

A Review on Pharmacognosy, Pre-phytochemistry and Pharmacological analysis of *Tridax procumbens*

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ABSTRACT

Pharmaceutical Biotechnology is not a source of energy, but a scientific method that provides tools to produce energy based entirely on modern biotechnological techniques, as to date encompass a wider range of altogether newer medicinal compounds, e.g., antibiotics, vaccines development and monoclonal antibodies (MABs) that may now be produced commercially using well-defined, optimized and improved fermentative methodologies. In fact, genetic engineering has brought in a sea change by virtue of the directed construction of microorganisms resulting in a plethora of newer life-saving drugs. Focus on a variety of research areas including health/medicine, food science, environmental science and agri- science and also bioenergy development.

Keywords: Pharmacognostic, Pre-Phytochemical, pharmacological, *Tridax procumbens* L, Asteraceae

INTRODUCTION

Tridax procumbens Linn. is a wild plant, found as weed throughout India. The plant is native of tropical America and naturalized in tropical Africa, Asia, and Australia. Local people knew it as “Ghamara”, in English popularly called ‘coat buttons’ and is dispensed for “Bhringraj” by some of the practitioners for hair growth in Ayurveda.



Table 1: Scientific and Biological classification of *Tridax procumbens*

Classification	Scientific Name	Biological Name
Kingdom	Plantae	Plants
Sub kingdom	Tracheobionta	Vascular plants
Division	Spermatophyta	-
Subdivision	Magnoliophyta	Flowering plants
Class	Magnoliopsida	Dicotyledons
Subclass	Asteridae	-
Order	Asterales	-
Family	Asteraceae	Aster family
Genus	<i>Tridax</i> L	Tridax
Species	<i>Tridax procumbens</i> L	coat buttons

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MORPHOLOGICAL DESCRIPTION

Stems decumbent, producing roots at the nodes, up to 50 cm tall. Stems clothed in pale hairs. Leaf blades 30-60 x 15-35 mm, clothed in hairs, lateral veins 2-3 on each side of the midrib. Petioles hairy, 5-10 mm long. Flowers produced in heads about 10 x 10-12 mm. Peduncles hairy, 11-20 cm long. Heads surrounded by bracts, the outer bracts hairy, each bract about 7 x 4 mm, inner bracts glabrous, 7-8 mm long. Calyx (pappus) consists of barbed or fimbriate hairs 10-12 mm long. Corolla on the ray florets ligular, 9-10 x 4 mm, apex 3-lobed. Corolla of the disk florets tubular, about 5 mm long, corolla lobes about 0.5 mm long. Stamens fused to form a tube. Ovary 2-2.2 x 1 mm, densely clothed in long pale brown or golden hairs. Fruit (achene) 1.6-2 mm long; pappus of slender, plumose bristles 5-6 mm long, with fine spreading hairs. Seedlings Features is not available. (Du Puy et al. 1993)

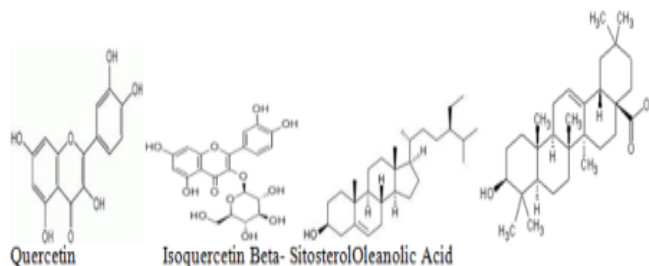
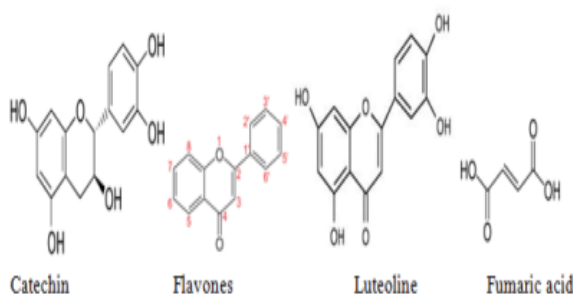
GEOGRAPHICAL DISTRIBUTION

The plant bears daisy like yellow-centered white or yellow flowers with three-toothed ray florets. The leaves are toothed and generally arrowhead-shaped. Its fruit is a hard achene covered with stiff hairs and having a feathery, plume like white pappus at one end. Calyx is represented by scales or reduced to pappus. The plant is invasive in part because it produces so many of these achenes, up to 1500 per plant, and each achene can catch the wind in its pappus and be carried some distance. This weed can be found in fields, meadows, croplands, disturbed areas, lawns, and roadsides in areas with tropical or semi-tropical climates.

