

# A Concise Review on Biological Activity of *Tridax procumbens* Linn

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## Abstract

*Tridax procumbens* Linn belongs to the family asteraceae. The extracts of *Tridax procumbens* have been used as indigenous medicine for a variety of ailments. It has been extensively used in Indian traditional medicine for wound healing, as anticoagulant, antifungal and insect repellent, in diarrhea and dysentery. Leaf extracts are used to treat infectious skin diseases in folk medicines. It is also dispensed as 'Bhringraj' which is well known ayurvedic medicine for liver disorders. Antioxidant, antimicrobial, anti-inflammatory and immune modulatory properties have also been demonstrated. Plants have strong ability to synthesize aromatic substances, most of which are phenols or their oxygen substituted derivatives which are mostly secondary metabolites. At least 12,000 have been isolated, a number estimated to be less than 10% of the total. These substances serve as plant defense mechanisms against predation by microbes, insects, herbivores. Some terpenoids are plant pigment, some are plant flavoring agents and some are having medicinal properties.

**Keywords:** *Tridax procumbens*; Biological activity; Plant extract; Medicinal plants

## Introduction

*Tridax procumbens* is a species of flowering plant belonging to family asteraceae and is the most potent species among 30 species. It is best known as widespread weed and pest plant. It is native to the tropical Americas but it has been introduced to tropical, subtropical and mild temperate regions worldwide. It is listed as a noxious weed in the United States and has a pest status. Some of the medicinally important species of the genus *Tridax* are: *T. angustifolia*, *T. serboana*, *T. bicolor*, *T. accedens*, *T. dubia*, *T. erecta* and *T. rosea*.

## Scientific classification

Kingdom: Plantae

Division: Angiosperms

Order: Asterales

Family: Asteraceae

Genus: *Tridax*

Species: *Procumbens*

Binomial name: *Tridax procumbens* Linn.

The plant bears white or yellow flowers with three toothed ray florets. The leaves are toothed and generally anchor shaped. Its fruit is 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 to some distance. This weed can be found in fields, meadows, crop lands, disturbed areas, lawns and roadsides in areas with tropical or semitropical climate [1].

A survey of literature revealed isolation of tannins, flavonoids, glycosides, isoflavonoids, steroids, saponins, lipids, phospholipids, resins, sterols, reducing sugars, phenols, anthraquinone and catechol [2].

*Tridax procumbens* is employed as indigenous medicine for a variety of ailments. It has been extensively used in Indian traditional medicine for wound healing, as anticoagulant, antifungal and insect repellent, in

diarrhea and dysentery [3]. Leaf extracts are used to treat infectious skin diseases in folk medicines. It is also dispensed as 'Bhringraj' which is well known ayurvedic medicine for liver disorders [4]. Antioxidant properties have been demonstrated [5], also hair growth promoting activity have been analyzed [6].

## Biological studies

As *Tridax procumbens* is employed as indigenous medicine for the variety of ailments, the biological activities surveyed are: During the anti-inflammatory activity of *Tridax procumbens* extracts, the significantly reduced parameters like exudate volume leukocyte migration, edema fluid, granuloma tissue and  $\gamma$ -glutamyl transpeptidase depicted the good anti-inflammatory action of this plant. Furthermore, the results suggest that *Tridax procumbens* has negligible ulcerogenic property and causes anti-inflammatory activity through inhibiting SRs and PGs [7].

The hypoglycemic rats in 95% ethanolic extract of *Tridax procumbens* (TP) were tested. In addition some of TP-1 extract was suspended in water and was then partitioned with ether and n-butanol, respectively. After solvents were evaporated, four fractions of T.P. were obtained, ether (TP-2.1), n-butanol (TP-2.2), emulsion (TP-2.3) and aqueous fraction (TP-2.4). The hypoglycemic properties of the ethanolic extract (TP-1) and its fraction were evaluated. The search was pursued in normoglycemic and alloxan-diabetic rats. The blood sugar level of diabetic rats were reduced by 10-17%, however this extract has no effect on fasted blood sugar level of the normal rats. Moreover, oral administration of TP-2-1 could improve both oral and intraperitoneal glucose tolerance of normoglycemic rats. Taken together, these results

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suggest that *Tridax procumbens* contains hypoglycemic compound(s) which could be isolated by solvent fractionation [8].

The n-hexane extract of the flowers of *Tridax procumbens* exhibited activity against *Escherichia coli* while that of ethyl acetate extract was active against *Bacillus cereus* and *Klebsiella sp.* The same extract of the whole aerial parts were active against *Mycobacterium smegmatis*, *Escherichia coli*, *Salmonella group* and *Salmonella paratyphi*. The aerial part extract also showed activity only against *M. smegmatis* and *S. aureus*, while the aqueous extract showed no antimicrobial activity [9].

