

Short Communication

**Studies on Morpho-microanatomical Evaluation of the Leaves of
Tridax procumbens Linn (Asteraceae)**

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Abstract

The present study deals with the macro and microscopical studies of *Tridax procumbens* Linn.leaf. Some distinct characters were observed while studying their transverse sections. Macroscopically, the leaf's shape was lanceolate to ovate measuring 7 cm long and 1-4 cm wide with irregularly serrate margin and pubescent on both sides. Microscopically, the midrib and laminar region showed a distinct epidermis. The upper epidermis was bilayer, with a small, rounded shape, covering multicellular trichome and the lower epidermis had single layer, elongated cells, arranged closely. Physiochemical and preliminary phytochemical studies of the leaf were also carried out. The present study might be useful to supplement information in regard to its identification parameters.

Keywords: Leaf; Macroscopical; Microscopical; *Tridax procumbens*.

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1. Introduction

The family Asteraceae (also known as compositae) consists of about 1400 species, out of which 674 species are found in India. Some of them are tropical trees and shrubs (erect, struggling and twining) while few members are herbs (erect or decumbent) [1]. *Tridax procumbens* (Fig. 1) is a common annual weed in the West African sub-region and other tropical zones of the world and is known as "coat-buttons". The plant is used to prepare 'Bhringraj' which is a reputed medicine in Ayurveda for liver disorder. Alcoholic extract of the plant is useful in liver regeneration. The juice of leaves has been found to remove subcutaneously harvested granuloma tissue formed on dead space wound in rats at 4 days interval up to 32 days of wounding. The flowers yield on essential oil showing insect repellent activity against stored grain insects. Acetone extract of the plant exhibited growth inhibitory and anti-juvenile hormone mimicking activity when administered to the

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larvae of the mosquito, *Culex quinquefasciatus* [2]. Alcoholic extract of aerial parts showed hepatoprotective action against acute hepatitis induced by carbon tetrachloride in albino rats; the activity has been attributed to the chloroform insoluble fraction of the ethanolic extract [3]. Alcoholic extract of the aerial parts also exhibited hair growth promoting activity in albino rats [4]. The extract of *Tridax procumbens* also possesses antidiabetic effect [5, 6], haemostatic activity [7], anti-inflammatory activity on wistar albino rats [8, 9], antimicrobial activity on *S. aureus*, *P. mirabilis* and *E. coli* [10], cardiovascular effects [11] and immunomodulatory effects [12]. Some drugs of plant origin in conventional medical practice are not pure compounds but direct extract or plant material that have been suitably prepared and standardized. Establishment of pharmacognostic profile of the leaves of *Tridax procumbens* will assist in standardization, which can guarantee quality, purity and identification of samples.



Fig. 1. *Tridax procumbens*.

2. Material and Method [13, 14]

Plant materials: Fresh leaves of *Tridax procumbens* were collected from Herbal Garden Noida Institute of Engineering and Technology, Greater Noida U.P. India 201306 and identification of plant was done by Dr M.P. Sharma, Department of Botany, Jamia Hamdard.

Macroscopy: Leaves are opposite, 3-7 cm in length, 1-4 cm wide, lanceolate to ovate with characteristic odour and acrid taste. Appearance of leaf is rough and scabrous with irregularly toothed margin, acute apex and wedge shaped base. Petiole is short and easy to fracture.

Microscopy: Leaves were warmed with chloral hydrate solution to remove chlorophyll content. The outer epidermal membranous layer was observed under a compound microscope. The presence or absence of the characteristic features like Epidermal cells, stomata (type and distribution) and epidermal hairs (types of trichomes and distribution) was observed. The transverse section through the lamina and the midrib as well as small quantity of powdered leaves were also observed.

Chemomicroscopic examination: Examinations of the powder for calcium oxalate crystals, trichomes and starch grains were carried out.

Phytochemical investigation: Chemical tests were employed in the preliminary phytochemical screening for various secondary metabolites such as tannins, phenolic compounds, glycosides, alkaloids, carbohydrates, proteins and flavonoids.

Quantitative investigation: Quantitative leaf microscopy to determine Palisade ratio, stomatal number, stomatal index, vein islet and vein termination number was carried out on epidermal strips. Other parameters that were determined for the powdered leaves were moisture content, total ash, acid-insoluble and extractive value.

Fluorescence study [15]: It is an essential parameter for first line standardization of crude drug. The crude drug was subjected to this study and their fluorescence patterns were noted. The powdered drug was treated separately with different reagents and exposed to visible, UV light (short and long) to study their fluorescence behavior.

3. Results

3.1. Macroscopy

The following macroscopic characteristics of fresh leaves were noted which are as follows: The colour of the leaf was green, odour was odorless, taste was bitter. Further size was 7 cm long, 1-4 cm wide; shape was simple, opposite, lanceolate to ovate; margin was irregularly serrate and base was wedge shaped. The stem was more or less ascending, 30-50 cm high, branched, round, sparsely to very high.

3.2. Microscopy

Midrib portion

The transverse section of midrib portion of the leaf is shown in Fig. 2.