CHEMICAL CONSTITUENTS

β -sitosterol-3-O- β -D-xylopyranoside, Quercetin, Dexamethasone, Luteolin, Glucolutin, alkaloids, carotenoids, flavonoids (catechins and flavones) and tannins. It is richly endowed with carotenoids and saponins. The proximate

profile shows that the plant is rich in sodium, potassium and calcium. Leaf of *Tridax* mainly contains crude proteins 26%, crude fiber 17% soluble carbohydrates 39% calcium oxide 5%, Luteolin, glucoluteolin, quercetin and isoquercetin have been reported from its flowers. Whereas the fumaric acid, fl-sitosterol and tannin has also been reported in the plant. Oleanolic acid was obtained in good amounts from *Tridax* and found to be a potential antidiabetic agent when tested against aglucosidase (Jahangir, et al., 2002)



USES OF TRIDAX PLANT (FUNCTIONS REPORTED)

Tridax possesses significant anti-inflammatory, hepatoprotective, wound healing, antidiabetic activity and antimicrobial activity against both gram-positive and gram-negative bacteria (Vilwanathan et al. 2005). The leaf juice possesses antiseptic, insecticidal and parasiticidal properties and is used also to check haemorrhage from cuts, bruises and wounds. Its leaves also use for bronchial catarrh, dysentery, diarrhoea and to prevent falling of hair. It promotes the growth of hair, insect repellent (Mahanto and Chaudhary, 2005). Interestingly, it also has hypotensive effect and

potent immunomodulating property (Saxena and Albert, 2005). In the West Africa sub-region and tropical zone of the world, Traditional medical practitioners and the native peoples of these areas use the leaves of the plant as a

remedy against conjunctivitis. It is also used as bio adsorbent for chromium (VI) is one of the highly toxic ions released into the environment through leather processing and chrome plating industries (Singanan et al.2007)(Table 2)

Table 2 Uses of Tridax plant

Traditional uses	Pharmacological uses	Medicinal uses
<p>Antiviral, Anti-Oxidant Antibiotic Efficacies, Wound Healing Activity, Insecticidal And Anti-Inflammatory Activity (Suseela et al.,2002)</p>	<p>Antimicrobial activity against both gram-positive and gram- negative bacteria, Anti-coagulant</p> <p>Anti-inflammatory</p> <p>Antiseptic, Insecticidal, , Parasiticial,</p> <p>Hepatoprotective, Wound healing To check haemorrhage from cuts, bruises and wounds</p> <p>Hypotensive activity</p> <p>Antidiabetic activity</p> <p>To prevent falling of hair and promote the hair growth. Dysentery, Diarrhoea.</p> <p>Against conjunctivitis Immunomodulating property</p> <p>Insect repellent activity</p> <p>(Saxena et al ,2005)</p>	<p>Antiviral, Anti-Oxidant Antibiotic Efficacies, Antimicrobial activity against both gram-positive and gram- negative bacteria, Anti-coagulant</p> <p>Anti-inflammatory</p> <p>Antiseptic, Insecticidal, , Parasiticial,</p> <p>Hepatoprotective, Wound healing To check haemorrhage from cuts, bruises and wounds</p> <p>Hypotensive activity</p> <p>Antidiabetic activity</p> <p>To prevent falling of hair and promote the hair growth. Dysentery, Diarrhoea.</p> <p>Against conjunctivitis Immunomodulating property</p> <p>Insect repellent activity</p> <p>(Saxena et al ,2005;Suseela et al.,2002)</p>

PHARMACOGNOSTIC STUDY

Macroscopic study:

The Macroscopical characters (size, shape colour, odour, texture, margin, base, apex and petiole) of the leaves were observed 3, 1. Then, anatomical study, powder was identified with routine reagents to study the lignified cells, Trichomes, stomata, fibres etc. Quantitative microscopy was determined by methods prescribed by Trease and Evans 12, 13.

Table 3: Macroscopic of *Tridax procumbens* L.

