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Tridaxprocumbens: A comprehensive review of its botany, ethanomedicine, phytochemistry and pharmacological significance

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Abstract:

Tridaxprocumbens is a perennial herb of the Asteraceae family, popularly known as "Coat Buttons" or "Wild Daisy". The herb is utilized in a traditional medicine for the treatment of a variety of diseases such as fever, problems with your digestive system, and also wound healing. This research main aims to provide an in-depth examination of T. procumbens' botany, ethnomedicine, phytochemistry, and pharmacological usefulness. Different biological activities have been identified and documented for the plant phytochemicals components, which include alkaloid, flavonoid, carotenoid, saponins, and tannins. T. procumbens has been extensively examined and reported to have antihypertensive, antioxidant, anti-diabetic, anti-cancer, anti-bacterial, and wound-healing properties.This review discusses T. procumbens' potential as a useful source of natural compound for the development of a novel medications and treatments. Further research is needed to fully explore the therapeutic potential of this plant and to validate its traditional uses.

Keywords: Tridaxprocumbens, botany, ethanomedicine, phytochemistry

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Introduction

T. procumbens is commonly known as 'Jayanti-Veda' in Sanskrit, Tikki-Kasa/'Kamra' in Hindi and 'Wild Daisy', 'Mexican Daisy' and 'Coat Buttons' in English based on the appearance of the flower family (Asteraceae)[1]. Local people knewit as “Ghamara”, and is dispensed for “Bhringraj” by some of the practitionersfor hair growth in Ayurved India has an ancient heritage of traditional medicine, Indian traditional medicine based on various systems including Ayurveda, siddha, and unani [2]. The scientific name is 'Tridaxprocumbens' . The common name is derived from Greek, meaning 'summer eating', indicating that it is a summer vegetable. T. procumbens is the most vigorous of the 30 species. It is popular as a weed and pest plant [3].Traditionally, Tridaxprocumbens has been in use in India for wound

healing and as an anticoagulant [4].TridaxprocumbensL.haslong been used as a traditional drink to treat liver illnesses, diarrhea, dysentery, and bronchial catarrh [5]. It is said that the entire plant and its seeds may be used to cure a number of illnesses, including bronchial catarrh, dysentery, diarrhea, hair loss prevention, and bleeding from wounds . According to pharmacological research, T. procumbens has anti-inflammatory, hepatoprotective, immunomodulatory, wound-healing, antibacterial, antiseptic, and hypotensive actions in addition to bradycardiac effects.anti-hyperglycemic property of Tridax [6] [7].also treatment of asthma, ulcer, piles and urinary problems [8].

Synonym:

Sn.	Language	Name	Reference
1.	Hindi:	Khalmuriya, Tal muriya, Ghamra	[1]
2.	Sanskrit:	Jayanti Veda	[2]
3.	English:	Coat buttons, Tridax Daisy, Wild daisy	[2]
4.	Oriya:	Dagadipala	[2]
5.	Marathi:	GaddiChemanthi	[2]
6.	Tamil:	Vettukayathalai, Thatha	[9][66]
7.	Telugu:	Gayapuaku, Gaddichamanthy or Palakaaku	[65][2]

Taxonomical Classification:

1.	Kingdom	Plantae – Plants	[67]
2.	Sub kingdom	Tracheobionta – Vascular plants	[68]
3.	Division	Spermatophyta	[16][10]
4.	Subdivision	Magnoliophyta – Flowering plants	[16]
5.	Class	Magnoliopsida – Dicleotydons	[16]
6.	Order	Asterales	[69]
7.	Subclass	Asteridae	[10]
8.	Family	Asteraceae – Aster family	[16]
9.	Genus	Tridax L. – tridax	[71]
10.	Species:	Tridaxprocumbens L. – Coat buttons	[14]

Morphological character:

