Morphological, Anatomical and Preliminary Phytochemical Study of *Eclipta prostrata* (L.) L.

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Abstract

The morphological, anatomical and preliminary phytochemical analysis of *Eclipta prostrata* (L.) L (Kyeik-man) belonging to family Asteraceae was conducted in present research. The plants were collected in Sagaing University Campus from January to August in 2022. In morphological study; the plant was annual or perennial herbs, stem terete, often rooting at the nodes. The leaves were simple, opposite and decussate, stiffy appressed pilose on both surfaces. Inflorescences were solitary and capitula. Ray florets were 1-2 seriate, liguliform, unisexual, pistillate, zygomorphic. Disc florets were numerous, disciform, bisexual, actinomorphic. In anatomical study; multicellular trichomes were found in both surfaces of lamina, midrib, petiole and stem. Anisocytic type of stomata was present on upper surface and anomocytic type of stomata on lower surface in lamina. In phytochemical study; the preliminary phytochemical screening showed that alkaloids, starch, polyphenols, glycosides, reducing sugars, tannins, phenols, lipophenols, flavonoids and saponins were present.

Keywords: *Eclipta prostrata* (L.) L., morphological, anatomical, phytochemical.

Introduction

The Asteraceae is the largest flowering plant family in the world with 24,000-30,000 accepted species and 1,600-1,700 genera, cosmopolitan in distribution except in Antarctica (Funk *et al*., 2005). Asteraceae is one of the largest families in the Magnoliophyta group which is estimated to have 20,000 species and 950 genera (Sharma, 2004).

Eclipta prostrata (L.) L commonly known as false daisy belonging to this family is well known for its hair growth promoting capacity (Mithun *et al*., 2011). It is a creeping and moisture loving herb commonly found on roadsides and waste lands. It is small branched annual herbaceous plant with a long history of traditional medicines uses in many countries especially in tropical and subtropical regions (Sharma, S. *et al*., 2017).

Plant anatomy plays an important role in the understanding of plant biology. It is to be noted that transverse section and longitudinal section of the plant parts show unique characters. The anatomical characters are very usefully informatics for identification and classification (Mathew *et al*., 2014). Anatomical studies revealed clear differences in size, shapes of leaf midrib, epidermal layer, ground tissues, vascular bundle, lamina etc. Anatomical characteristics have an important role in taxonomy and determining the number of plant genera and species (Rajput, 2002).

The phytochemical constituents are mainly secondary metabolite secreted by all plants in small quantities. These compounds play a significant role in survival of the plants under harmful conditions and also in the protection from microbes. Research around the globe has proved that the phytochemicals from the plant possess various medicinal properties. Hence the phytochemical screening as necessary to find out the bioactive profile of plants having therapeutic significance (Priya, K. *et al*., 2018).

Phytochemical screening is one of the important criteria in identifying and characterization of new pharmaceutical compounds having medicinal values (Rani, J. *et al*., 2020). The active secondary metabolites possess various medicinal applications for drug synthesis. The medicinal value of the drug plant is due to the presence of chemical substances. Chemical compounds from medicinal plants are important for health care of many people (Sinha, S. *et al*., 2016).

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Eclipta prostrata (L.) L is also popularly known as "King of hairs" used in indigenous system of medicine as a hepatoprotective drug. This plant has been traditionally used as a liver tonic in Ayurveda and is commonly used as deobstruent to promote bile flow and to protect the liver (Sharma, S. *et al*., 2017).

The aim and objectives of this study are to know the morphological characters, to record the anatomical characters and to provide the information that the preliminary phytochemical analysis of leaves extract in *Eclipta prostrata* (L.) L. can treate some diseases to local people.

