a layer. Color change from violet to blue to green at interface showed the presence of terpenoids.

Salkowski's Test: 2 g of plant sample was pulverized and macerated in 5 mls of chloroform and filtered. 2 mls of H_2SO_4 was carefully added to the filtrate and observed. A reddish brown colour at the interface indicated presence of steroidal substances.

RESULT

Geographic Location Parent Plants

The geographic location of the parent plant was found and harvested in the University of Port Harcourt, Port Harcourt, and Rivers State, Nigeria.

Morphological Study

Plate 1a: *Emilia sonchifolia* (L.) DC. 1b: Flower inflorescence; 1c: Adaxial and abaxial foliar surfaces; 1d: Root system

The morphological feature of *Emilia sonchifolia* revealed that the stem is erect to prostrate, branched and sparingly pubescent which can attain up to 30cm in height (plate 1a to 1c). The sessile leaves are simple lanceolate with opposite phyllotaxy having margins that are deeply lobed, measuring up to 6.4±1.0 cm long and 3.5±0.8 cm wide with an acute apex. The inflorescence is bell-shaped capitulum consisting of disc florets surrounded by involucre of bracts. Florets are pale purple rarely white in color.

Epidermal Studies

Epidermal study revealed anomocytic stomata and simple uniseriate trichomes on both surfaces of leaf. See plate 2a and 2b.

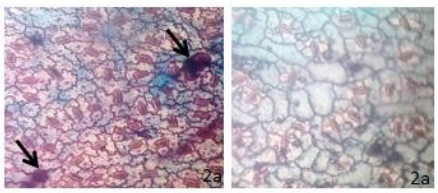

Plate-2a: Abaxial foliar surface; 2b: Adaxial foliar epidermis. Arrow showed simple trichomes. Anomocytic stomata present in both surfaces.

Anatomical Studies

The hypodermis is made of 2 to 3 rolls of collenchyma, general cortex and pith dominated by parenchyma in the same mode of occurrence in mid-ribs, petioles, stems, nodes and roots except that the number of rolls of cells varied slightly and vasculation is open type. There are presence of crystals and tanniferous cells.

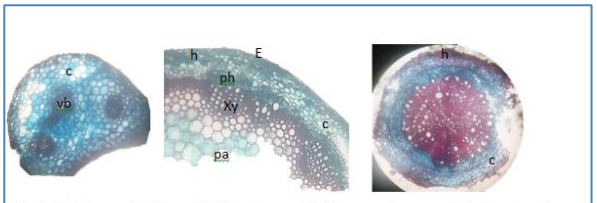

Plate 3a: *E. sonchifolia* mid-rib anatomy; 3b: Stem anatomy and 3c: Root anatomy. Key: E- Epidermal layer, vb- Vascular bundle, h- Hypodermis, C- general cortex, ph- phloem, Xy- Xylem, pa- parenchyma in the pith.

Phytochemical Studies

The phytochemical studies revealed the presence of alkaloids, saponins, tannins, Phlobatannins, Cyanogenic glycosides, flavonoids, terpenoids, phenol and steroids.

Table-2: Qualitative Phytochemical Studies on *Emilia sonchifolia*

Phychemicals tested	Result
Saponins	+ve
Alkaloids	+ve
Tannins	+ve
Phlobatannins	+ve
Cyanogenic glycosides	+ve
Phenol	+ve
Flavonoids	+ve
Terpenoids	+ve
Steroids	+ve

Key: '+ve' revealed 'presence' while '–ve' showed 'absence'

DISCUSSION

The description accorded *E. sonchifolia* is in accordance to those of [1, 2], the stem is erect to prostrate, branched and sparingly pubescent which can attain up to 30cm in height. Epidermal study revealed anomocytic stomata which are amphistomatic in nature. Anatomical differences accruing from same species as in the number of rolls of cells, trichome density, presence of secretory cells and growth levels may be due to environmental diversities in agreement with [11] which most likely have given rise to *E. coccinea* and *E praetermissa*, closely related species with E sonchifolia except in the number of involucre and color variation in the florets.

CONCLUSION

Emilia sonchifolia is used as animal feeds in most parts of Nigeria, but when consumed much may often result in intoxication of the animals. The presence of huge number of phytochemicals embedded in the plant may likely be responsible and its used in tradomedicine. Areas of research attention: DNA barcode, Proximate analyses, Heavy metal content and quantitative aspect of phytochemistry.

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REFERENCES

1. Akubundu, A., & Agyakwa, C. W. (1987). A Handbook of West African Weeds. INTEC Printers, Ibadan, 176-177.
2. Hutchinson, J., & Dalziel, J.M. (1953). Flora of West Africa. Crown Agents for Oversea

Government and administrations, 4, Millbank, London, S.W.I. 600-611.
3. Baldwin, J. T., & Speese, B. M. (1949). Cytogeography of *Emilia* in West Africa. Bull Torrey Bot Club 76: 346-351.
4. Souza, V. C., & Lorenzi, H. (2005). Botânica sistemática: guia ilustrado para identificação das famílias de Angiospermas da flora brasileira, baseado em APG II. Instituto Plantarum.
5. Olorode, O. (1974). Chromosome numbers in Nigeria Compositae, Bot J. Linn. Soc. 68: 329-355.
6. Metcalfe, C. R., & Chalk, L. (1950). Anatomy of the Dicotyledons: leaves, stem, and wood, in relation to taxonomy, with notes on economic uses. Anatomy of the Dicotyledons: leaves, stem, and wood, in relation to taxonomy, with notes on economic uses.
7. Fahn, A. (1979). Secretory Tissues in Plants. Academic Press, New York.
8. Solereder, H. (1908). Systematic anatomy of the Dicotyledons. Claredon Press, Oxford.
9. Makbul, S., Coskuncelebi, K., Türkmen, Z. A. F. E. R., & Beyazoglu, O. (2011). Comparison of foliar anatomy of Scorzonera L.(Asteraceae) taxa from northeast Anatolia. Pakistan Journal of Botany, 43(1), 135-155.
10. Ekeke, C., & Mensah, S. I. (2015). Comparative anatomy of midrib and its significance in the taxonomy of the family Asteraceae from Nigeria. Journal of Plant Sciences, 10(5), 200-205.
11. Werker, E. (2000). Trichome diversity and development. In: Hallahan, D.L., Gray, J.C. (Eds.), Advances in Botanical Research: Plant Trichomes. Academic Press, San Diego. Pp. 1–35.
12. Arnold, E. (1973). Peacock's Elementary Micro technique. Pitman Press, Bath, Great Britain. Pp. 12-16.
13. Wahua, C. (2020). Free-hand Sectioning Machine Invented for Anatomical Studies of Biological Materials. Scientia Africana. 19; 159-162.
14. Harborne, J.B. (1973). Phytochemical Methods: A Guide to modern Techniques of Plants Analysis. Chapman and Hall London. 279.
15. Trease, G.E., & Evans, I.N.C. (1989). A textbook of Pharmacognosy 3rd ed. Boilliere Tinall LTD. London.
16. Farnsworth, N.R., & Euer, K.L. (1962). An Alkaloid screening procedure utilizing thin –layer Chromatography. Lioydia, 25-186.
17. Wall, M.E., Eddy, C.R., McClenna, M.L., & Klump, M.E. (1952). Detection and estimation of steroid Sapogenin in plant tissues. Anal Chem. 24:1337.
18. Shoppe, C.W. (1964). Chemistry of the Steroids, 2nd Ed. Butterworths, London. 56.