Sn.	Part	Description	References
1.	**Appearance**	T.procumbens is a perennial herb that has a creeping stem which can reach from to (8-30) inches (20-75 cm) long	(fig. A). [74]
2.	**Foliage**	Leaves of T.procumbens are opposite, pinnate, oblong to ovate, and 1-2 inches (2.5-5 cm) long with cuneate bases, coarsely serrate margins, and acute apexes	[75]
3.	**Flowers**	T.procumbens has daisy-like flowers with white ray florets and yellow disc florets, 1-1.5 cm wide on 10-30 cm stalks. It features a capitulum inflorescence with tubular flowers and black achenes, 2.0-2.5 mm long, with feathery pappus. The plant flowers and fruits year-round.	(fig.B).[10]
4.	**Fruits**	The fruits are dark brown to black achenes, oblong, 2 mm long, with stiff hairs and a feathery pappus of bristles 3-6 mm long. At one end It has plume like white pappus.	[76] [77] (fig.C).
5.	**Seeds**	T. procumbens seeds germinate best at 35/25°C or 30/20°C with 58-78% light. They are sensitive to	(fig. D).[78]

		salt and water stress. The plant has a diploid chromosome number of 36 and a haploid number of 18, reproducing via spreading stems and seed production.	
6.	**Calyx**	It is represented by scales or reduced to pappus.	(fig. E).[79]
7.	**Leaves**	The leaves are irregularly toothed, arrowhead-shaped, simple, ovate, opposite, and lanceolate, measuring 3-7 cm. They have a wedge-shaped base, are shortly petioled, and hairy on both surfaces	(fig. F).[63]
8.	**Stem and root**	Stems are cylindrical, hispid, covered with multi-cellular hairs of mm; tuberculation at the base root is a strong taproot system. The plant stem is ascending 30-50 cm height, branched, sparsely hairy, rooting at nodes.	(fig.G) [63]