Materials and Methods

1. Morphological characteristics of *Eclipta prostrata* (L.) L

1.1. Collection and Identification

Eclipta prostrate (L.) L growing as natural wild in Sagaing University Campus was collected from January to August in 2022. After being collected, the specimens were measured, recorded in detail for taxonomic description, properly dried, pressed and mounted on the herbarium sheets. Identification of the collected specimens was carried out by referring Hooker (1875), Backer & Brick (1965), Dassanayake (1981) and Ming, H.Q. (2011). The color photographs of plants were recorded.

2. Anatomical characteristics of *Eclipta prostrata* (L.) L

Leaves, stems and roots were cut by using a new razor blade to obtain thin sections. These sections were killed and fixed in 70% ethyl alcohol solution. About 5-15 drops of chloral-hydrate solution was applied onto the sections for 10 minutes and then washed by water. These sections were stained with safranin and temporarily mounted in dilute glycerin. Then, the sections were photographed under a microscope. The anatomical characters were studied by Metcalfe and Chalk (1965) and Esau (1953).

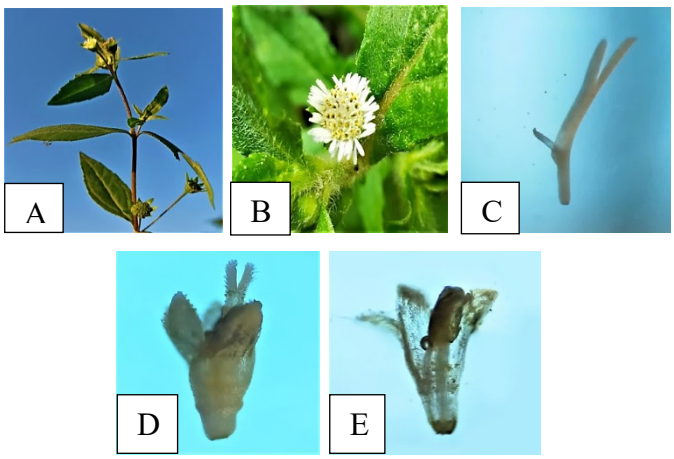
3. Preliminary Phytochemical Screening of *Eclipta prostrata* (L.) L

Fresh leaves of *Eclipta prostrata* (L.) L was rinsed thoroughly in running tap water, and air-dried at room temperature for a period of 14 days and then pulverized. The prepared extracts were analyzed for the presence or absence of alkaloids, starch, polyphenols, glycosides, reducing sugars, tannins, phenols, lipophenols, flavonoids and saponins and were studied according to the methods of Harbone, J.B (1991), Kokate (1997), Trease & Evans (2002) and Khandelwal, K. R. (2005).

Results

Morphological characteristics of *Eclipta prostrata* (L.) L .Pl. 2: 286 (1771)
Family - Asteraceae
Scientific Name - *Eclipta prostrata* (L.) L.
English Name - Trailing Eclipta
Myanmar Name - Kyeik-man

Annual or perennial, erect-ascending herbs, stem terete, often rooting at the nodes, stiffly appressed pilose. Leaves simple, opposite and decussate, exstipulate, attenuate and sub-petiole at the base, narrowly acute at the apex, margin entire or faintly serrate, stiffly appressed pilose on both surfaces, quite strongly tri-nerved at the base, reticulate venation. Inflorescence solitary, axillary, capitula, white, with numerous flowers. Ray florets 1 to 2 seriate, liguliform, unisexual, pistillate, zygomorphic. Corolla of ray florets ligulate, with entire or shallowly 2 lobes. Disc florets tubular, with 4 to 5 limbs, bisexual, actinomorphic. Corolla of disc florets often 4-toothed, pappus with very minute teeth on the top of the achenes. Stamens 4, filament short, anther syngenesious. Ovary thinly hirsute, style filiform. Achenes, sparsely and minutely pubescent at the top, black.



