Comprehensive Morphological, Anatomical and Phytochemical Assessment of *Tridax procumbens* L. (Asteraceae)

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ABSTRACT

The present study aimed to characterize *Tridax procumbens* L. (Asteraceae), a medicinal herb widely used in folk and Unani medicine, through a systematic pharmacognostic and phytochemical evaluation. The plant, locally known as *Zakhm-e-Hayat*, is traditionally employed by local hakims in the Amravati district of Maharashtra for the treatment of various ailments. Macroscopic and microscopic examinations of different plant parts were carried out to establish diagnostic features for identification and authentication. Physicochemical parameters, including ash values, were determined to assess the quality of the crude drug. Preliminary phytochemical screening was performed to identify major bioactive constituents, along with analyses of free amino acids and mineral content. The findings of this study provide reliable standards for the identification, authentication of *T. procumbens*, thereby supporting its safe and effective use in traditional medicinal systems such as Unani medicine.

Keywords – Anatomical Studies, Phytochemical Analysis, *Tridax procumbens*, Wound Healing, Zakhm-e-hayat.

INTRODUCTION

Tridax procumbens L. (Asteraceae) is a widely distributed herbaceous plant commonly found growing along roadsides, waste disposal sites, ditches, subways, riverbanks, grasslands, and other disturbed or wild habitats (1). Owing to its hardy nature and wide ecological adaptability, the plant is easily accessible and has long been utilized in various traditional systems of medicine. Among its ethnomedicinal applications, *T. procumbens* is particularly valued for the management of liver disorders and other systemic ailments.

Pharmacological investigations have demonstrated that *T. procumbens* possesses a broad spectrum of biological activities, including antibacterial, antifungal, antiprotozoal, hypotensive, immunomodulatory, antidiabetic, anti-inflammatory, antioxidant, and sedative effects on respiration (2.). These therapeutic properties are attributed to the presence of diverse

phytochemical constituents distributed across different parts of the plant. Reported bioactive compounds include carotenoids, alkaloids, flavonoids, saponins, fumaric acid, and tannins, which collectively contribute to its medicinal potential.

Commonly known as "coat buttons," *T. procumbens* has been traditionally employed for wound healing and for the treatment of gastrointestinal disorders such as diarrhea and dysentery, as well as seizures, malaria, stomach pain, and hypertension. The plant is also known to exhibit insecticidal, antiseptic, and antiparasitic properties. Experimental studies have indicated its hepatoprotective role in reducing liver damage caused by hepatotoxic agents, in addition to its ability to remove toxic chromium from industrial wastewater, highlighting its environmental remediation potential (3).

In traditional practice, various leaf extracts of *T. procumbens* are used as antiseptics for treating fresh cuts, wounds, and burns, particularly in anemic individuals. The plant is also commonly applied in the treatment of boils, blisters, and cuts by local healers in different regions of India. Within the Unani system of medicine, the juice of the leaves is widely used to arrest bleeding and promote wound healing. The application of a leaf poultice directly to the wound is believed to facilitate complete healing (4). These extensive traditional and therapeutic applications underscore the importance of scientific characterization and validation of *T. procumbens* to support its continued use in traditional medicine.

MATERIALS AND METHODS

The hakims consulted for the study use to collect plant material themselves from the field. For identification, plant was brought to the laboratory, described and identified with the help of standard flora (5). Fresh plants were collected and preserved in 70% FAA. Hand sections of root, stem, node and leaf were taken. For vessel studies thin slices of old roots and stems were treated with macerating fluid (5% solution of HNO_3 and 5% solution of K_2Cr2O7) for 12 to 24 hr. The macerate was then thoroughly washed, stained with 1% aqueous safranin and measurements were made by ocular scale lens. Camera lucida sketches were drawn. Classification of Radford et al., (1974) (6) is followed for categorizing the vessel elements. For chemical analysis mature plants were collected, shade dried and powdered. Powder was preserved in zip lock bags at 4^{o}C and tested qualitatively for various bioactive compounds (7,8,9,10,11). Amino acid profile was studied by two dimentional chromatography (12,7). Plant ash was prepared (13) at 400^{o}C and various ash values were estimated following Kulkarni and Apte (2000) (14). Qualitative analysis was undertaken to detect various mineral elements (15), while quantitative estimation was done using flame photometer.