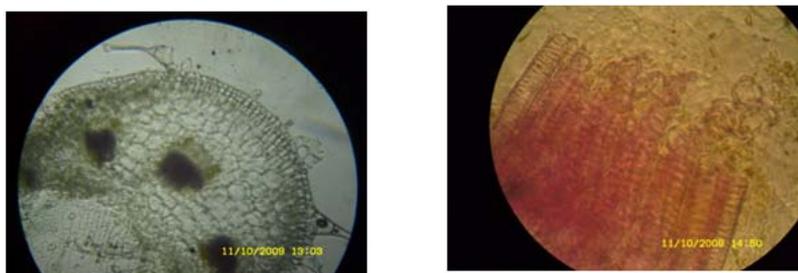


Fig. 2. Transverse section of midrib portion of the leaf:(*left*) Upper epidermis and lower epidermis, palisade cells of leaf; (*right*). Bundles of xylem vessels centrally located; collateral vascular bundle surrounded by some parenchymatous cells.

Palisade cells: Palisade cells are bilayered, tubular shaped and compactly arranged.

Upper epidermis: It is single layered and covered with thick cuticle. Trichomes are simple, multicelled (3-6 celled) and more no on dorsal side. Basal cells of trichomes looks like ***claw***.

Spongy parenchyma: Multi-layered and distinct.

Vascular bundles: Concentric in shape, Meristeel consists of single centrally located collateral vascular bundle surrounded by some parenchymatous cells filled with dark content.

Lower epidermis: Single layered, elongated cells and closely arranged.

Lamina portion (see Fig. 3)

Upper epidermis: Single layered, rounded shape and covering multicellular trichome are present.

Spongy parenchyma: Multi-layered, loosely arranged, round shaped and pink colour xylem vessels are present.

Lower epidermis: Single layered, elongated cell and closely arranged.



Fig. 3. Transverse section of lamina. (upper epidermis, spongy parenchyma and lower epidermis).

3.3. Chemomicroscopic examination

Chemomicroscopic examination of the leaves revealed the presence of starch grain (average 16.25μ), calcium oxalate crystal, trichomes (average size $170-180\mu$)

3.4. Phytochemical investigation

Phytochemical evaluation revealed the presence of alkaloids, carbohydrates, flavonoids and fatty acids. These secondary plant metabolites are known to possess various

pharmacological effects and may be responsible for the various actions of *Tridax procumbens* as presented in Table 1.

Table 1. Phytochemical investigations.

Sl.	Phytochemicals	Status in drug
1.	Alkaloids	Present
2.	Tannin	Absent
3.	Volatile oil	Present
4.	Flavonoids	Present
5.	Amino acids	Absent
6.	Phenolic comp	Absent
7.	Fatty acid	Present

3.5. Quantitative investigation

The numerical and quantitative values of leaves are presented in Tables 2 and 3.

Table 2. Numerical data of the leaves of *Tridax procumbens*.

Parameters	Mean
Ash value	12.5
Acid insoluble ash value	0.45
Water soluble ash value	0.125
Moisture content	7.5
Alcohol soluble extractive	0.124
Water soluble extractive	0.24

Table 3. Quantitative leaf microscopy of *Tridax procumbens*.

Parameter	Range
Palisade ratio	1:8
Stomatal number (upper surface)	2 – 4
Stomatal number (lower surface)	3 – 4
Stomatal index (upper surface)	13.3 – 22.2
Stomatal index (lower surface)	12.0 – 13.7
Vein islet number	8 - 10
Vein termination number	2 - 3

3.6. Fluorescence study

The fluorescence behavior of the powdered drug is shown in Table 4.

Table 4. Fluorescence behavior of the powdered drug.

Sl. Treatment	254 nm	365 nm	400-800 nm
1. Methanol	Yellow	Brownish yellow	Yellow
2. 1N NaOH	Yellow	Dark yellow	Yellow
3. CH ₃ OH+NaOH(1:1)	Yellow	Dark yellow	Yellow
4. Ethanol	Yellow	Dark yellow	Yellow
5. Sulphuric acid (66%)	Greenish yellow	Greenish yellow	Yellow
6. Conc. sulphuric acid	Black	Black	Black
7. Nitric acid	Yellow	Brown	Dark brown
8. Hydrochloric acid	Light yellow	Brown	Brownish yellow

4. Discussion

A consistent supply of drug from herbal origin can only be achieved if the starting plant materials are defined in a rigorous and detailed manner. The characterization of herbal drug is therefore essential to allow specification to be established, which is both comprehensive and relevant. The present study was an attempt in this direction for the useful utilization of the leaves as an essential ingredient of antiviral agents. The extractive values for the powdered drug were found to be 0.125 and 0.0124 for water and alcohol, respectively. The total ash, acid insoluble ash and water soluble ash were found to be 12.5, 0.45 and 0.125, respectively. The observation of phytochemical tests indicated the presence of alkaloids, volatile oil, flavonoids and fatty acids. But tannins, amino acid and phenolic compounds were absent. The observations in the present study have brought out several diagnostic features of the leaf on the basis of which identification of crude drugs can be ascertained.

5. Conclusion

The present study on pharmacognostical characters of *Tridax procumbens linn* may be useful to supplement information with regard to its identification and will be helpful in establishing the standardization criteria.

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