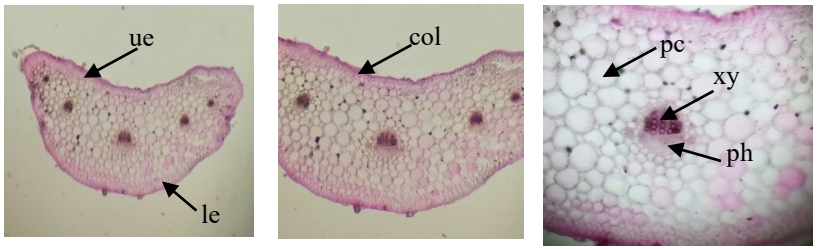
Morphological characters of *Eclipta prostrata* (L.) L.

A. Habit
B. Inflorescence
C. Ray floret
D. Disc floret
E. L.S of disc floret

Anatomical characteristics of *Eclipta prostrata* (L.) L.

Petiole

In transverse section, the petiole was crescent-shaped in outline, composed of epidermal cells with thin cuticle and non-glandular, multicellular trichomes. The upper and lower epidermal cells were one layered. Composed of outer collenchymatous cells and inner parenchymatous cells were found in both sides. In upper side, collenchymatous cells 3-4 layered. The parenchymatous cells were 4-6 layered. In lower side, collenchymatous cells 3-5 layered. The parenchymatous cells were 5-7 layered. The vascular bundles were embedded in ground tissue and small, four seperated bundles towards the adaxial side and single large bundle in the middle. Vascular bundle was collateral type and crescent shaped. Phloem was found 3-5 layered in thickness. Xylem was found 2-5 rows and each row 1-4 cells.

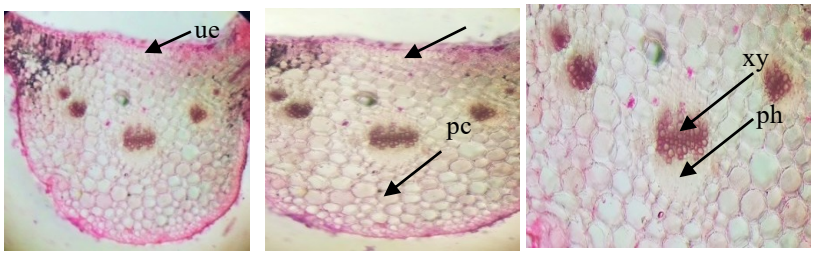


A. T.S of petiole (outline)
B. Ground tissue system of petiole
C. Vascular tissue system of petiole
(ue = upper epidermis, col = collenchyma cell, le = lower epidermis,
pc = parenchyma cell, xy = xylem, ph = phloem

Midrib

In transverse section, the midrib was semicircular-shaped in the abaxial side and crescent-shaped in adaxial side. Composed of epidermal cells with thin cuticle and non-glandular, multicellular trichomes. Both upper and lower epidermal cells one layered. Composed of outer collenchymatous cells and inner parenchymatous cells were found in both sides. In upper side, collenchymatous cells 2-3 layered. The parenchymatous cells

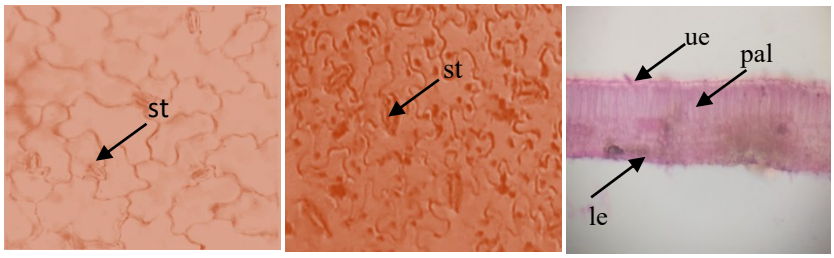
were 3-7 layered. In lower side, collenchymatous cells were 3-5 layered. The parenchymatous cells were 6-9 layered. A single large bundle appearing as media strand and four small bundles towards the adaxial side. The vascular bundles were collateral type and crescent shaped. Phloem was found 4-8 layered. Xylem was found 2-10 rows; each row 1-7 cells.