(A)Tridaxprocumbens

(B)Flower

(C) Fruit

(D) Seeds

(E) Calyx

(F) Leave

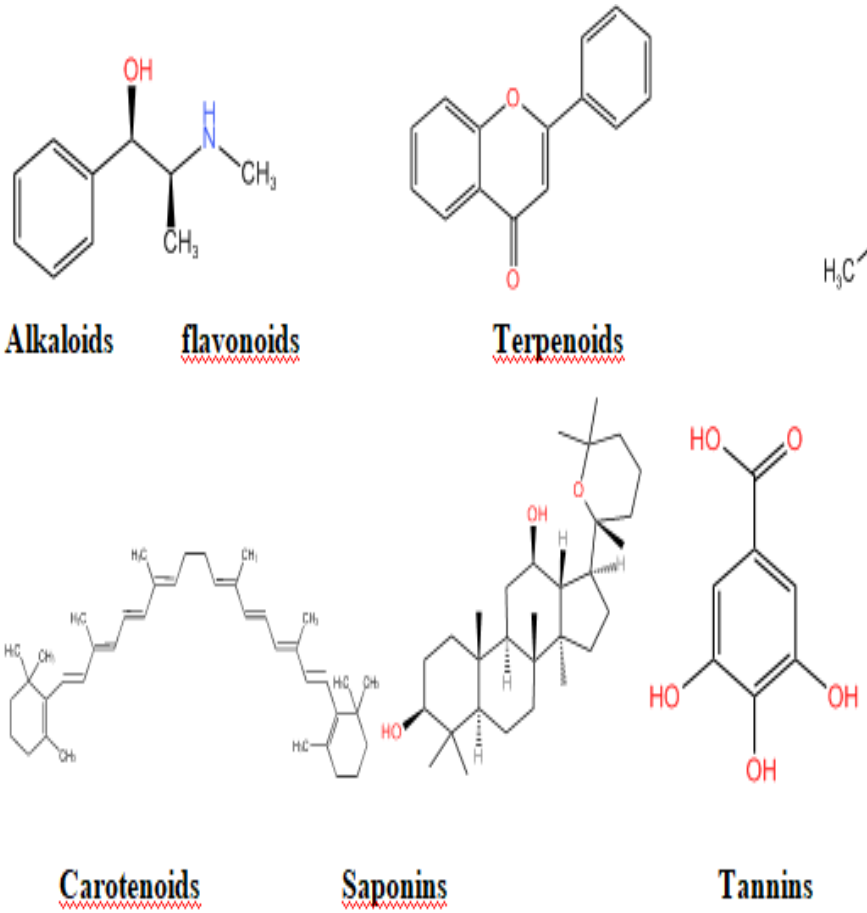
(G) Stem and Root

Geographical distribution

Tridaxprocumbeans is found in tropical and subtropical regions worldwide, including various parts of India [11]. Coat buttons is also found along roadsides, wastegrounds, dikes, railroads, riverbanks, meadows, anddunes. Its widespread distribution and importance as aweed are due to its spreading stems and abundant seed production [12]. It is one of the most potent species among the 30 species of the genus *Tridax* . It is originated in Mexico, Central America, and South America, although it may also be found in Tropical America, Africa, and Asia [13], also India, Nepal, and Nigeria[14], In India (Andhra Pradesh, Maharashtra, Madhya Pradesh and Chhattisgarh[15], Madhya Pradesh, Gujrat, Odissa, or other Indian states [14]. It is common grass found all over the world, growing primarily during raining season[17]and also China [21].

Phytochemical Constituents:

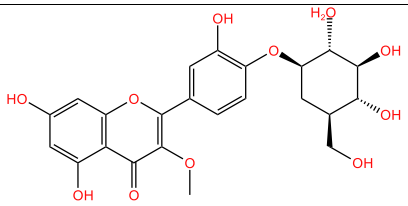
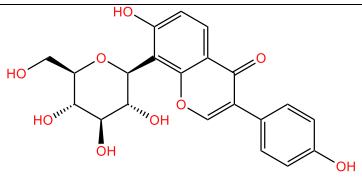
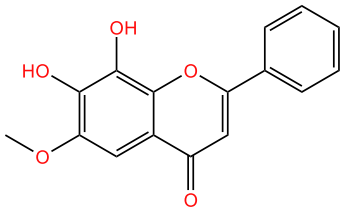
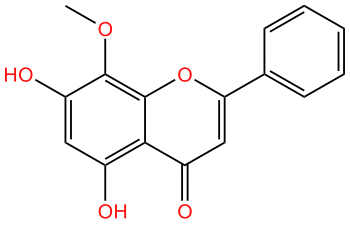
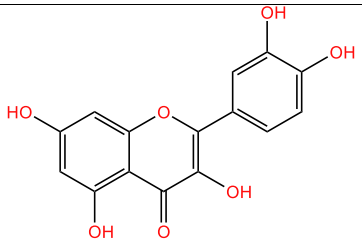
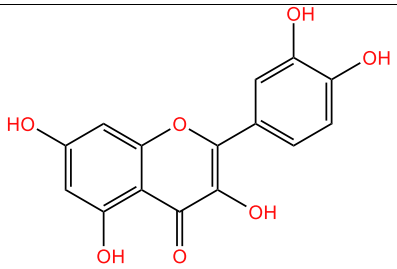
The plant's different components contain a variety of phytochemical compounds such as alkaloids, flavonoids, carotenoids, saponins, fumaric acid, and tannins [11].coumarins, , quinines, resins, Proteins and carbohydrates, steroids [19], Phenols, Glycosides Terpenoidswith their different activities [20]. specifically, The aerial components of the plant harbor crucial substances, including phytosterols like beta-sitosterol, stigmasterol, and campesterol.[73]