RESULTS AND DISCUSSIONS

Macromorphology:

Procumbent herbs; branches spreading, 30-60 cm. long, hairy. Leaves opposite, ovate elliptic, 2-5 x 0.8-2.5 cm, pinnatifid or deeply inciso dentate, acute, clothed on both sides with hairs, petioles 8-12 mm long, densely hairy. Heads 10-15 mm. across, solitary on long slender peduncles. Receptacle flat, paleaceous; palea membranous, linear. Involucral bracts few; seriate, the outer ones ovate, densely hairy, the inner ones membranous, oblong, pubescent. Marginal florets 4-8, with white or yellow, 3-dentate ligules. Central florets many, with tubular, 5-lobed yellow corollas. Anther bases sagittate with short, acute auricles at base. Achene oblong, 2-2.5 mm. long, densely silky black. Pappus of many feathery bristles. (Fig. 1-8).

Micromorphology

Root tetrarch, pith absent. Secondary growth normal. Rays short, multiseriate. Cork cambium develops deeper in the cortex. Secondary cortical cells thin walled, irregular. (Fig. 9-10)

Stem cylindrical in t.s. Epidermis single layered, cutinised & cuticularised; followed by collenchymatous hypodermis, interrupted by chlorenchyma at places. Epidermis with stomata in chlorenchymatous regions. Cortex narrow, cells parenchymatous in 2-3 layer. Endodermis distinct followed by multilayered pericycle. Pericycle sclerenchymatous opposite the pericycle. Vascular bundles conjoint, collateral, arranged in a ring. Pith large, parenchymatous. Some of the pith cells divide to produce resin canals. (Fig. 11-12).

Secondary growth normal. Abundant resin canals are present in cortex and pith of old stem. (Fig. 13).

Node trilacunar three trace. As leaves are opposite at each node 6 traces depart from the main stele. (Fig. 14)

Leaf base half cylindrical with concave upper surface. Epidermis single layered, ground tissue parenchymatous, Vascular bundles three arranged to form a shallow arc. Small resin canals associated with vascular bundles present in ground tissue. (Fig. 15-16)

Lamina dorsiventral, amphistomatous. Epidermal cells shallowly sinuate. Stomata anomocytic. Many of the stomata anomalous. Sometimes the guard cells are very narrow, rod-like. At places instead of two guard cells only one guard cell develops. The other one is abortive. Palisade single layered, spongy tissue 5-6 layered, cells somewhat horizontally stretched, chlorenchymatous. (Fig. 17-19)

Midrib with single vascular bundle in the centre. Epidermal cells small. Ground tissue parenchymatous with few small resin canals neighbouring vascular bundles. (Fig. 20). In some of the populations cells of lower epidermis show presence of small rod shaped crystals.

Trichomes Entire body covered with hairs. Hair both glandular as well as non-glandular.

Non-glandular - Uniseriate with enlarged base. Wall rough, warty (Fig. 2l a-b)

Glandular - Less frequent, uniseriate, thin walled with small glandular head (Fig. 22)

Vessels:

Roots vessels (Fig. R1-R5)

Extremely small (Class A) 158 µm long - 69 µm broad

Moderately short (Class C) 254 µm long - 331 µm long

46 µm long – 77 µm broad

Medium size (Class D) 377 µm long - 35 µm broad

Stem vessels: (Fig. S1-S2)

Medium size (Class D) 423 - 731 µm long 31 – 38 µm broad

Phytochemistry

Phytochemical analysis was done for leaves as they are used medicinally. Leaves of the plant contains alkaloids, anthraquinones, cardenolide and steroids/ triterpenoids. Ten free amino acids were found in the leaves. These are glutamic acid, tyrosine, aspergenine, glycine, threonine, DL- alanine, Proline, DL- valine, valine, tryptophan present. Ash yield was found to be 600 mg/gm. dry tissue. HCL soluble ash – 800 mg/gm, HNO_3 soluble ash - 785 mg /gm. Acid insoluble ash 200 mg./gm.215 mg./gm. Among the minerals – Sulphur, Calcium, Magnesium, Iron, Chlorine, Phosphorus, Sodium were detected. The Sodium, Potassium and Chlorine contents were found to be 20.33 mg/gm, 175 mg/ gm, and 114.86 mg/gm. respectively.