A. T.S of midrib (outline)
B. Ground tissue system of midrib
C. Vascular tissue system of midrib
(ue = upper epidermis, col = collenchyma, pc = parenchyma cell, xy = xylem, ph = phloem)

Lamina

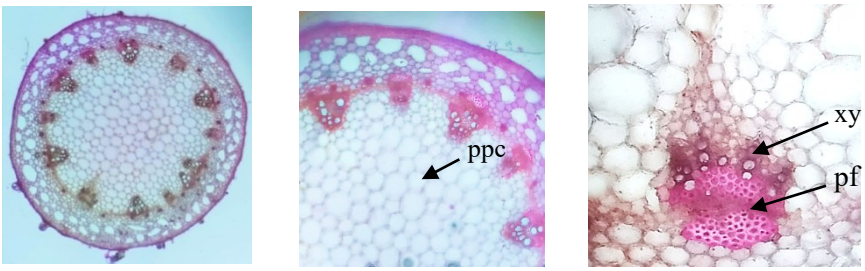
In transverse section, the lamina was typically dorsiventrally with reticulate venation. Composed of epidermal cells with thin cuticle, guard cells of stomata and non-glandular multicellular trichomes. In surface view, upper epidermal cells were slightly wavy and stomata were anisocytic type; the lower epidermal cells were deeply wavy and stomata were anomocytic type. The mesophyll cells composed of palisade and spongy parenchyma cells. Palisade cells were single. Spongy parenchyma were 4-5 layered. The vascular bundles were embedded in mesophyll cells. Phloem was found 2-3 layered. Xylem was found 1-2 rows and each row 2-3 cells.



A. Adaxial surface
B. view of lamina
C. Abaxial surface view of lamina
D. T.S of lamina (outline)
(st = stomata, ue = upper epidermis, le = lower epidermis, pal = palisade)

Stem

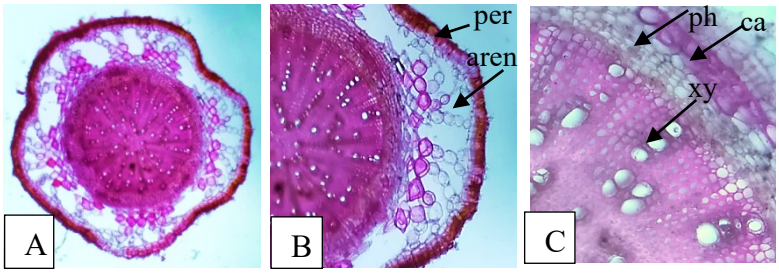
In transverse section, the stem was circular-shaped in outline, composed of epidermal cells with thin cuticle and non-glandular, multicellular trichomes. The epidermal cells one layered. Composed of outer collenchymatous, inner aerenchymatous, endodermis, pericycle and pith. The outer collenchymatous cells were 2-4 layered; inner aerenchymatous cells 1-2 layered; endodermis 1-layered; pericyclic sclenrenchymatous cells at the outer boundary of the phloem group, 2-3 layered, innermost layer of pith, 18-25 layered. The vascular bundles arranged in circular ring and open collateral type. The bundles were 13-17 in numbers; phloem towards the peripheral and xylem towards the pith, vascular cambium between the xylem and phloem, 2-4 layered. Xylem was found 2-7 rows, each row 1-5 cells.



A. T.S of stem (outline)
B. Ground tissue system of stem
C. Vascular tissue system of stem
(aren = arenchyma cell, ppc = pith parenchyma cell, xy = xylem, pf = phloem fibre)

Root

In transverse section, the root was semicircular-shaped with four broad protruding ridges in outline; the outermost regions of mature root consists of a few layers of periderm. Composed of epidermal cells with thin cuticle and non-glandular, multicellular trichomes. The epidermal cells one layered. Composed of initial periderm, the epidermis ruptured and disappeared initial periderm, 3-5 layered. Composed of aerenchymatous cells, endodermis, pericycle and pith. The bundles were cylinder polyarch; phloem distributed near the periphery of the vascular cylinder beneath the pericycle. Xylem were arranged in radially, each row 2-8 cells. Medullary rays were separated xylem arms, rays 1-2 seriate.