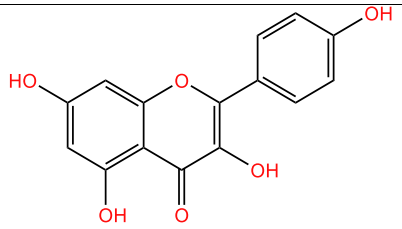
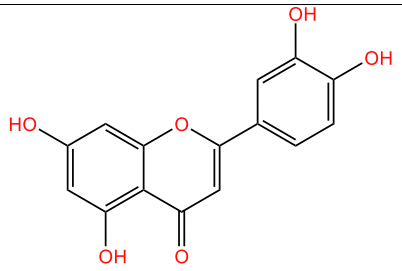


Phenolic compound (flavonoids)

Phytochemical studies showed that the T. procumbens is a rich source of flavonoids with a percentage of flavones and flavanones most commonly present. They are responsible for antioxidant, hepatoprotective, anticancer, antibacterial, wound healing properties. In addition, flavonoids play an important role to control the growth of toxin-producing

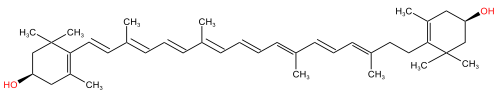
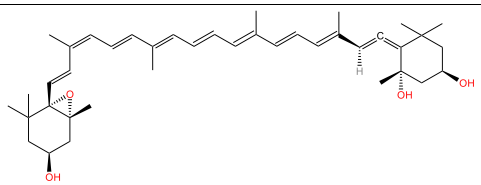
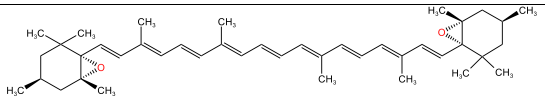
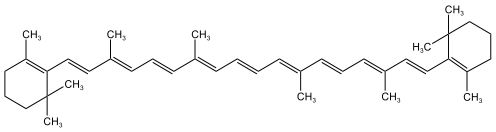
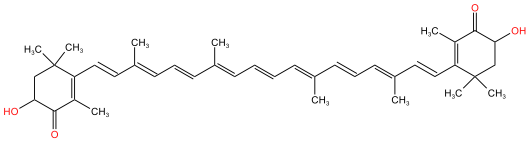
bacteria in plants [29]. anticoagulants, hair tonics, anti-fungal, against problems of bronchial catarrh, diarrhea, dysentery, and wound healing[32]

Sn.	Pytoconstituents	Structure	Activity	Reference
1.	3-O-Methylquerecetin-4'-O-β-D-glucopyranoside		Antibacterial	[23] [24]
2.	Puerarin		Antioxidant	[25]
3.	6-methoxy-7,8-dihydroxyflavon		Antioxidant	[26]
4.	Wogonin		Antioxidant	[26]
5.	Oroxylin		Antiinflammatory and Antioxidant	[26]
6.	Quercetin		Antioxidant Antiulcer activity	[14] [28][33][38]
7.	Kaempferol		Antioxidant Antimicrobial	[14][43]

				
8.	Luteolin		Anticarcinogenic activity anti-inflammatory	[35][36][37]

Carotenoids

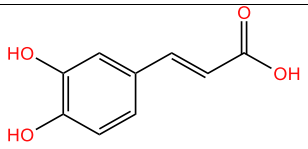
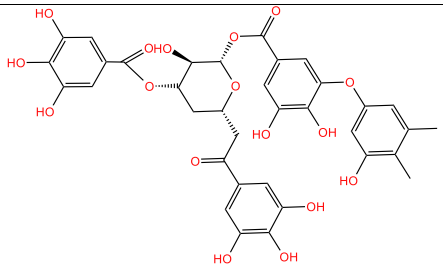
Carotenoids are fat-soluble pigments found in the leaves[22], The photoprotective properties have also been linked with the antioxidant properties of carotenoids [41].