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REFERENCES:

[1] Mundada S, Shivhare R. Pharmacological of Tridax procumbens a weed : review. International journal of pharma tech research 2010: Vol 2 ISSN: 0974-4304. p.g. no. 1391-1394.

[2] Ingle N, H. Dubey, Kaur N, Gupta R. Tridax Procumbens: A multi useful weed A review. journal of advance oral research. 2014: vol 5.pg no.14-16.

[3] Ghosh D, Biswas S, Biswas M., A Dutta, s.sil,s.chatterje. morphological ethno biological and phytopharmacological attributes of tridax procumbens linn. (asteraceae): A review. International journal of scientific research in biological sciences 2019: vol. 6. ISSN: 2374-7520. p.no.182-191.

[4] Ahmad, S.A. (2005) "Taxonomic and Pharmacognostic Studies of Some local Unani medicinal plants" Ph.D Thesis, Sant Gadge Baba Amravati University, Amravati.

[5] Naik, V.N. (1998). "Flora of Marathwada" Vol I and II, Amrut Prakashan, Aurangabad. India.

[6] Radford, E.A.,Dickson, C., William, R., Massey, J. Bell and C. Ritcha. (1974). "Vascular Plant systematic". Harper and Row Publishers, New York.

[7] Harborne, J.B. (1973). "Phytochemical Methods". A Guide to modern techniques of Plant Analysis Chapman and Hall., London.

[8] Gibbs, R. (1974). "Chemotaxonomy of Flowering Plants".McGill Queen's University Press. Montreal, Canada.

[9] Peach, K. and M.V. Tracey. (1979)."Modern Methods of plant Analysis." Vol. I- VII. Narosa Publications,New Delhi.

[10] Kokate, C.K., A.P. Purohit and S.B.Gokhale. (1990). "Pharmacognosy" Nirali Prakashan, Pune.

[11] Evans, W.C. (1996). "Trease and E v a n s Pharmacognosy" th 14 edition.W.B.Saunders Company Limited, Singapore.

[12] Lederer E. and Lederer M. (1957). "Chromatography – A review of Principles and Applications". Elsevier Pub. Co., Amsterdam.

[13] A.O.A.C (1975). "Official and tentative methods of analysis." Association of Official Agriculture chemists, Washington D.C.

[14] Kulkarni, P.H. and B.K. Apte. (2000). "Research Methodology for students of Ayurveda." Ayurveda Research Institute, Pune.

[15] Johannson, D.A. (1940). "Plant Microtechnique" Tata Mc-Grawhill Publishing Company, Ltd. New Delhi.