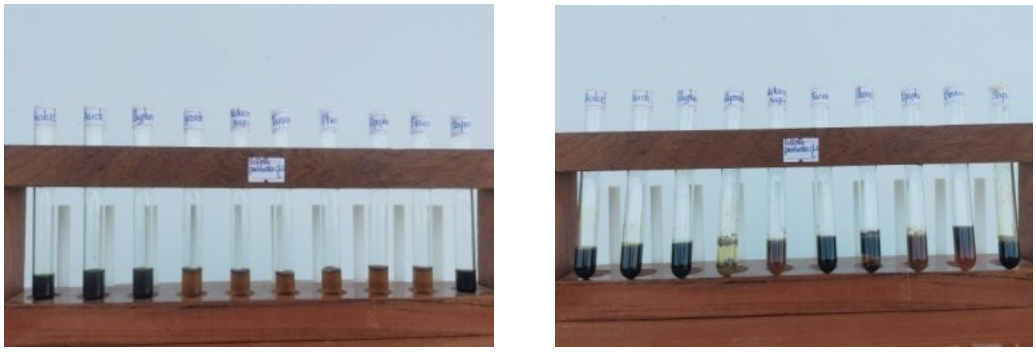
A. T.S of stem (outline)
B. Ground tissue system of stem
C. Vascular tissue system of stem
(per = periderm, aren = arenchyma, ca = cambium, xy = xylem, ph = phloem

Result of Preliminary Phytochemical study on leaves extracts of *Eclipta prostrata* (L.) L.

No	Test	Extract	Test reagent	Observation	Results
1	Alkaloids	EthOH	Mayer's reagent	Pale green color, black ppt	+
		EthOH	Wagner's reagent	Reddish green color, black ppt	+
		Methanol	Wagner's reagent	Reddish brown color, gray ppt	+
2	Starch	EthOH	Iodine solution	Pale green color, black ppt	+
3	Polyphenols	EthOH	10%$FeCl_3$ solution	Deep green color	+

4	Glycosides	D/W	10%Lead acetate solution	Whitish yellow color, gray ppt	+
5	Reducing sugars	D/W	Benedict's solution	Reddish brown color	+
6	Tannins	D/W	1%$FeCl_3$ solution	Deep black color	+
7	Phenols	D/W	5%$FeCl_3$ solution	Deep black color, pale yellow ppt	+
8	Lipophenols	D/W	1%NaOH solution	Brown color, gray ppt	+
9	Flavonoids	D/W	Stock solution (1ml)+ NaOH solution	Brown orange color, brown ppt	+
10	Saponins	Methanol	1% $NaHCO_3$ solution	Frothing	+

+ = Present - = Absent ppt=Precipitate



A. Before phytochemical test on leaves of *Eclipta prostrata* (L.) L.
B. After phytochemical test on leaves of *Eclipta prostrata* (L.) L.

Discussion and Conclution

The present research focussed on characterization of morphological, anatomical characters and preliminary phytochemical analysis of *Eclipta prostrata* (L.) L. The distinguishing morphological characters are perennial or annual herbs. Leaves are simple, opposite and decussate. Inflorescences are solitary. Ray florets are liguliform, 1-2 seriate and zygomorphic. Disc florets are numerous with 5 limbs, disciform and actinomorphic. Stamen are five and ovary thinly hirsute. Fruits are achenes. The characters recorded in the present work agreed with Hooker (1875), Backer & Brick (1965), Dassanayake (1981), Ming, H.Q and Fayaz, A. (2011).