PARTS	OBSERVATION
Part	Leaves
Arrangement	Opposite
Size	3-7 cm long, 1- 4 cm wide
Shape	Lanceolate to ovate
Colour	Green
Odour	Characteristic
Taste	Acrid
Appearance	Rough & Scabrous
Margin	Irregularly toothed
Apex	Acute
Base	wedge- shaped
Petiole	Short
Texture	Short
Fracture	Easy

Microscopic study:

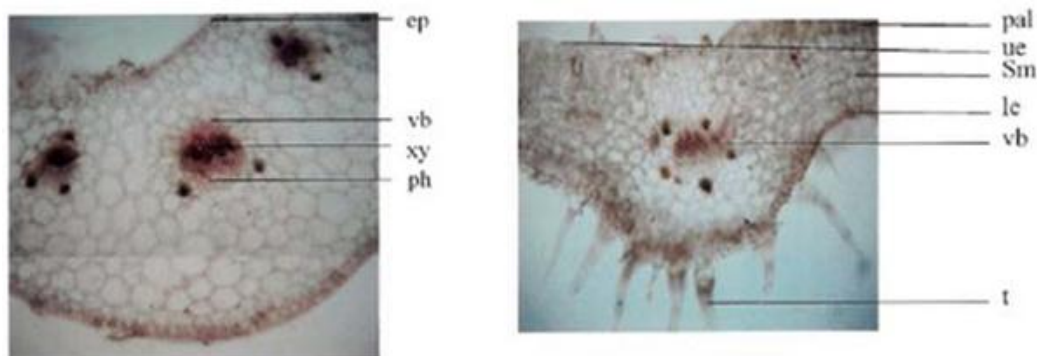
Petiole

Kidney shaped towards the distal end and crescent shaped towards the laminal side. Single layered epidermis covered with cuticle and interrupted by simple, multicellular, 3-5 celled trichomes. Hypodermis 1-2 celled collenchymatous. Ground tissue parenchymatous; vascular bundles 5, the size of the vascular bundles various from centre to margin i.e. Large too small. These are centripetal i.e. xylem surrounded by the phloem.

Leaf

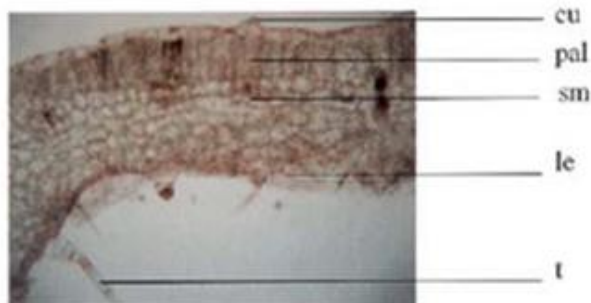
T.S. leaf is dorsi ventral, epidermis single layered on both the surfaces and covered with thick cuticle. T.S. passing through the mid rib region shows slight depression on ventral side and slightly protuberated on dorsal size. Trichomes are simple, multicelled (3-6 celled) and more in number on dorsal side. The basal cells of the Trichome are swollen and Trichome looks like claw. Meristeel consists of single centrally located collateral vascular bundle surrounded by some parenchymatous cells filled with dark content. T.S. passing through the laminar region shows single layered palisade cells just below the appear epidermis followed by 5-7 celled mesophyll parenchyma mostly devoid of inter cellular spaces.

Figure 1: Microscopy of *Tridax procumbens* leaf and petiole

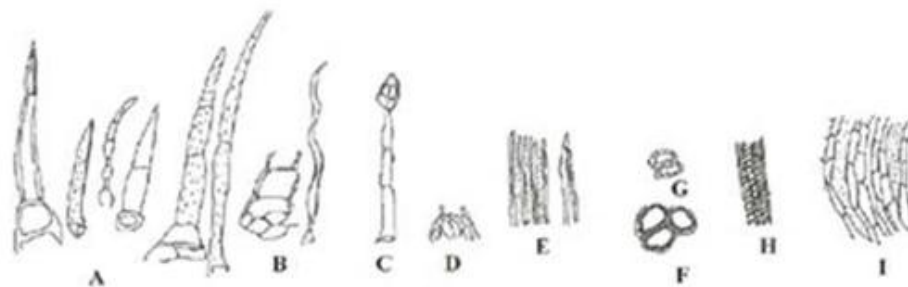


T.S. petiole

T.S. Leaf passing through midrib region

*Tridax procumbens* (Whole plant)