Sn.	**Pytoconstituents**	**Structure**	**Activity**	**Reference**
1.	Lutein		Reduction of UV-induced erythema	[28] [10] [41]
2.	neoxanthin		anti-cancer, antioxidant	[28][82]
3.	Viola xanthin		Antioxidant Activities	[28][83]
4.	Carotene		Reduction of UV-induced erythema	[28][41]
5.	Astaxanthin		Antidiabetic Effect Anti oxidant	[45]

			Activity	

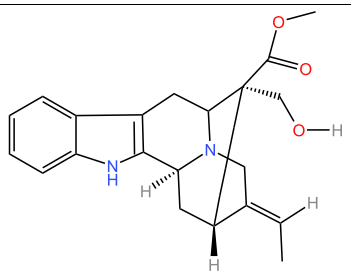
Tannins

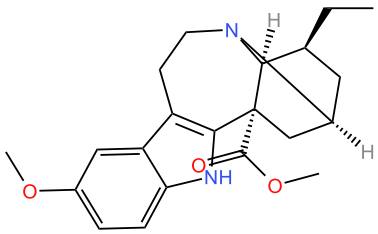
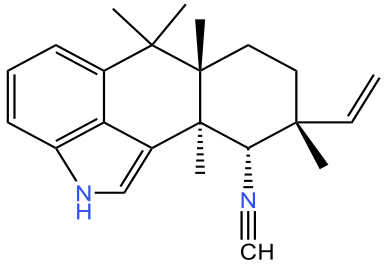
Tannins are naturally occurring water-soluble polyphenols found in plants. Tannins have anti-microbial properties, as well as anti-carcinogenic and anti-mutagenic properties, potentially because of their antioxidant capabilities [39].Tannins are present in the pedicle and buds of T. procumbens [42].

Sn.	Pytoconstituents	Structure	Activity	Reference
1.	Caffeic acid		Antioxidant, Anti-inflammatory and Anticarcinogenic activity	[28][84]
2.	Tannins		antimicrobial and antiviral activity	[31] [85]

Alkaloids

In a phytochemical screening analysis, using aqueous extraction of the leaves, thirty-nine alkaloids were present [42]. Alkaloids are defined as any class of nitrogenous organic compounds of plant origin that have pronounced physiological effects on humans. The presence of some alkaloids has also been reported in T. procumbens [34].

Sn.	Pytoconstituents	Structure	Activity	Reference
1.	akuammiddine		Antimicrobial Activity	[28] [42]

2.	Voacangine		Antimicrobial Activity	[28] [42]
3.	Hapalindoles		Antimicrobial Activity	[44]

Traditional uses:

Tridaxprocumbens L. (T. procumbens) belongs to the Asteraceae family, is an Ayurvedic herb of Asia with a history of traditional use [14], 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 [47]. Their traditional drink to treat liver illnesses, diarrhea, dysentery, and bronchial catarrh [5], malaria, high blood pressure and to check haemorrhage from cuts, bruises and wounds [48]. T. procumbens can serve as a good source of plant protein and potassium supplement, as well as being potential source of pro vitamin A [22]. Numerous antimicrobial screening evaluations have been published based on the traditional use of Chinese, African and Asian plant-based drugs [50]. Many aromatic plants have been used traditionally in folk medicine as well as to extend the shelf life of foods, showing inhibition against bacteria, fungi and yeast [51]. The juice extracted from the leaves is directly applied on wounds. Its leaf extracts were used for infectious skin diseases in folk medicines [4]. Tridaxprocumbens is traditionally used in the treatment of fever, typhoid fever, cough, asthma, epilepsy [53]. Indian traditional medicine as anticoagulant, anticancer, antifungal, and insect repellent [57]. The leaf juice shows antiseptic, insecticidal and parasiticidal properties, against conjunctivitis and is used also to check hemorrhage from cuts, bruises and wounds insect repellent.[60]

Pharmacological Properties:

