

REVIEW ARTICLE

Pharmacognostical, Phytochemical and Pharmacological Review on *Tridax procumbens* Linn

Shankul Kumar*¹, Anuradha Prasad¹, S.V.Iyer¹ and Santosh Vaidya²

¹Department of Pharmacognosy and Phytochemistry, GHB Pharmacy College, Aniyad (Gujarat), India

²Department of Pharmacology, C.U Shah College of Pharmacy, Wadhawan city, (Gujarat), India

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ABSTRACT

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. The Pharmacognostical studies give pharmacopoeial standards like physical constant, leaf constant. The phytochemical screening revealed the presence of alkaloids, carotenoids, flavonoids, fumaric acid, β -sitosterol, saponins and tannins. It is richly endowed with carotenoids, saponins, oleanolic acid and ions like sodium, potassium and calcium. Luteolin, glucoluteolin, quercetin and isoquercetin have been reported from its flowers.

It has known for its number of pharmacological activities like hepatoprotective activity, anti-inflammatory, wound healing, antidiabetic activity, hypotensive effect, immunomodulating property, anticancer activity, antioxidant activity, bronchial catarrh, dysentery, diarrhoea and to prevent falling of hair promotes the growth of hair, and antimicrobial activity against both gram-positive and gram-negative bacteria. The leaf juice possesses antiseptic, insecticidal and parasiticidal properties, as a remedy against conjunctivitis and is used also to check haemorrhage from cuts, bruises and wounds insect repellent. This review focus on folk occurrence and the wide phytochemicals and pharmacological activities of weed *Tridax procumbens*.

Key words: *Tridax procumbens*, Weed, leaf constant, antioxidant, anticancer.

INTRODUCTION

Tridax procumbens Linn. (*Tridax*) family Compositae commonly known as ‘Ghamra’ and in English popularly called ‘coat buttons’ because of appearance of flowers has been extensively used in Ayurvedic system of medicine for various ailments and is dispensed for “Bhringraj” by some of the practitioners of Ayurveda which is well known medicine for liver disorders [1]. The plant is native of tropical America and naturalized in tropical Africa, Asia, Australia and India. It is a wild herb distributed throughout India.

India has an ancient heritage of traditional medicine. Materia medica of India provides lots of information on the folklore practices and traditional aspects of therapeutically important natural products. Indian traditional medicine based on various systems including Ayurveda, siddha, and unani. The evaluation of these drugs is mostly based on,

- Pharmacognostical investigation

- Phytochemical investigation
- Pharmacological investigation

Plant review:



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: *Tridax* L. – tridax
Species: *Tridax procumbens* L. – coat buttons

*Corresponding Author: Shankul Kumar, Email: Kumar.sankul@gmail.com

Synonym:

Hindi: Khal muriya, Tal muriya, Ghamra

Sanskrit: Jayanti Veda

English: Coat buttons, Tridax Daisy, Wild daisy

Oriya: Dagadi pala

Marathi: Gaddi Chemanthi

Tamil: Vettukaya thalai, Thatha

Telugu: Gayapu aku, Gaddi chamanthy or Palaka aku.

DESCRIPTION

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 achenes, upto 1500 per plant, and each achene can catch the wind in its pappus and be carried some distance. This weed can be found in field, meadows, croplands,

Table 2: Physicochemical constant

Sample identity	%LOD	% Total Ash	Acid insoluble ash %	Water soluble ash %	Water soluble Extractive value%	Alcohol soluble Extractive value%
leaves	13	11.88	3.05	2.14	28.16	07.17

Phytochemical Review:

The phytochemical screening revealed the presence of 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^[4]. 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^[5]. Oleanolic acid was obtained in good amounts from *Tridax* and found to be a potential antidiabetic agent when tested against α -glucosidase^[6].

- The ethyl acetate soluble part of hexane extract of *Tridax procumbens* yielded a new bis-bithiophene named tridbisbithiophene along with four known terpenoids: taraxasteryl acetate, beta-amyrone, lupeol and oleanolic acid^[7].
- Two new flavones, 8,3'-dihydroxy-3,7,4'-trimethoxy-6-O- β -D-glucopyranosyl flavone and 6,8,3'-trihydroxy-3,7,4'-trimethoxyflavone were isolated from *Tridax procumbens* Linn., together with the four known compounds puerarin, esculetin, oleanolic acid and betulinic

disturbed areas, lawns and road side area as with tropical or sub tropical climates^[2].

Quantitative Microscopy^[3]:

Quantitative microscopy includes stomatal number, stomatal index, palisade ratio, vein-islet number and vein termination number. The value obtained for leaf constant is tabulated in (Table 1).

Table 1: Quantitative microscopy

Sample Identity	Stomatal index		Vein-islet No. per mm ²		Vein termination No. per mm ²	
	upper	lower	upper	lower	upper	Lower
Leaves	30.12	36.31	32.33	20.66	32.66	19.66

Physicochemical parameters^[3]:

Physicochemical parameter includes moisture content, total ash, acid insoluble ash, water-soluble ash, water-soluble extractive and alcohol soluble extractive. The values for physicochemical parameter are tabulated in (Table 2).

acid. The structures of the two new flavones were elucidated based on chemical analysis and spectral methods (IR, 1D and 2D NMR, ESI-MS, HR-ESI-MS)^[8].