Study on the cardiovascular effects of aqueous extract from the leaves of *Tridax procumbens* on anaesthetized Sprague-Dawley rat showed that the intravenous administration of 3, 6 and 9 mg/kg of the aqueous extract caused significant decrease in the mean arterial blood pressure in a dose related manner that is the extract caused greater decrease in the mean arterial blood pressure at higher dose than at lower dose. Also, higher doses of the extract 6 mg/kg and 9 mg/kg caused significant reductions in the heart rate while lower dose of the extract 3 mg/kg did not cause any significant change in the heart rate. The hypotensive and the bradycardiac effects were immediate. These results therefore seemed to support the claim that the leaves of *Tridax procumbens* has hypotensive effect and that the mechanism of its action is possibly through activation of muscarinic cholinergic receptors [10].

A study was carried out to assess the effect of chloroform insoluble fraction of ethanolic extract of *Tridax procumbens* against D-galactosamine/ lipopolysaccharide (D-galn/LPS)-induced hepatitis in rats. Induction of rats with D-galn/LPS (300 mg/kg body weight) leads to a marked increase in lipid peroxidation as measured by thiobarbituric acid: a reactive substance in liver. Further there was a decline in the activities of enzymic antioxidants such as *superoxide dismutase*, *catalase*, *glutathione peroxidase*, *glutathione s-transferase* and the levels of non-enzymatic antioxidants namely reduced glutathione, vitamin C and vitamin E. These biochemical alterations were normalized upon pre-treatment with *Tridax procumbens* extract. The results suggest that *Tridax procumbens* is very effective in alleviating the D-galn/LPS-induced oxidative stress suggesting its antioxidant property [11].

The immune modulatory properties of ethanolic leaf extract of *Tridax procumbens* on swiss albino rats orogastrically dosed with *Pseudomonas aeruginosa* was analysed. The results showed that ethanolic leaf extract of *Tridax procumbens* has immunomodulatory properties and it is able to inhibit proliferation of *Pseudomonas aeruginosa* [12].

The essential oils extracted by steam distillation from leaves of *Tridax procumbens* were found to be promising as repellents against *Anopheles stephensi* and could be useful in the search for new natural repellent compounds [13].

Dried aqueous, alcoholic and pet-ether extract of leaves of *Tridax procumbens* were subjected for hypoglycemic activity in *wistar* rats (150-200 g) and blood sugar level was determined by glucometer. The oral administration of leaf extract at doses of 200 mg/kg body weight. leads to sufficient blood sugar reduction. These results show that *Tridax procumbens* is anti-diabetic in nature [14].

The haemostatic activity of various extracts of leaves of *Tridax procumbens* were screened by studying at a time of ten human volunteers employing Lee-White's method performed *in vitro*. Out of ethanolic and petroleum ether extract, ethanolic extract showed positive activity. The results suggest that the *Tridax procumbens* plant

possesses haemostatic activity [15].

Aqueous methanolic extracts of *Tridax procumbens* exhibited inhibitory activity against *Staphylococcus aureus* strains indicating good antimicrobial activity. The activity was done by agar-disc and well diffusion method [16].

The anti-inflammatory activity of *Tridax procumbens* was carried out on carrageenin-induced paw edema along with standard drug, Ibuprofen. The ibuprofen significantly reduced paw edema. The oral administration equi-effective dose of *Tridax procumbens* revealed about 20-35% more activity than the one rendered by Ibuprofen. The effect of *Tridax procumbens* along with various dose regimen of Ibuprofen showed greater anti-inflammatory activity than the Ibuprofen alone [17,18].

The anti-hyperglycemic potential of *Tridax procumbens* was also evaluated during which oral administration of acute and sub-chronic doses (250 and 500 mg/kg body weight) of ethanolic extract of *Tridax procumbens* showed a significant reduction in fasting blood glucose levels in diabetic rats. The results were compared with the standard drug Glibenclamide (10 mg/kg body weight) [19].

The free and bound flavonoids of different parts of *Tridax procumbens* for their antimicrobial activity using "disc diffusion" assay against two gram negative bacteria (*Escherichia coli* and *Proteus mirabilis*), one gram positive bacteria (*Staphylococcus aureus*) and a fungus (*Candida albicans*) were studied. This plant exhibited broad spectrum antimicrobial activity and the results indicate that *Tridax procumbens* can be exploited for future antimicrobial drugs [20].