T.S. leaf passing through laminar region



Abbreviations: cu, cuticle; le, lower epidermis; pal, palisade cells; sm, spongy mesophyll; t, Trichome; vb, vascular bundle. Powder A – I (A and B, simple Trichome; C, glandular Trichome; D, Trichome base; E, laticifers and vessels; F and G, stone cell; H, spiral vascular bundle; I, laticifers and with adjacent parenchyma)

PRE-PHYTOCHEMICAL STUDY

Chemical tests were carried out on the aqueous extract and on the powdered specimens using standard procedures to identify the phyto constituents as described by Sofowara (1993), Trease and Evans (1989) and Harborne (1989)

Table 4 pre-phytochemical study of tridax plant

S.No	Phytochemicals	Presence/Absence
1	Alkaloids	+
2	Tannin	+
3	Saponin	+
4	Steroid	-
5	Phlobatannin	-
6	Terpenoid	-
7	Flavonoid	+
8	Cardic glycoside	-

PHARMACOLOGICAL STUDY

Literature review contains pharmacological activities of different parts of *Tridax procumbens* plants. With the help of the literature and studying of the different articles its came into the knowledge that Tridax plant has most of the pharmacological activities in different plant parts. In this review some pharmacological activities (Mundada and Shivhare, 2010) are described .Following are some pharmacological activities of tridax plant on which work has been reported:

Hepatoprotective Activity

The hepatoprotective activity of aerial parts of *Tridax* shows significant protection in alleviation of D Galactosamine/Lip polysaccharide (D-GalN/LPS) induced hepatocellular injury 7. D-GalN/LPS have been proposed to be hepatotoxic due to its ability to destruct liver

cells. The multifocal necrosis produced by D-GalN and the lesion of viral hepatitis in humans are similar. This amino sugar is known to selectively block the transcription and indirectly hepatic protein synthesis and as a consequence of endotoxin toxicity, it causes fulminant hepatitis within 8 hr after administration. (Mundada and Shivhare, 2010)

Anti diabetic Activity

The knowledge of diabetes mellitus, as the history reveals, existed with the Indians since from prehistoric age. Madhumeha another name of diabetes in which a patient passes sweet urine and exhibits sweetness all over the body in the form of sugar, i.e., in sweat, mucus, urine blood, etc. from ancient time various herbs were practically used for lowering of blood glucose level as such or in juices form. Aqueous and alcoholic extract of leaves of *Tridax* showed a significant decrease in the blood glucose level in the model of alloxan-induced diabetes in rats. (Bhagwat, et al, 2008)

Immunomodulatory Activity

Ethanol extracts of leaves of *Tridax* have immunomodulatory effect on Albino rats dosed with *Pseudomonas aeruginosa* also inhibits proliferation of same (Oladunmoye, 2006). Also a significant increase in phagocytic index, leukocyte count and splenic antibody secreting cells has been reported to ethanol insoluble fraction of aqueous extract of *Tridax*. Stimulation of humoral immune response was also observed along with elevation in hemagglutination antibody titer. Study also reveals that *Tridax* influences both humoral as well as cell mediated immune system. (Tiwari, et al, 2004)

Antimicrobial Activity

Whole plant of *Tridax* has reported for its antimicrobial activity on various species of bacteria. A whole plant is squeezed between the palms of hands to obtain juice. Fresh plant

juice is applied twice a day for 3-4 days to cure cuts and wounds. The extract of whole plant of *Tridax* showed antibacterial activity only against *Pseudomonas aeruginosa*. The disk diffusion method was used to test the antibacterial activity. Four strains of bacteria employed in test were two-gram positive *Bacillus subtilis*, *Staphylococcus aureus* and two gram negative *Escherichia coli* and *Pseudomonas aeruginosa*. (Mahato and Chaudhary, 2005)