Sn.	Activity	Mechanism	References
1.	**Anti hypertension**	Tridaxprocumbens has blood pressure lowering effect and this is probably mediated through activation of muscarinic cholinergic receptors	[52]
2.	**Anti-oxidant**	Polyphenols of Tridaxprocumbens has antioxidant activity, which can play an important role in neutralizing free radical and quenching oxygen or decomposing peroxides, Protect unsaturated fats in the body, that inhibit enzyme-catalyzed oxidation include agents that bind free oxygen	[53]
3.	**Anti-dibetic activity**	hypoglycemic mechanism was shown by whole plant extract Tridaxprocumbensby stimulating the peripheral glucose utilization or by enhancing glycogenic and glycolytic pathways with concominant decrease in glycogenolysis and gluconeogensis.	[55]
		Oral administration of Tridaxprocumbens leaves extract	[56]

		reduction in blood glucose level indicating that the activation of β cells and granulation returns to normal, which shows an insulinogenic effect.	
4.	**Anti-cancer activity**	cytotoxic activity of various extracts Tridaxprocumbens against various human cancerous cell lines, The acetone and ethanol leaf extracts showed a potent anticancer activity on Hep G2 and A549 cancerous cell line by 3-(4,5-dimethylthiazole-2-yl)-2,5-diphenyl tetrazolium bromide	[59]
		Antioxidants prevent the damage done to cells by free radicals-molecules that are released during the normal metabolic process of oxidation. Some of these free radicals include reactive oxygen free radicals species (ROS), reactive hydroxyl radicals (OH.), the superoxide anion radical (O2 .), hydrogen peroxides (H2O2) and peroxyl (ROO.) which generates metabolic products that attack lipids in cell membranes or DNA. These are associated with several types of biological damage, DNA damage, carcinogenesis	[58]
		luteolin from Tridaxprocumbens demonstrates significant anticancer activity through various mechanisms, including apoptosis induction and inhibition of cancer cell proliferation. effective against different types of cancer, such as lung, breast, and prostate cancers.	[57]
5.	**Anti-bacterial activity**	Excellent inhibition zones and improved resistivity power against both gram-positive and gram-negative bacteria Research shows that Quercetin disrupts bacterial cell walls, alters cell permeability, inhibits enzyme activity, and reduces nucleic acid synthesis	[61][80]
6.	**Wound-healing activity**	Ethanolic extract of *Tridaxprocumbens (L.)* in 5% w/w in simple ointment base showed the most potent wound healing potential in diabetic and non- diabetic group both The mechanism of wound repair occurs in several processes such as hemostasis, inflammatory phase, proliferative or fibroblasts phase (this phase includes collagen synthesis, neovasculature formation and re-epithelialization) and wound contraction which is also called remodeling of tissue	[62][63]
8.	**Anti-ulcer activity**	Terpenoids and alkaloid compounds are also reported to have potent activity against gastric ulcers. The extract was observed to significantly reduce mucosal damage empty stomach causes ulcers mostly on the glandular (mucosal) part	[64]

		of the stomach by inhibiting prostaglandin synthesis through the cyclooxygenase pathway.	
9.	**Hepatoprotective activity**	Oral administration of various doses of Tridaxprocumbens (TP) ethanolic extract gradual normalization of the activities of Aspartate aminotransferase (AST), Alanine aminotransferase (ALT) Alkaline phosphatase (ALP) and also recovery of the hepatocytes from necrosis ,improving the functional integrity of liver cells,	[67]
10.	**Anti- Inflammatory Activity**	The study investigates the in vivo anti-inflammatory effects of T. procumbens extracts using a carrageenan-induced rat paw edema assay. It also details the isolation and characterization of bioactive compounds and the in vitro inhibition of COX-1 and COX-2,Quercetin, noted for its anti-inflammatory effects,It also shows gastrointestinal cytoprotective and mast cell stabilizing activities	[72]

Conclusion

Tridaxprocumbens, perennial plant, is widely used in the traditional medicine. and also its phytochemical ingredients have a variety of biological actions, including - wound healing, anti-hypertensive, antioxidant, antidiabetic, and anti-cancer characteristics. The plant has promise for producing novel medications and cures. Additional study is required to properly investigate its a medicinal potential and substantiate its traditional usage.

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