The anti-bacterial analysis of *Tridax procumbens* against different bacterial strains was analysed by comparing minimum inhibitory concentration and zone of inhibition with that of standard antibiotic discs of Vancomycin. The results suggest that extract of *Tridax procumbens* has anti-bacterial properties [20].

The results from the investigation of the effect of *Tridax procumbens* on the weight, packed cell volume and plasma electrolyte profiles of salt loaded rats. The results suggest that the anti-hypertensive action of *Tridax procumbens* may be mediated via reduction of weight and alteration of plasma sodium and potassium levels and in addition suggests its use in the management of obesity and diabetes mellitus [21].

The reducing power ability analysed for antioxidant activity using the 1, 1-diphenyl-2-picrylhydrazyl (DPPH) assay and for total phenolics using Follian-ciocalteu method. The ethanolic extract showed that *Tridax procumbens* has a percentage antioxidant activity of 96.70 which was observed to be higher than that of gallic acid (92.92) and ascorbic acid (94.81) used as standards. The total phenolic determination shows that *Tridax procumbens* has a phenolic content of 12 mg/g GAE (Gallic acid equivalent). The reductive potential determination shows that *Tridax procumbens* has very significant reductive potential of 0.89 nm at the same concentration with gallic acid whose reductive potential was 0.99 nm. The results of these analyses revealed the fact that plants are rich source of natural antioxidant [5].

The toxicity of ethanolic extract of *Tridax procumbens* in rats at a dose level of 300 mg/kg body weight was designed to study. It was observed that daily administration of extract showed significant decrease in level of blood sugar. Simultaneously, percent of haemoglobin was also determined and it was observed that percent of haemoglobin does not show significant changes after daily and single administration of dose [22].

A protocol for the callus induction in *Tridax procumbens* from various explants like leaf, internodes and shoot apical buds was developed. The sterilized explants were inoculated in MS-media containing various combination of auxins such as 2,4-dichlorophenoxy acetic acid (2,4-DPA), naphthalene acetic acid (NAA) and cytokinins such as kinetin and 6-benzyl amino purine (BAP). Leaf and apical bud explants showed early and profuse callus induction whereas internodal explants showed comparatively delayed but profuse callus induction. *In vitro*, generated callus can be used as source for the isolation of secondary metabolites from *Tridax procumbens* [23].

The antifungal effect of *Tridax procumbens* against *Helminthosporium oryzae*, *Rhizoctonia solani* and *Pyricularia oryzae* were checked. The radial growth of these fungal pathogens was significantly effected by 0.1% concentration of extract. The leaf extract has shown higher zone of inhibition in *H. oryzae* in comparison to the zone of inhibition values of *R. solani* and *P. oryzae* [24].

It was analysed that the standardized EtOAc, MeOH and 70% EtOH extracts of *Tridax procumbens* aerial parts showed significant inhibition of rat paw edema at a medium dose of 200 mg/kg and the EtOAc extract was the most active. The extracts were evaluated for COX-1 and COX-2 (cyclooxygenase) inhibitory activity and EtOAc extract exhibited the highest inhibition of COX-1 and COX-2 at 50 µg/ml. The results showed that the anti-inflammatory activity of *Tridax procumbens* of aerial parts could be at least in part due to COX-1 and COX-2 enzyme inhibition and free radical scavenging activities may be attributed to the presence of flavonoids and other polyphenols in the extract [25].

The phytoconstituents of *Tridax procumbens* responsible for effect on cellular and hormonal functions in mice were attempted to explore. The *in vitro* (phagocytosis) and *in vivo* (haemagglutination and delayed hypersensitivity) were used to study the effect of extract and fraction on the cellular and hormonal immunity. The results obtained indicate the ability of flavonoidal and saponin fraction of *Tridax procumbens* to modulate both cell mediated and the hormonal components of the immune system and explored the phytoconstituents responsible for immunomodulatory potential of *Tridax procumbens* [26].

The anti-microbial effect of aqueous and ethanolic leaf extracts of *Tridax procumbens* on rot causing fungi isolated from the infected tomato fruit parts viz: *Aspergillus niger*, *Rhizopus stolonifer*, *Fusarium oxysporum*, *Geotrichum candidium* revealed all the plant extracts both aqueous and ethanolic showed significant reduction of mycelia growth of isolated pathogens. Higher concentration of both the extracts favoured higher mycelia growth reduction [27].

### Phytochemical studies

The compounds isolated from various parts of *Tridax procumbens* (Figure 1) are listed in Table 1.