Wound Healing Activity

Wound healing involves a complex interaction between epidermal and dermal cells, the extra cellular matrix, controlled angiogenesis and plasma-derived proteins all coordinated by an array of cytokines and growth factors (Bhat, et al, 2007). *Tridax* antagonized antiepithelization and tensile strength depressing effect of dexamethasone (a known healing suppressant agent) without affecting anticontraction and antigranulation action of dexamethasone. Aqueous extract was also effective in increasing lysyl oxidase but to a lesser degree than whole plant extract. Further it has been shown that extract of leaves of this plant also promotes wound healing in both normal and immunocompromised (steroid treated) rats in dead space wound healing model. The plant increase not only lysyl oxidase but also, protein and nucleic acid content in the granulation tissue, probably as a result of increase in glycosamino glycan content (Nia, et al, 2003)

Cardiovascular Activity

The cardiovascular effect of aqueous extract from the leaf of *Tridax* was investigated on anaesthetized *Sprague-Dawley* rat. The aqueous extract caused significant decreases in the mean arterial blood pressure in a dose-related manner, i.e. the extract caused greater decrease in the mean arterial blood pressure at higher dose than at lower dose also higher dose leads to significant reduction in heart rate whereas lower dose did not cause any changes

in heart rate .It means that a leaf of *Tridax* has hypertensive effect. (Salahdeen,et al, 2004)

Anti-malarial Activity

In one study, essential oils extracted by steam distillation from leaves *Tridax* were evaluated for its topical repellency effects against malarial vector *Anopheles stephensi*(*An. Stephensi*) in mosquito cages. All essential oils were tested at three different concentrations (2, 4 and 6%). Of these, the essential oils of *Tridax* exhibited relatively high repellency effect (>300 minutes

at 6% concentration) and concluded that *Tridax* are promising as repellents at 6% concentration against *An. Stephensi*' (Rajkumar and Jebanesan, 2007)

Anti-inflammatory and Antioxidant Activity

Tridax also reported for its anti-inflammatory and anti-oxidant activity when DPPD (2, 2 – diphenyl-1-picrylhydrazyl hydrate) and HET – CAM (Hen's egg chorioallantoic membrane) assay were done. (Nia,et.al, 2003)(Table 1.5)

Table 5: List of various Pharmacological activity of parts of plant *Tridax procumbens*

Plant part	Pharmacological activity	Reference
Whole plant	Antimicrobial activity against both gram-positive and gram-negative bacteria,	R.B. Mahato and R.P. Chaudhary 2005.
	Anti-coagulant	Mohammed Ali et.al, 2001
	Anti-inflammatory	R. Nia et.al. 2003
Flowers, Leaves	Antiseptic, Insecticidal, , Parasiticial,	V. K. Saxena and Sosanna Albert, 2005
	Hepatoprotective,	Vilwanathan Ravikumar et.al. 2005
	Wound healing	Rajinderraina, et.al., 2008
	To check haemorrhage from cuts, bruises and wounds	V. K. Saxena and Sosanna Albert, 2005
	Hypotensive activity	Salahdeen H. M. et.al. 2004
	Antidiabetic activity	Bhagwat D.A., et.al., 2008.
	To prevent falling of hair and promote the hair growth.	V. K. Saxena and Sosanna Albert 2005;
	Dysentery, Diarrhoea.	V. K. Saxena and Sosanna Albert 2005;
Against conjunctivitis Immunomodulating property	R. Nia et.al. 2003.	
Insect repellent activity	Umesh Tiwari et.al. 2004, M.K. Oladunmoye et.al. 2006. Rajkumar, S. and Jebanesan, A., 2007	

CONCLUSION

Tridax procumbens Linn. (Compositae) is found throughout India, it is native of tropical America and naturalized in tropical Africa, Asia, and Australia. This plant widely distributed and it's each and every part having noble pharmacological activity. The work done till to date on its Pharmacognostical, pre-phytochemical and pharmacological activities like hepatoprotective effect, immunomodulating property, promising wound healing activity, antidiabetic, hypotensive effect, antimicrobial, insect repellent activity, anti-inflammatory and antioxidant, bronchialcatarrh, dysentery, diarrhoea also prevent falling of hairs and leads to hair growth promotion. This plant also used as bioadsorbent for removal of Cr (VI) from the industrial wastewater (summarized in Table 5). This is dispensed for "Bhringraj" by some of the practitioners of Ayurveda. In future, there is huge room for research in direction of more pharmacological activities of plant and to elucidate the mechanism of action of same. The studies on plant *Tridax procumbens* Linn. also desired development of novel therapeutic agents isolated from it, as isolation of oleanolic acid a single triterpenoids is reported from this plant.

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