In present research, the primary anatomical structure of the leaves, stem and root were distinguishable into three tissue systems. Dermal tissue system was composed of cuticle, epidermal cells and trichomes. In surface view, anisocytic stomata were observed on upper surface and anomocytic stomata occurred on lower surface. Lower epidermal cells were deeply wavier than the upper epidermal cells. In transverse section, chloroplasts were found in the palisade and spongy tissues. All these characters agreed with Metcalfe and Chalk (1965) and Sharma, S. *et al*., (2017).

The outermost layer of epidermis covered with thick cuticle, upper and lower epidermis layer showed unicellular and few glandular trichomes in leaves and stem. These characters were not in agreement with Sharma, S. *et al.,* (2017).

In transverse section, the present research showed semi-circular shaped in abaxial side and crescent-shaped in adaxial side in midrib; crescent-shaped in petiole; circular-

shaped in stem and semi-circular with four protruding rides in root. These characters agreed with Tandon, N. (2011) except the shaped of root.

In this research, vascular bundles were open collateral type with small oval and one layered bundle sheath present in lamina; crescent shaped with large bundle in middle and four small bundles were present in adaxial side in midrib and petiole. All these characters agreed with Tandon, N. (2011) except the number of small bundles in midrib and petiole.

Tandon, N. (2011) also reported that *Eclipta prostrata* (L.) L was showed 3 to 5 bicollateral meristeles in leaves and discontinuous ring of 10 to 12 vascular bundles capped with fibres in stem. In root, pericycle is composed of two layered parenchymatous. These characters were not in agreement with the present research.

In this research, the ethanol leaf extract of *Eclipta prostrata* (L.) L showed the presence of alkaloids, starch and polyphenols. Dalal, S. and Kataria, S. (2010) studied that alkaloids were present, thus showing agreement with the present research.

The present research presented glycosides, reducing sugars, tannins, phenols, lipophenols and flavonoids in aqueous leaf extract. Rani, J. *et al*., (2020) reported that the presence of flavonoids and phenolic compounds, thus showing agreement with the present research.

The present research showed the presence of alkaloids and saponins in methanol leaf extract which were agreed with Arunachalam, G. *et al*., (2009).

Karuppaiah, B. *et al*., (2019); Kumar, N. and Mahesh, K. M. (2016) mentioned that the phytochemical screening of methanol leaf extract showed the absence of saponins. Priya, K. *et al*., (2018) reported that the absence of alkaloid which were not in agreement with the present study.

Eclipta prostrata (L.) L is used in indigenous system of medicine as a hepatoprotective drug. This plant has been traditionally used as a liver tonic in Ayurveda and is commonly used as deobstruent to protect the liver (Sharma, S. *et al*., 2017).

Eclipta prostrata is used in traditional medicines for infectious diseases. It is believed that these medicinal herb possesses anti-aging and rejuvenate teeth, bone, sight and hearing activity, insecticidal activity, antioxidant, antihepatotoxic, anticancer immunomodulatory, anti-inflammatory and antidiabetic activities (Urul, E., 2002).

According to traditional practitioners, the fresh leaves juice is very effective in wounds and mixed with honey is also used for children with respiratory, eye and ear infections, appetite stimulant, as a digestive. It is also used to prevent hair loss and to promote hair growth (Daw Moe Moe Tun, (Tasa- 1940)).

In Myanmar, the taste of Kyeik-man is bitter. The qualities and properties of this plant are to relieve the various diseases such as antiseptic, anti-inflammatory, anti-toxicity, laxative, cardiotonic, cough, asthma, syplilis, skin diseases, hair loss, abortion and utrine pain after birth. And then, it can effect hair black and growth and eye color to become brightly (An Shin, Na-Ga-Thein 1969). An Shin, Na-Ga-Thein (1969) stated that Kyeik-man can effect hair black and growth, eye and ear infections which were agreed with Daw Moe Moe Tun.

In conclusion, *Eclipta prostrata* (L.) L of leaves extract constituent of secondary metabolites have medicinal properties. It is of very importance in medicinal world and to provide the information of other researchers and traditional practitioners.

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