### Conclusion

The use of plants, both the wild and domesticated species has been recorded since ancient times in almost all major civilizations. Ayurveda has been known to be practiced in the Indian subcontinent since long. The specimen under consideration has also come to notice due to its already predominant use as wound healing, anticoagulant, antimicrobial, insect repellent, in diarrhea and dysentery. Leaf extracts are used to treat infectious skin diseases in folk medicines. It is also dispensed as 'Bhringraj' which is well known ayurvedic medicine for liver disorders. Antioxidant, antimicrobial, anti-inflammatory and

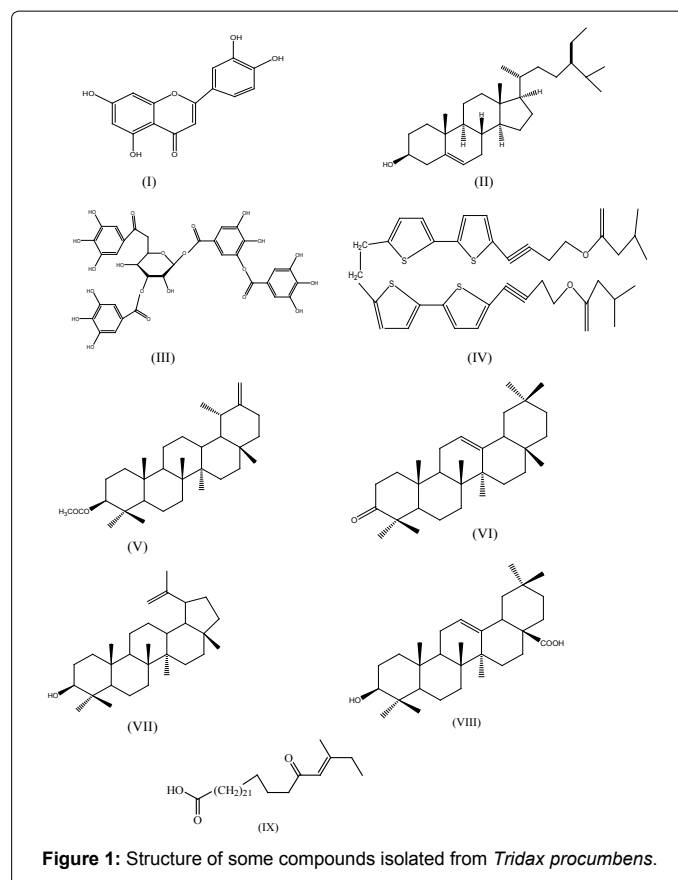


Figure 1: Structure of some compounds isolated from *Tridax procumbens*.

Compounds	Plant part
Luteolin (I) and Glucoluteolin; β-sitosterol (II) and Tannins (III).	Flowers
A flavones glycoside:- 5,7,4-trihydroxy-6,3-dimethoxy flavone 5-O-alpha-L-rhamnopyranoside and 3,6-dimethoxy-5,7,2,3,4-pentahydroxyflavone 7-O-β-glucopyranoside; 3S-16-17-didehydro falcariinol.	Leaves
A flavonoldiglycoside:- quercetagenin-3,6,4-trimethoxy-7-O-neohe speridoside (3S, 5R, 6S, 7E)-5,6-epoxy-3-hydroxy-7-megastigmen-9-one and Icariside. A polyacetylene:- 1,2-dihydrodendroarbores B, an enonederivative:- (3S, 5R, 6S, 7E)-3-tetradecanoate-5,6-epoxy-β-ionone along with Sodium, potassium, calcium, quercetin and isoquercetin.	Whole plant
Bis-bithiophene- tribisbithiophene (IV), taraxasteryl acetate (V), beta-amyrenone (VI), lupeol (VII), oleanolic acid (VIII).	
β-Sitosterol-3-O-β-D-xylopyranoside	
Methyl 14-oxooctadecanoate, Methyl 14-oxononacosanoate, 3-methyl nonadecylbenzene, Heptacosanyl cyclohexane carolyate, 1(2, 2-dimethyl-3-hydroxypropyl)-2-isobutylphthalate, 12-hydroxytetracosan-15-one, 32-methyl-30-oxotetracon-31-en-1-ol and 30-methyl-28-oxodotriacon-29-en-1-oic acid (IX).	
Water soluble novel polysaccharides; Sterols, Hydrocarbons, Saturated & Unsaturated fatty acids.	
Alkaloids, carotenoids, flavonoids, saponins and tannins and lipids.	

Table 1: Compounds isolated from *Tridax procumbens*.

immune modulatory properties have also been demonstrated.

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