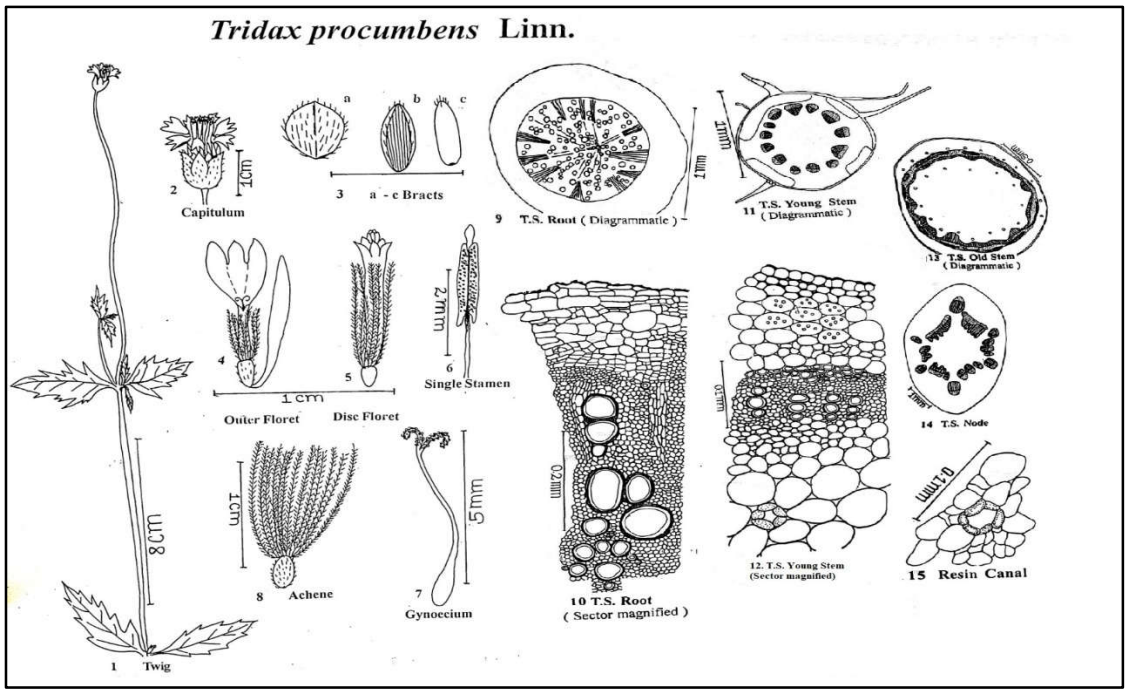

Plate 1 - figures 1 to 15

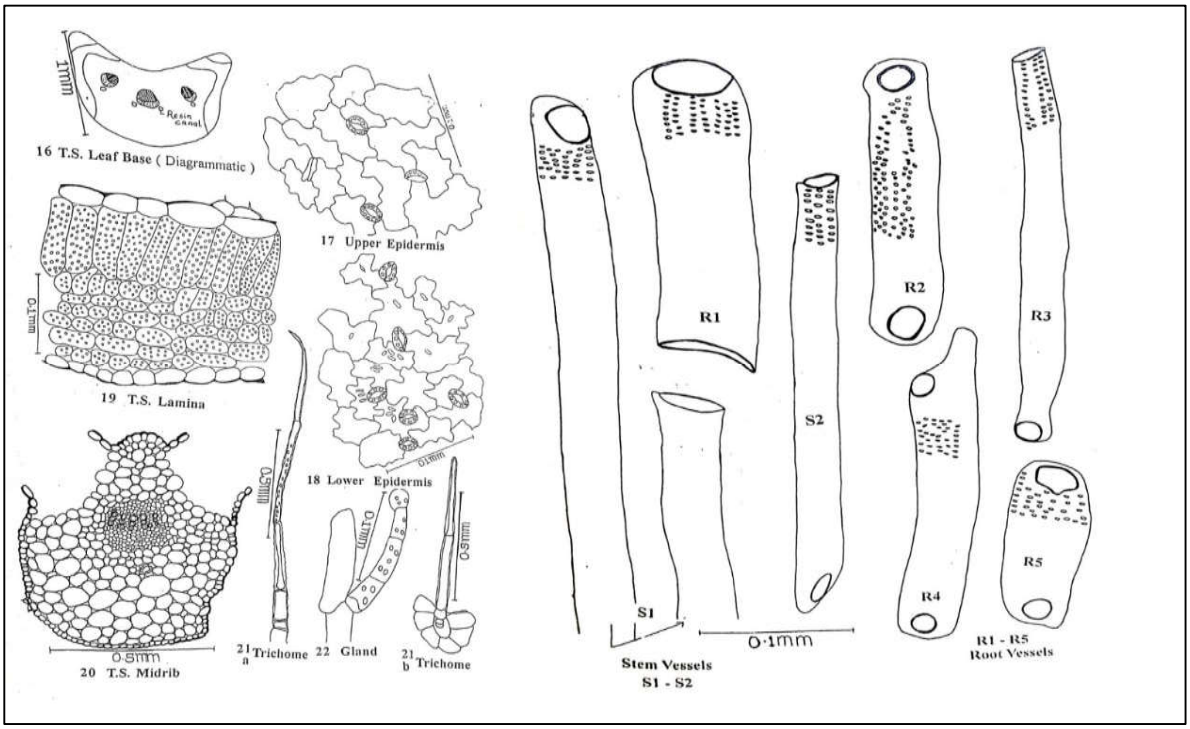

Plate 2 - 16 to 22