- A new flavonoid (procumbetin), isolated from the aerial parts of *Tridax procumbens*, has been characterized as 3,6-dimethoxy-5,7,2',3',4'-pentahydroxyflavone 7-O-beta-D-glucopyranoside on the basis of spectroscopic techniques and by chemical means^[9].
- Two water-soluble polysaccharide fractions, WSTP-IA and WSTP-IB were purified from the leaves of *Tridax procumbens* Linn. with graded ethanol precipitation followed by mild delignification and size-exclusion chromatography. WSTP-IA contained L-Araf and D-Galp in approximately 1:3 molar proportions, and WSTP-IB contained only D-Galp as the major sugar component. The results of methylation linkage analysis, and 1H and 13C NMR studies on the native and modified polysaccharides, indicated that WSTP-IA is an L-arabino-D-galactan with a beta-(1->6)-D-galactan main chain in which at

least one in every two D-Galp residues carries single residues of either L-Araf (alpha-/beta-) or beta-D-Galp end-group as substituents at O-3. WSTP-IB is a linear beta-(1->6)-D-galactan^[10].

Table 3: Qualitative Profile of Phytochemicals Found in *Tridax procumbens* Leaves

S. No	Phytochemical	Status
1	Alkaloids	+
2	Carotenoids	++
3	Flavonoids	
3a	C catechin	+
3b	C flavone	+
4	Saponins	+
5	Tanins	++

Key: + = moderately present; ++ = highly present

Pharmacological review:

Hepatoprotective Activity

The hepatoprotective activity of aerial parts of *Tridax* shows significant protection in alleviation of D-Galactosamine/Lipopolysaccharide (D-GalN/LPS) induced hepatocellular injury^[11]. 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.

Immunomodulatory Activity

Ethanol extracts of leaves of *Tridax* have immunomodulatory effect on Albino rats dosed with *Pseudomonas aeruginosa* also inhibits proliferation of same^[13]. 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^[12].

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^[14]. *Tridax* antagonized anti-epithelization 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^[15].

Antidiabetic 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^[1].

Antiobesity activity

In atherogenic diet induced obesity model, the rat receiving treatment with *Tridax procumbens* showed significant reduction in total cholesterol, triglycerides total protein, free fatty acids and elevation of high density lipoprotein cholesterol. *Tridax procumbens* was found to possess significant antiobesity activity^[16].

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*^[17].

Anti Inflammatory and Analgesic Activity

The analgesic activity is evaluated by two analgesic and one inflammatory *in vivo* pain Models, male C57 BL6/J mice (25-30g) and male Sprague-Dawley rats (150-230g) was selected for this study. In the formalin test, late phase of moderate pain, which starts about 20 min after formalin injection and lasts about 40 min to 60 min, appears to be caused by tissue and functional changes in the dorsal horn of the spinal cord, Administration of extract demonstrated significant

inhibition in late phase Similarly, In the acetic acid-induced abdominal constriction test, T.P extract dose-dependently and significantly reduced the abdominal writhing. In CFA Induced Hyperalgesia Oral administration of T.P extract significantly reduced mechanical hyperalgesia in CFA injected rats. So, it has been observed that *Tridax procumbens* has marked beneficial effects against centrally, peripherally and inflammatory pain models. This protective action may be attributed towards the presence of flavanoid and sterol indicates that the extract of *Tridax procumbens* may be used as an effective analgesic [18].

Anticancer Activity

The effect of anti-cancer activity of traditional plant *Tridax procumbens* flower crude aqueous and acetone extract was tested on Prostate epithelial cancerous cells PC 3 was determined by measuring cell viability by MTT assay. Experiment consists of cleavage of the soluble yellow coloured tetrazolium salt MTT [3-(4, 5-dimethyl-2-thiazole-yl)-2, 5-diphenyl tetrazolium bromide] to a blue coloured formazan by the mitochondrial succinate dehydrogenase. The assay is based on the capacity of mitochondrial enzymes of viable cells to reduce the yellow soluble salt MTT to purple blue insoluble formazan precipitate which is then quantified spectrophotometrically at 570nm. The results of this analysis revealed the fact that flower crude extract has anti-cancer activity [19].

Antioxidant activity

The free radicals scavenging activity of the *Tridax procumbens* fractions and Ascorbic acid was measured in terms of hydrogen donating or radical-scavenging ability using the stable radical DPPH²⁰⁻²³. 0.1 mM solution of DPPH in methanol was prepared and 1.0 ml of this solution was added to 3.0 ml of extract solution in water at different concentrations (10-100 µg/ml). Thirty minutes later, the absorbance was measured at 517 nm. Lower absorbance of the reaction mixture indicates higher free radical scavenging activity. The capability to scavenge the DPPH radical was calculated by using following equation:

Scavenging Effect (%) = $[1 - \text{Abs. of Sample} / \text{Abs. of Control}] \times 100$

The antioxidant activity of the fractions was expressed as IC₅₀. The IC₅₀ value was defined as the concentration (in µg/ml) of methanolic extract fractions that indicates the formation of DPPH radicals by 50% [21].

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